The Economic Costs and Impact of Home Gardening in Ouagadougou, Burkina Faso

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Summary

The world's population is increasing by about 85 million every year (LEISINGER, 2000; WORLD BANK, 2000). These figures are closely related to the rapid growth of urban centers. Sub-Saharan Africa is one of the regions most affected by urbanization. It has an annual growth rate of 2.8% in the total population and 5.8% in the urban population (WORLD BANK, 2000). This process can also be seen in Burkina Faso, where the capital, Ouagadougou, had a growth rate of 6.8% in 1998 compared to 2.8% for the entire country (LEREBOURS PIGEONNIERE & JOMNI, 1998).

In connection with the dynamic urbanization in developing countries, the informal sector becomes the predominate form of economic production among city-dwellers (AKKARI, 1995; IMFELD, 1995). One expanding sector of the informal urban economy is urban agriculture (LANDAUER & BRAZIL, 1990; SMIT, 1996). Home gardening is a part of the urban agriculture system and can be seen as a small-scale production of vegetables, fruits, flowers and plants on small plots. In arid and semi-arid regions, such as the Sub-Saharan countries, where hunger and malnutrition are becoming more and more urban problems, urban agriculture is an activity that contributes to the nutritional self-reliance of a town. In addition, it is an income-generating activity mainly for the less privileged segments of the population (ILEIA, 1994; RABINOVITCH & SCHMETZER, 1997). Nevertheless, in addition to these benefits of urban agriculture for towns and their inhabitants, urban agriculture also creates risks, such as health problems caused by polluted water used for irrigation (i.e. virus, bacteria and parasites / CISSE, 1997; BOSSHART, 1998) and contaminated soils (MARA & CAIRNCROSS, 1991), and socio-economic difficulties, which vary from season to season. Urban agriculture depends crucially on the annual rainfall, which is limited to the months of the rainy season, to irrigate the fields.

This study was undertaken within the project 'Health impact and management of wastewater use in small-scale agriculture in urban Saharan settings, risks and potential intervention strategies'. It is a multidisciplinary project concerning the epidemiological, engineering, socio-cultural and economic dimensions of home

gardening, emphasizing health risks associated with the use of wastewater for irrigation.

To complete the multidimensional project, the overall aim of this study was to evaluate the economic costs and impact of home gardening, taking as examples three separate sites with different social and economic structures in Ouagadougou. The focus was on the identification of a possible link between the economic dimension of home gardening and the health status of home gardeners. As the economic factor (income and expenditures) is only one of the many factors of the urban agriculture system (i.e. quality and quantity of water and soil, seasonality, variation of vegetables, trade possibilities), it was of interest to know how the economic factor influenced the health status of home gardeners in comparison to other city-dwellers.

From among the 48 different sites of home gardening in Ouagadougou, three sites were selected for the study. They are three of the main and biggest home gardening sites in town and show clear differences in the position of urban agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies.

Field work took place after the dry season in 1998 and after the rainy season in 1999. The dry season in 1998 was a particularly difficult season as rainwater was running short very early in this season.

Using a questionnaire, information was collected about the economic status of households engaged in home gardening (HGs households) and compared with that of households in the same area engaged in any activity other than home gardening (NHGs households). Using a combination of quantitative and qualitative methods and adhering to the principle of triangulation, the information of the questionnaire was completed by focus group discussions with home gardeners and market vendors and by personal observations.

One of the main results of the study was that both in the dry and in the rainy season HGs households had a lower estimated average monthly income than their counterparts practicing any activity other than home gardening. In addition to the generally lower income level a different seasonal pattern could also be seen. In all three sites the average monthly income in HGs households was higher in the dry

season than in the rainy season. Furthermore, the HGs income varied from site to site, according to the different external factors of each site, which were mainly the different quality of irrigation water and the vegetable patterns.
In the whole study population more than half of the predictable expenditures were spent on food. In addition to high food expenditures, a seasonality in the spending could also clearly be seen in HGs households in each of the three sites. In the rainy season HGs households had significantly lower expenditures for food than NHGs households. This was due to the fact that in the rainy season the HGs households in all three examined sites could obtain most of their food through subsistence production of both vegetables and cereals. In the dry season the HGs households had the same high expenditures for food as the NHGs households. The subsistence production was reduced to a very low level and stopped totally at the end of the dry season, because then there was no more water to irrigate the fields.
In all three sites the HGs households were not able to cover their monthly expenditures with their estimated income, but the NHGs households always had a surplus in the dry as well as in the rainy season. There were also differences in socio-economic status in the study population: more HGs households than NHGs households belonged to a lower socio-economic class.

Home gardening can be seen as an income-generating activity especially for people with few skills and limited education. (More than 80% of the HGs in the study were illiterate.) However, the income obtained by home gardening was very low. In addition, home gardening contributes to food security in a household, because it saves food costs through subsistence production. However, this advantage was only given for the rainy season. The HGs households in Ouagadougou belonged to one of the lowest socio-economic classes. The risk of being exposed to seasonal changes of the already low income and the risk of being exposed to food insecurity at least in one season of the year made them extremely vulnerable. As they did not have the potential to save money or to stock food they had almost no means to cope with these risks.

Regarding the health status of the study population, in HGs and NHGs households, in all three sites, and in the rainy as well as in the dry season, malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases, were the most

frequently named last illnesses. Furthermore, the average number of days of illness was equivalent in all examined households, children had the highest rate of illness in a household and the expenditures for medical care were comparable in all households. Although different socio-economic classes in the study population could be identified and HGs households belonged more often to lower socio-economic classes, there was no correlation between the health status of a population group and their socio-economic status.
In this study, the health risk related to practicing home gardening was not found in Ouagadougou. These results indicate that lower monthly predictable expenditures, a lower income and a lower expenditures coverage rate are not directly related to a lower health status in the home gardeners' population.

Lessons learned from this study in Ouagadougou have scientific and practical implications for other home gardening sites as well, since home gardening exists in an ever growing number of countries and towns all over the world. Especially in developing countries home gardening is seen as one of the main economic activities of poorer urban households.
In all countries, home gardening depends on many external factors (see above). All these determinants are difficult to influence and have a different priority for different countries, towns and even sites. It was clearly seen in this study that despite the similarity in activity HGs were not a homogenous group and had different economic situations, which depended on the different external factors of the respective sites.

In Sub-Saharan countries many external determinants that influence the urban agriculture system show similar patterns. These determinants are mainly linked to the quantity of the water for irrigation during the year and the seasonal variations regarding income, expenditures and trade possibilities for HGs. Thus, the data obtained in this study will have applications as a base for research and intervention possibilities in other countries of Sub-Saharan Africa. Further research, which emerges from the results of the study, would be the search for rapid assessment methods in order to detect faster particular groups at risk, which are related to urban agriculture.

Specific interventions, which arise from the findings of the study concern the micro and macro levels. Concerning the feasible interventions to strengthen home gardening, the existing external determinants at each specific site must be carefully examined. The main factors are the quality of the soil as well as the water for irrigation and the variation of vegetables.

On the micro level ‘HGs banks’ on the different home gardening sites should be established. Carefully tailored to each site, such micro-credit schemes could increase the income of home gardeners and might reduce seasonal variations in the income by increasing productivity as well as identifying new income-generating activities. In addition, a process of participatory action research should be established in order to achieve the successful translation of interventions in each of the sites due to the participation of the respective HGs.

On the macro level a wider acceptance of home gardening as an important activity in the town should be achieved. This could be obtained by establishing a risk mapping of home gardening and by organizing ‘information-education-communication’ campaigns.

Résumé

La croissance démographique est estimée à 85 millions chaque année (LEISINGER, 2000; WORLD BANK, 2000). Ce chiffre est étroitement lié à la croissance rapide des centres urbains. L'Afrique sub-sahélienne est l'une des régions les plus affectées par l'urbanisation. Son taux de croissance annuel est de 2,8% au niveau de la population total et de 5,8% au niveau de la population urbaine (WORLD BANK, 2000). Ce processus est également le même au Burkina Faso, où la capitale Ouagadougou, avait un taux de croissance de 6,8% en 1998 comparé à 2,8% pour le pays (LEREBOURS PIGEONNIERE & JOMNI, 1998).

En rapport avec l'urbanisation dynamique des pays en développement, le secteur informel devient chez les citadins la forme prédominante de production économique (AKKARI, 1995; IMFELD, 1995). L'agriculture urbaine figure parmi les secteurs en développement au niveau de l'économie urbaine informelle (LANDAUER & BRAZIL, 1990; SMIT, 1996). Le maraîchage fait partie du système d'agriculture urbaine et peut être considéré comme une petite et moyenne production de légumes, de fruits, de fleurs et de plantes sur des lopins de terre. Dans les régions arides et semi-arides, telles que les pays sub-sahéliennes où la famine et la malnutrition sont des problèmes urbains atteignant des proportions de plus en plus alarmantes, l'agriculture urbaine est une activité qui contribue à l'autosuffisance alimentaire des villes. C'est également une activité rémunératrice, plus principalement pour les franges les moins nanties de la population (ILEIA, 1994; RABINOVITCH & SCHMETZER, 1997). Néanmoins, en plus des avantages que cette forme d'agriculture présente pour les villes et leurs habitants, l'agriculture urbaine comporte également des risques, tels que les risques sanitaires, du fait de la pollution des eaux utilisées pour l'irrigation (c'est-à-dire les virus, les bactéries et les parasites / CISSE, 1997; BOSSHART, 1998) et la contamination des sols (MARA & CAIRNCROSS, 1991), et des difficultés socio-économiques, qui connaissent des variations saisonnières. L'agriculture urbaine dépend principalement de la pluviométrie annuelle qui se limite aux mois de la saison pluvieuse pour l'irrigation des sites.

La présente étude a été menée dans le cadre du projet 'Impact sanitaire des eaux usées dans l'agriculture urbaine sahélienne – Cas de Ouagadougou (Burkina Faso) et de Nouakchott (Mauritanie)'. C'est un projet multidisciplinaire portant sur les dimensions épidémiologiques, techniques, socioculturelles et économiques du maraîchage, avec un accent mis sur les risques sanitaires liés à l'utilisation d'eaux usées pour l'irrigation.

En vue de la réalisation complète du projet multidimensionnel, cette étude vise l'évaluation des coûts et de l'impact du maraîchage, en sélectionnant trois sites différents comportant des structures économiques et sociales, en se focalisant sur l'identification d'un lien possible entre la dimension économique du maraîchage et l'état de santé du maraîcher. Le facteur économique (revenu et dépenses) n'étant qu'un des nombreux facteurs du système d'agriculture urbaine (c'est-à-dire la qualité et la quantité d'eau et du sol, les saisons, les types de légumes, les possibilités de commercialisation), il est important de savoir à quel point le facteur économique influence l'état de santé des maraîchers par rapport aux autres citadins.

Sur 48 différents sites de maraîchage à Ouagadougou, trois sites ont été sélectionnés pour l'étude. Ces trois sites comptent parmi les plus grands sites de maraîchage de la ville et présentent des différences assez nettes de par leur position dans l'agriculture urbaine, leur organisation sociale, les types de légumes produits et leurs stratégies de plantation et d'irrigation.

Les travaux sur le terrain ont eu lieu après la saison sèche en 1998 et après la saison pluvieuse en 1999. La saison sèche était une saison particulièrement difficile, vu que l'eau de pluie fait déjà défaut très tôt durant cette saison.

A l'aide d'un questionnaire, il a été possible de réunir des informations relatives à la situation économique des ménages engagés dans le maraîchage (les maraîchers). Ces données ont été ensuite comparées à celle des ménages vivant dans la même zone mais qui sont engagés dans des activités autres que le maraîchage (les non-maraîchers). La stratégie d'investigation était celle de la triangulaire, qui consiste à la combinaison des méthodes quantitatives et qualitatives. Ainsi, le questionnaire fut rempli par des discussions en groupes focaux avec les maraîchers et les vendeurs du marché et par des observations directes non-structurées.

L'un des résultats les plus frappants est que pendant la saison sèche et la saison pluvieuse, le revenu des ménages pratiquant le maraîchage est inférieur à celui des ménages engagés dans des activités autres que le maraîchage. Outre le faible revenu, on note le facteur saison, car dans tous les trois sites la moyenne du revenu mensuel des maraîchers est plus haute pendant la saison sèche que pendant la saison pluvieuse. En plus, la moyenne du revenu mensuel des maraîchers n'est pas comparable dans chacun des trois sites, mais varie selon les différents facteurs extérieurs de chaque site respectif qui sont surtout les différentes qualités d'eau utilisée pour l'irrigation et les types de légumes.

Pour l'ensemble de la population, plus de la moitié des dépenses prévisibles sont investies dans les provisions alimentaires. A côté des dépenses élevées pour la nourriture, la saisonnalité des dépenses est également mise en évidence au niveau des maraîchers dans chacun des trois sites examinés. Pendant la saison pluvieuse, les maraîchers réduisent significativement leurs dépenses pour la nourriture par rapport à ceux engagés dans les activités autres que le maraîchage. Cela est dû fait que pendant la saison pluvieuse, les maraîchers dans tous les trois sites examinés peuvent obtenir la plupart de la nourriture dont ils ont besoin, par la production de subsistance de légumes et de céréales. Pendant la saison sèche les maraîchers ont les mêmes dépenses pour la nourriture que les non-maraîchers. La production de subsistance est réduite à un niveau très bas et connaît une interruption totale à la fin de la saison sèche, du fait du manque d'eau pour l'irrigation des sites.

Dans tous les trois sites, les maraîchers n'ont pas été en mesure d'amortir leurs dépenses mensuelles avec leur revenus estimés; cependant les non-maraîchers enregistrent toujours un surplus aussi bien pendant la saison sèche que pendant la saison pluvieuse. En ce qui concerne le statut socio-économique dans l'étude de la population, les maraîchers ont un statut socio-économique qui est plus bas que les non-maraîchers.

Le maraîchage peut être considéré comme une activité rémunératrice, en particulier pour les personnes peu instruites et peu qualifiées. (Il ressort de l'étude que plus de 80% des maraîchers sont illettrés.) Cependant, le revenu provenant du maraîchage est très bas. En outre, le maraîchage contribue à la sécurité alimentaire des ménages, en ce sens qu'il participe à la réduction des charges alimentaires, en

raison de la production de subsistance. Cependant, cet avantage est uniquement donné pour la saison pluvieuse.
Les maraîchers à Ouagadougou appartiennent à l'une des classes socio-économiques les plus basses. Le risque d'exposition aux changements saisonniers des revenus déjà faibles, et le risque d'exposition à l'insécurité alimentaire, du moins pendant une saison de l'année, les a rendus extrêmement vulnérables. Ne disposant pas de possibilités d'économiser de l'argent ou d'emmagasiner la nourriture, ils n'ont pratiquement pas les moyens de faire face à ces risques.

En ce qui concerne l'état de santé de la population faisant l'objet de l'étude, au sein des ménages pratiquant et ceux ne pratiquant pas le maraîchage, dans tous les trois sites, aussi bien pendant la saison pluvieuse que pendant la saison sèche, le paludisme, les maladies gastro-intestinales, y compris la diarrhée, et les infections respiratoires, sont les maladies les plus fréquemment perçues. Par ailleurs, le nombre moyen de jours passés dans la maladie s'est révélé identique dans tous les ménages étudiés, les enfants étant les plus touchés dans les ménages et les dépenses pour la santé sont plus ou moins uniformément reparties chez les maraîchers et les non-maraîchers. En dépit de l'identification de diverses classes sociales au sein de la population étudiée, et du fait que les maraîchers appartiennent assez souvent à une classe socio-économique inférieure, aucune corrélation n'est établie entre l'état de santé d'un segment de la population et son statut socio-économique.
Au cours de cette étude, aucun risque sanitaire n'a été constaté dans la pratique du maraîchage à Ouagadougou. Ces résultats portent à croire que le faible taux de dépenses mensuelles prévisibles, les faibles revenus et le faible taux de couverture des dépenses ne sont pas directement liés à une situation sanitaire faible au sein de la population des maraîchers.

Les leçons retenues de cette étude à Ouagadougou, peuvent être appliquées à d'autres sites de maraîchage, d'autant plus que le maraîchage est pratiqué par un nombre de plus en plus important de pays et de villes de par le monde. Le maraîchage est perçu en particulier dans les pays en voie de développement comme figurant parmi les principales activités économiques des ménages urbains les moins

nantis. Dans tous les pays, le maraîchage est tributaire des nombreux facteurs externes (voir plus haut).
Toutes les facteurs sont à peine influençables et comportent une priorité différente pour chaque pays, ville ou site. L'étude a clairement démontré que malgré la similitude d'activités, les maraîchers ne constituaient pas un groupe homogène et connaissaient une situation économique différente tributaire des facteurs externes du site en question.
Dans les pays sub-sahéliens, plusieurs facteurs externes exerçant un impact sur le système d'agriculture urbaine suivent le même scénario. Ces facteurs sont principalement liés à la quantité des eaux d'irrigation au cours d'une année et le caractère saisonnier des revenus, des dépenses et des possibilités commerciales des ménages pratiquant le maraîchage. Ainsi, les données obtenues dans le cadre de cette étude peuvent être également utilisées comme le fondement de recherches et de possibilités d'intervention dans d'autres pays de l'Afrique sub-sahélienne. Des recherches ultérieures émergeant des résultats de l'étude pourraient être l'identification de méthodes d'évaluation rapide, en vue d'identifier plus rapidement les groupes particuliers à risque en rapport avec l'agriculture urbaine.

Des interventions spécifiques émanant des résultats de l'étude concernent les niveaux micro et macro. Pour cerner les actions possibles pour le renforcement du maraîchage, l'on doit soigneusement identifier les facteurs externes existants sur le site en question (la qualité du sol, les eaux d'irrigation et la structure végétale). Au niveau micro, les 'banques-maraîchers' sur les différents sites doivent être créées. Conçus en tenant compte des spécificités des sites, ces programmes de micro-crédit pourraient accroître les revenus des maraîchers et réduire le caractère saisonnier en accroissant la productivité et en identifiant de nouvelles activités génératrices de revenus. En outre, l'approche participative RAF (Recherche-Action-Formation) doit être initiée, afin d'assurer le succès des interventions sur les sites, du fait de la participation des maraîchers respectifs.
Au niveau macro, une plus grande reconnaissance du maraîchage en tant qu'activité urbaine majeure doit être obtenue. Ceci pourrait être réalisé à travers l'établissement d'un 'risk-mapping' du maraîchage et l'organisation de campagnes d'information-éducation-communication.

Zusammenfassung

Die Weltbevölkerung wächst jährlich um etwa 85 Millionen Menschen (LEISINGER, 2000; WORLD BANK, 2000). Diese Zahl ist eng verknüpft mit dem rapiden Anwachsen von Städten. Die Sahelzone in Afrika ist dabei die Region mit dem höchsten städtischen Bevölkerungswachstum. Die Gesamtbevölkerung wächst dort jährlich um 2,8%, hingegen steigt die Bevölkerung in den Städten um 5,8% (WORLD BANK, 2000). Auch in Burkina Faso spiegelt sich dieses Wachstumsverhältnis wieder. Während 1998 die gesamte Bevölkerung jährlich um 2,8% zunahm, hatte die Hauptstadt Ouagadougou eine Wachstumsrate von 6,8% (LEREBOURS PIGEONNIERE & JOMNI, 1998).

In Zusammenhang mit dem rapiden Anwachsen von Städten in Entwicklungsländern gewinnt bei der Stadtbevölkerung der informelle Sektor als wirtschaftlicher Zweig und hier vor allem der Teilbereich der städtischen Landwirtschaft immer mehr an Bedeutung (LANDAUER & BRAZIL, 1990; AKKARI, 1995; IMFELD, 1995; SMIT, 1996). Ein wachsender Bereich der städtischen Landwirtschaft sind Gartenanbaugebiete, die als ein eng umgrenztes agrarisches Produktionssystem mit Gemüse-, Frucht-, aber auch Blumen und Pflanzenanbau definiert werden können.

In ariden und semi-ariden Gebieten wie der Sahelzone werden Unter- und Mangelernährung immer mehr zu einem Problem der Städte. Hier leistet städtische Landwirtschaft einen wichtigen Beitrag zur Unabhängigkeit in der Ernährungs-sicherung der Städte. Darüber hinaus stellt die städtische Landwirtschaft besonders für die unterprivilegierten Schichten der Bevölkerung eine geldbringende Tätigkeit dar (ILEIA, 1994; RABINOVITCH & SCHMETZER, 1997). Neben den erwähnten Vorteilen, sowohl für die Stadt selbst als auch für die Bevölkerung, kann die städtische Landwirtschaft jedoch auch Risiken bergen. Zum einen sind dies Gesundheitsrisken, da oft verschmutztes Wasser zur Bewässerung verwendet wird, welches Viren, Bakterien und Parasiten enthalten kann, und da zudem auf kontaminierten Gartenanbaugebieten angepflanzt wird (MARA & CAIRNCROSS, 1991; CISSE, 1997; BOSSHART, 1998). Zum anderen können jahreszeitabhängige sozio-ökonomische Risiken zum Tragen kommen. Städtische Landwirtschaft ist stark abhängig vom jährlichen Regen der zeitlich begrenzten Regenzeit, um die Gartenanbaugebiete zu bewässern.

Die vorliegende Studie wurde im Rahmen des Forschungsprojektes ‘Städtische Landwirtschaft im Sahel: Gesundheitsrisiken beim Gebrauch von Abwasser für die Bewässerung und mögliche Handlungsstrategien’ durchgeführt. Das Projekt ist multidisziplinär und umfaßt die epidemiologische, technische, sozio-kulturelle und ökonomische Seite von Gartenanbaugebieten, wobei ein klarer Schwerpunkt auf Gesundheitsrisiken im Zusammenhang mit der Bewässerung durch städtische Abwässer liegt.

Ziel dieser Studie war die Bewertung der ökonomischen Bedeutung von Gartenanbaugebieten am Beispiel dreier Gebiete in Ouagadougou, die verschiedene soziale und wirtschaftliche Strukturen aufweisen. Der ökonomische Faktor (Einkommen versus Ausgaben) ist nur einer von vielen Einflußfaktoren der städtischen Landwirtschaft. Des weiteren können auch Qualität und Quantität des Wassers und der Anbaugebiete, saisonale Unterschiede in den Gebieten, Gemüsesortiment oder Handelsmöglichkeiten die städtische Landwirtschaft beeinflussen. Schwerpunkt der Studie war es herauszuarbeiten, ob und in wie weit die ökonomische Komponente einen Einfluß auf den Gesundheitszustand der Stadtgärtner im Vergleich zur städtischen Bevölkerung hat.

Von den 48 existierenden Gartenanbaugebieten in Ouagadougou wurden drei für die Studie ausgewählt. Diese drei Gartenanbaugebiete gehören zu den wichtigsten und größten der Stadt und unterscheiden sich untereinander deutlich in ihrem Grad der städtischen Landwirtschaft, ihrer sozialen Struktur, in ihren Gemüsesorten sowie der Anbau- und Bewässerungsstrategie.

Die Feldstudien wurden 1998 nach der Trockenzeit und 1999 nach der Regenzeit durchgeführt. Die Trockenzeit des Jahres 1998 war besonders gravierend, da das Regenwasser damals schon sehr früh in der Trockenzeit verbraucht war.

Informationen über die wirtschaftliche Situation in Haushalten von Stadtgärtnern und einer Vergleichsgruppe, die zwar in der selben Umgebung wie die Stadtgärtner wohnte, aber einer anderen Tätigkeit nachging, wurden mit Hilfe eines quantitativen Fragebogens gesammelt. Die Forschungsstrategie bediente sich der triangularen Kombination von quantitativen und qualitativen Methoden, so daß der Fragebogen durch Fokus-Gruppen-Diskussionen mit Stadtgärtnern und Marktfrauen und persönlichen Beobachtungen auf den jeweiligen Gebieten ergänzt wurde.

Ein Hauptergebnis der Studie war, daß sowohl in der Trockenzeit als auch in der Regenzeit Stadtgärtner-Haushalte ein geringeres geschätztes monatliches Durchschnittseinkommen hatten als Vergleichsgruppen-Haushalte. Darüber hinaus konnten auf der geringeren Einkommensstufe auch noch saisonale Unterschiede festgestellt werden. In allen drei Gartenanbaugebieten war das geschätzte monatliche Durchschnittseinkommen der Stadtgärtner-Haushalte in der Regenzeit geringer als in der Trockenzeit. Zudem unterschied sich das Einkommen der Stadtgärtner-Haushalte in den drei verschiedenen Gartenanbaugebieten gemäß der verschiedenen externen Faktoren der jeweiligen Gebiete, wobei die Hauptfaktoren vor allem die Qualität des Wassers und das Gemüsesortiment waren.
Sowohl die Stadtgärtner-Haushalte als auch die Vergleichsgruppen-Haushalte gaben mehr als die Hälfte ihrer kalkulierbaren monatlichen Ausgaben für Essen aus. Zu den hohen Essensausgaben kamen auch hier saisonale Unterschiede im Ausgabeverhalten der Stadtgärtner-Haushalte der drei Anbaugebiete hinzu. Die Stadtgärtner-Haushalte hatten in der Regenzeit signifikant geringere Essensausgaben als die Vergleichsgruppen-Haushalte. In der Regenzeit war es den Stadtgärtner-Haushalten möglich, das meiste des benötigten Essensbedarfs durch Subsistenzanbau von Gemüse und Getreide zu decken. In der Trockenzeit hingehen hatten die Stadtgärtner-Haushalte gleich hohe Essensausgaben wie die Vergleichsgruppen-Haushalte. In dieser Zeit ist der Subsistenzanbau stark verringert bzw. kommt völlig zum Erliegen, wenn kein Wasser zur Bewässerung der Gebiete mehr vorhanden ist.
In allen drei Anbaugebieten waren die Stadtgärtner-Haushalte weder in der Regen- noch in der Trockenzeit in der Lage, ihre monatlichen Ausgaben über ihr Einkommen zu decken. Hingegen erzielten die Vergleichsgruppen-Haushalte immer einen monatlichen finanziellen Überschuß. Ferner hatten mehr Stadtgärtner-Haushalte als Vergleichsgruppen-Haushalte einen niedrigeren sozio-ökonomischen Status.

Städtische Landwirtschaft kann vor allem für weniger qualifizierte Schichten der Bevölkerung mit geringerer Schulbildung als einkommensbringende Tätigkeit in Frage kommen. (Mehr als 80% der befragten Stadtgärtner waren Analphabeten.) Das erzielte Einkommen durch Gartenbau ist jedoch gering. Darüber hinaus kann städtische Landwirtschaft als ein Beitrag zur Ernährungssicherung

angesehen werden, da durch Subsistenzanbau Essensausgaben gespart werden können. Dieser Vorteil war jedoch ausschließlich in der Regenzeit feststellbar. Das Risiko von saisonalen Schwankungen in Verbindung mit einem ohnehin schon sehr geringen Einkommen sowie das Risiko, zumindest in einer Jahreszeit nicht genügend Essen zu haben, macht die Stadtgärtner-Haushalte extrem vulnerabel. Da sie weder über die Möglichkeit des Geldsparens noch über die der Vorratshaltung verfügen, haben sie wenig Kapazitäten, auf diese oben genannten Risiken adäquat reagieren zu können.

Betrachtet man den Gesundheitszustand in Stadtgärtner-Haushalten und Vergleichsgruppen-Haushalten, in allen drei Anbaugebieten und in der Regen- wie in der Trockenzeit, dann waren Malaria, gastro-intestinale Erkrankungen einschließlich Durchfall sowie Atemwegserkrankungen die zu letzt am häufigsten aufgetretenen Krankheitsursachen. Die durchschnittliche Anzahl von Krankheitstagen war in allen befragten Haushalten ähnlich, ebenso waren die Behandlungsausgaben vergleichbar. Sowohl in den Stadtgärtner-Haushalten als auch in den Vergleichs-gruppen-Haushalten waren Kinder am meisten von Krankheiten betroffen. Obwohl die befragten Haushalte einerseits zu verschiedenen sozio-ökonomischen Klassen und die Stadtgärtner-Haushalte dabei zu einer der niedrigsten Klassen gehörten, waren keinerlei Korrelationen zwischen dem Gesundheitszustand der befragten Bevölkerung und ihrem jeweiligen sozio-ökonomischen Status zu erkennen.
Ein erhöhtes Gesundheitsrisiko durch Ausübung von städtischer Landwirtschaft in Ouagadougou konnte in dieser Studie nicht festgestellt werden. Die Ergebnisse legen somit die Vermutung nahe, daß geringere monatliche Ausgaben und Einnahmen und somit eine geringere Ausgabendeckungsrate nicht in direkter Beziehung zu einem schlechteren Gesundheitszustand bei Stadtgärtnern stehen.

Die Ergebnisse der Studie in Ouagadougou sind sowohl von wissenschaftlichem als auch von praktischem Nutzen für andere städtische Gartenanbaugebiete, die im zunehmenden Maße in Ländern auf der ganzen Welt entstehen. Vor allem in Entwicklungsländern werden in die städtische Landwirtschaft als eine der Hauptaktivitäten der ärmeren Haushalte große Hoffnungen gesetzt.

Wie bereits erwähnt, hängt die städtische Landwirtschaft von vielen externen Faktoren ab. Diese sind schwierig zu beeinflussen und haben je nach Land, aber auch Stadt und sogar Anbaugebiet verschiedene Prioritäten. Die Studie machte deutlich, daß die Stadtgärtner trotz ihrer gleichen Tätigkeit keine homogene Gruppe waren, vielmehr hatten sie verschiedene Einkommens- und Ausgabemuster, die eng mit den externen Faktoren in ihren jeweiligen Anbaugebieten zusammenhingen.
In den Ländern der Sahelzone sind viele der externen Einflußfaktoren der städtischen Landwirtschaft vergleichbar, so vor allem die sich über das Jahr hinweg verändernde Menge an Wasser und die saisonalen Unterschiede bei Einkommen, Ausgaben und den Verkaufsmöglichkeiten. Die Studie kann deshalb als eine Basis für weitere Forschung und Handlungsstrategien in anderen Ländern der Sahelzone genutzt werden. Eine aus dieser Studie resultierende Forschungsaufgabe wäre die Suche nach ‘rapid assessment methods’, um noch schneller Stadtgärtner-Gruppen erkennen zu können, die im bezug auf die städtische Landwirtschaft einem erhöhten Risiko ausgesetzt sind.

Spezieller Handlungsbedarf ist sowohl auf der ‘Mikro-Ebene’ als auch auf der ‘Makro-Ebene’ geboten. Bei allen Maßnahmen zur Förderung städtischer Landwirtschaft müssen die jeweiligen externen Faktoren in den verschiedenen Anbaugebieten, also vor allem die Qualität des Wassers, der Böden und das Gemüsesortiment, besonders berücksichtigt werden.
Auf der Mikro-Ebene sollten sogenannte ‘Stadtgärtner-Banken’ gegründet werden. Angepaßt an das jeweilige Anbaugebiet, könnten mit Hilfe solcher Mikrokredite einerseits durch Intensivierung der Anbauproduktivität das Einkommen der Stadtgärtner erhöht und dabei auch die saisonalen Unterschiede minimiert, andererseits neue einkommensbringende Aktivitäten gefördert werden. Um eine erfolgreiche Umsetzung dieser Maßnahmen zu gewährleisten, sollten diese in den Prozeß der ‘Research-Action-Formation’ integriert werden, der die Einbindung der betroffenen Bevölkerung auf allen Maßnahmeebenen verlangt.
Auf der Makro-Ebene sollte eine breitere Akzeptanz der städtischen Landwirtschaft als ein bedeutender wirtschaftlicher Zweig in der Stadt erreicht werden. Das Erstellen eines ‘risk-mapping’ von Anbaugebieten und die Organisation von Informations-Bildungs-Kommunikationsforen könnten dafür erforderliche Maßnahmen darstellen.

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All photographs (except Photo 13) were taken by Sibylle Gerstl.

List of Abbreviations

BIT	Bureau International du Travail
BNI	Basic Needs Index
CAN	African Cup of Nations (Coupe d'Afrique des Nations)
CFAF	Communauté Financière Africaine Franc
DAC	Development Assistance Committee of the OECD
DALYs	Disability-Adjusted Life Years
DEZA	Direktion für Entwicklung und Zusammenarbeit
DS	Dry Season
EIER	Ecole Inter-Etats d'Ingénieurs de l'Equipement Rural
FAO	Food and Agriculture Organization of the United Nations
FGD	Focus Group Discussion
FGDs	Focus Group Discussions
FSI	Food Security Index
GDP	Gross Domestic Product
GNP	Gross National Product
HDI	Human Development Index
HG	Home Gardener
HGs	Home Gardeners
HPI	Human Poverty Index
IDRC	International Development Research Center (Canada)
IFAD	International Fund for Agricultural Development
ILO	International Labor Office
INSD	Institut National de la Statistique et de la Démographie
IPI	Integrated Poverty Index
IPTRID	International Program for Technology and Research in Irrigation and Drainage
Max	Maximum
Min	Minimum
NHG	Non-Home Gardener
NHGs	Non-Home Gardeners
OECD	Organization for Economic Co-operation and Development
ONEA	Office Nationale de l'Eau et de l'Assainissement
PPP	purchasing power parity
Q_{25}-Q_{75}	50% distribution with 25%-Quartile and 75%-Quartile as limits
RAF	Recherche-Action–Formation / participatory action research
RS	Rainy Season
RWI	Relative Welfare Index
SD	Standard Deviation
SDC	Swiss Agency for Development and Cooperation
SES	Socio-Economic Status
SONABEL	Société Nationale Burkinabé d'Electricité
STI	Swiss Tropical Institute
SWOT	Strengths-Weaknesses-Opportunities-Threats Analysis
UNDP	United Nations Development Program
UNICEF	United Nations Children Fund
US $	United States Dollar
WHO	World Health Organization

List of Terms and Definitions

Disease	a biopathological process, which affects the organism a (bio)medical model, which permits people to understand these processes see 'Illness'
Expenditures Coverage Rate	the estimated monthly income is divided by the predictable monthly expenditures
Enrollment	total number of pupils who have registered in a class or school during the current school year
European Vegetables	required seeds and cuttings were first brought to Africa at the end of the last century by the European colonial powers and the Western missionaries i.e. aubergines, tomatoes, courgettes, carrots, lettuce see 'Traditional Vegetables'
Expenditures Predictable	costs have to be paid monthly by each household i.e. costs for food, drinking water, fuel for cooking, energy
Unpredictable	costs occur irregularly in a household people can not allow for them in advance i.e. illness, leisure
GDP	Gross Domestic Product the total output produced within the geographical boundaries of the country regardless of the nationality of the entities producing the output
GNP	Gross National Product the country's output of final goods and services for an accounting period (valued at market or purchaser's price)
Home Gardening	part of the urban agriculture system refers to a small-scale production of vegetables, fruits, flowers and trees in small plots
Household	group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible.
HGs	Home Gardeners the people's first and main activity has to be home gardening
Horticulture	cultivation of flowers, plants and trees in urban agricultural areas

Ill	subjective state of the person who is aware of not being well
Illness	must be perceived as an abnormal state by the ill person itself a particular crisis suffered by individuals
Infant Mortality Rate	the number of deaths among children under one year old per 1.000 live births.
Literacy Rate	percentage of the population who can read and write a simple message in any language or dialect
Long-Cycle Vegetables	have to grow more than 110 days 1 to 2 harvests during the home gardening season i.e. aubergines, carrots, tomatoes
NHGs	Non-Home Gardeners people have to be engaged in an activity other than home gardening and they have to live in the neighborhood of the HGs i.e. trader, tailor, plumber, animal-breeder
Peri-urban area	area at the fringe of the city that is in the process of converting from rural to urban area is a common locus of urban agriculture
Seasonality	seasonal dimension of poverty such as adverse factors which may coincide with the rainy or dry season including shortage of food, scarcity of money, difficult conditions for agricultural work, and scarcity of water
Short-Cycle Vegetables	have to grow less than 110 days 3 to 5 harvests during the home gardening season i.e. cauliflower, beans, salad
Risk	uncertain events that can threaten well-being
Risk exposure	probability that a certain risk will occur
Traditional Vegetables	local vegetables which were planted originally in Sub-Saharan Africa and already existed there for centuries i.e. oseille, boulmboula, boulvanka, gombo
Urban Agriculture	activity that produces, processes, and markets vegetables, fruits, flowers and trees in urban and peri-urban areas of a town applying intensive production methods, and (re)using natural resources and urban wastes
Vulnerability	defenselessness and exposure to external risks and lack of means (capacity) to cope (potential) with damaging loss

PART I INTRODUCTION

Photo 1: Irrigation of the fields with water out of a well, Tanghin, Ouagadougou, 1999

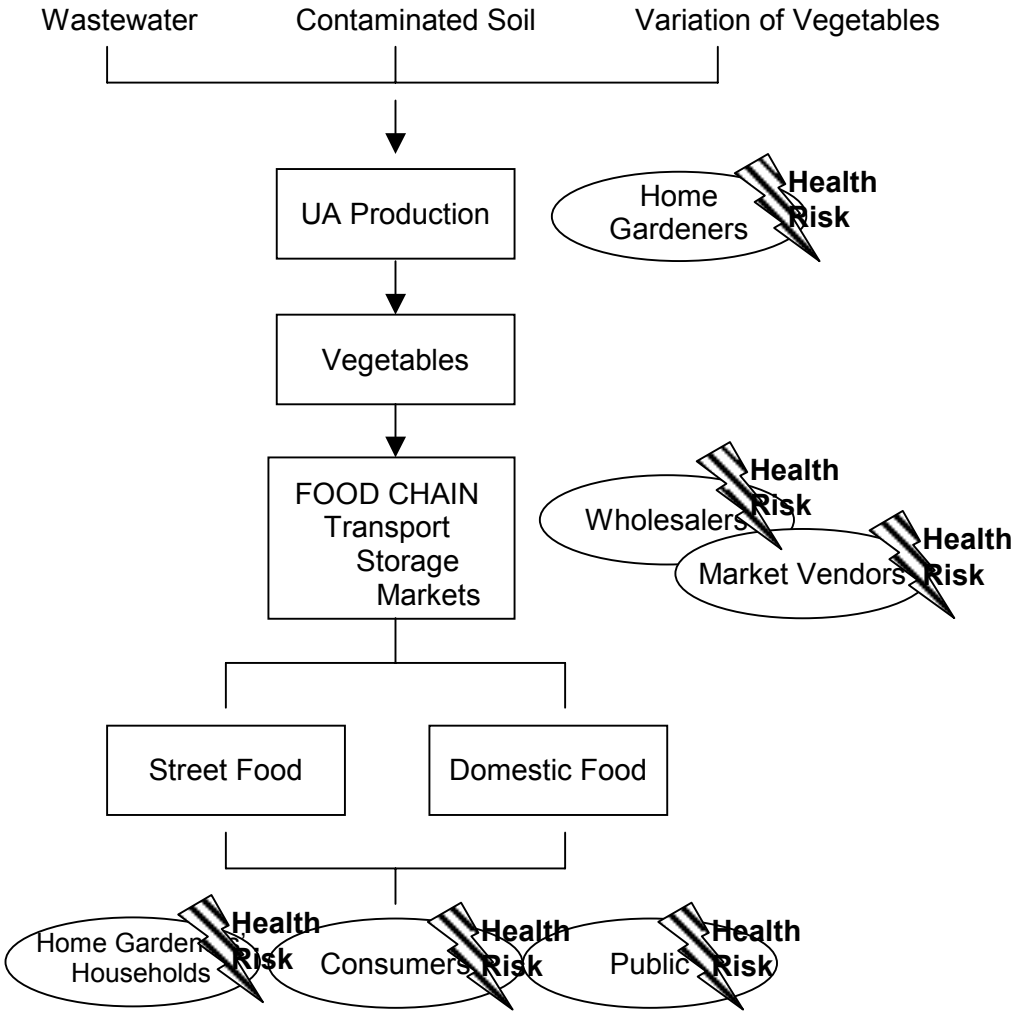
1. General Context

1.1. Urbanization and Urban Agriculture

Urban agriculture is a significant economic activity and is central to the lives of ten of millions of people throughout the world (LANDAUER & BRAZIL, 1990; SMIT, 1996). It is a rapidly growing industry that is increasingly essential to the economic and nutritional security of urban residents, especially in regions with low economic productivity, scarce food production and rapid urban growth.

In arid and semi arid regions such as the countries of the Sub-Saharan region where hunger and malnutrition are becoming more and more urban problems, urban agriculture is an activity that contributes to the nutritional self-reliance of a town. In addition it is an income-generating activity mainly for low-skilled and limited-educated city-dwellers. Urban agriculture is therefore an important factor for the socio-economic development of towns in the developing world. However, in addition to the benefits of urban agriculture for towns and their city-dwellers, urban agriculture may also create health risks for urban residents. Polluted irrigation water (i.e. with virus, bacteria and parasites / CISSE, 1997; BOSSHART, 1998), contaminated soils (MARA & CAIRNCROSS, 1991) and contaminated vegetables (CISSE, 1997) may increase the health risk for the urban population that is involved in the system of urban agriculture, the so-called home-gardeners, but also for all other residents of the town who consume the locally cultivated vegetables (refer to Figure 1.1.). An overview of the benefits and risks of urban agriculture with an emphasis on the related health risks is given in Section 1.2.3.f.

Figure 1.1. Urban agriculture (UA) and the related health risks



Urban agriculture is closely related to the rapid growth of the world's biggest cities, which results from the increase in the world population by about 85 million every year (LEISINGER, 2000). According to United Nations' projections, the current world population of about six billion will grow to more than nine billion by 2050 (UNITED NATIONS POPULATION DIVISION, 1998). During the same period the population of Africa will almost triple, which is a rate much higher than that of India, China and the rest of Asia. The projected growth rates are especially high in Sub-Saharan Africa. Since 1960 the population in Sub-Saharan Africa has more than doubled, rising from 85 million to 215 million people in 1993 (MOKWUNYE et al., 1996; THE ECONOMIST, 1998).

The current world population is split more or less equally between cities and rural areas. However, the population of urban areas is expected to surpass that of rural areas around the year 2005 (UN, 1997; LEISINGER, 2000). At present, 75% of the developed countries' populations is urban, compared to 38% in developing countries. The United Nations expects that between 1995 and 2025 the number of people living in urban areas will nearly double, from 2.8 billion to 5.3 billion. Over the next 20 years, 93% of the urban growth will occur in the cities of the developing world.
As the world population grows, the less urbanized regions of Asia and Africa are growing the fastest, with urban and peri-urban zones among them showing the biggest increase (FAO, 1998a). The population of urban areas in developing countries is growing by about 3.4% per annum (WORLD BANK, 2000). In the beginning of the 21st century, there will be around 200 cities with populations of over one million and 21 'megacities' with populations of over ten million people (FAO, 1996). By 2025 the human population will be predominantly urbanized, with 60% of the population living in urban areas.

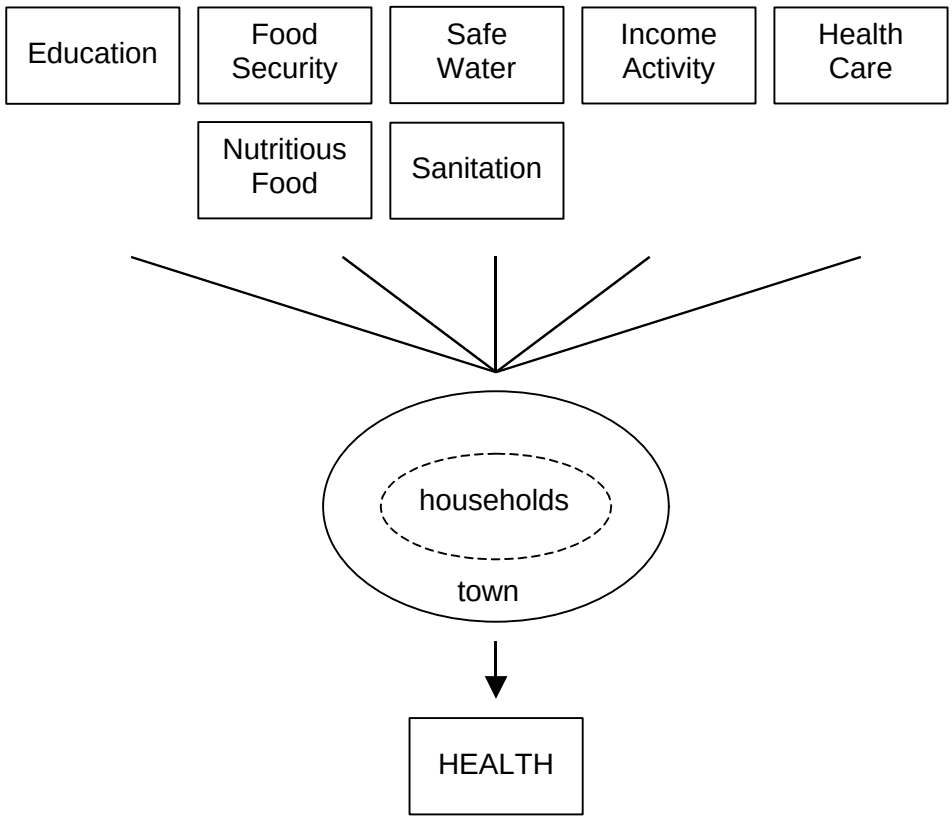
Sub-Saharan Africa is one of the regions most affected by urbanization. It has an annual growth rate of 2.8% in the total population and 5.8% in the urban population (WORLD BANK, 2000). In Sub-Saharan Africa much of the rapid growth of the urban population reflects a combination of flight from rural poverty and high fertility rates in urban areas (MCMICHAEL, 2000).
In 1930, there were 40 million people in Sub-Saharan Africa, with 4% living in cities; by 1990, the figure had risen to 190 million, with 40% living in cities. Projected figures for 2020 indicate that two-thirds of the population of Sub-Saharan Africa (430 million people) will be found in urban centers (SNRECH, 1994).

1.1.1. Urbanization and Health

Urbanization in the Southern hemisphere is rapidly increasing (WORLD BANK, 2000). This process is not necessarily bad in itself (WHO, 1991), but it becomes a problem when the rate of growth of the urban population exceeds the capacity of the infrastructure to absorb and support it (SEAGER, 1995). Health and the impact of the health situation on a town depend on access to education, food security, safe water

and sanitation, an income-generating activity and health care (WORLD BANK, 1994 / refer to Box 1.1.).

BOX 1.1. Different impact on health in urban settings
modified after WORLD BANK (1994)



The consequences for the health status of the urban population are substantial and call for comprehensive attention and public health action.

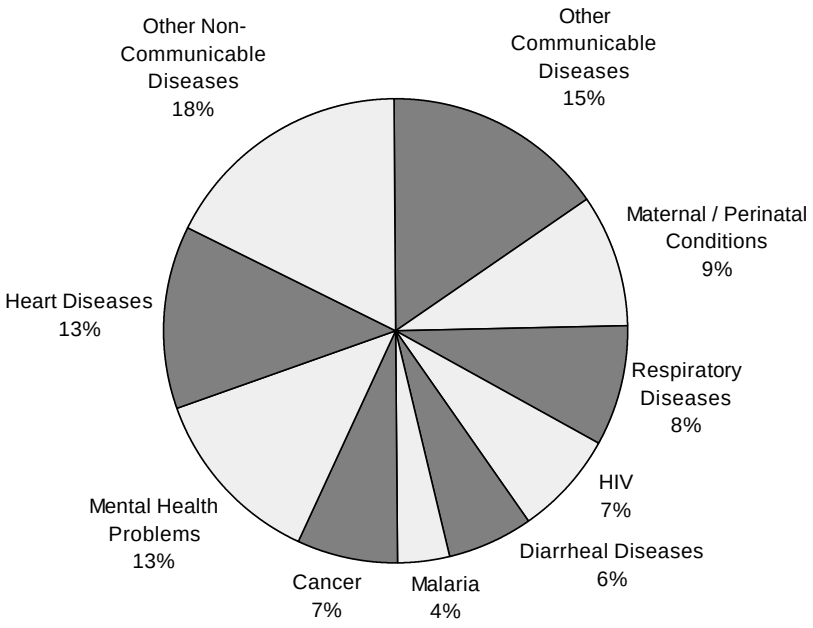
The typical health problems of the South, such as preventable and infectious diseases like measles, meningitis, malaria, cholera and AIDS, will remain and even increase (TANNER & HARPHAM, 1995). Poor sanitation, inadequate water supply, undernutrition and a poor vaccination rate in overcrowded urban areas are the major determinants for these diseases. In addition there is the problem of increasing resistance to available drugs due to poor compliance to treatment (SKÖLD, 1998). The urban poor suffer more from all these problems than people who are better off. Poor health is a common consequence of poverty and poverty can be a

consequence of poor health (FEACHEM, 2000). The incidence of many illnesses, especially communicable diseases, is higher for poor people, who usually have less access to health care. For example, between 1992 and 1997 only 22% of births among the poorest 20% of the population were attended by trained medical staff, compared to 76% among the richest 20% in the world (FAFCHAMPS & MINTEN, 1999). And in the same period in ten developing countries only 41% of poor people suffering from acute respiratory infections were treated in a health facility, compared with 59% of the non-poor (WORLD BANK, 2000/01).

In addition to the typical health problems of developing countries, many health problems associated with the developed world, which until today have occurred predominantly in the North, will substantially increase in developing countries (JAMISON et al., 1993). The most marked increases are in cardiovascular diseases and chronic diseases such as diabetes and cancer, but also mental health problems, which are associated with changes in lifestyle, changes in diet/over-eating and the acquisition of habits such as smoking and drinking alcohol. Another reason for mental health problems is the burden of work, especially for women in developing countries. Women contribute to the economic support of the household while also retaining full responsibility for domestic chores, child care, and the care of aging relatives. Thus, women work a ‘double day’ performing multiple roles. It was seen that this continuous state of exhaustion causes mental problems (DESJARLAIS et al., 1995). Today mental health problems together with cardiovascular diseases are one of the largest causes of lost years of quality of life (DESJARLAIS et al., 1995).

To obtain an estimate of the general health status of a population, the World Bank introduced the global burden of disease as a measurement in 1993 (WHO, 2000). The global burden of disease is a measurement of the number of disability-adjusted life years (DALYs) lost. It is calculated as the present value of the future years of disability-free life that are lost as the result of premature deaths or cases of disability occurring in a particular year (WORLD BANK, 1993). DALYs are therefore a type of health gap that measure the differences between a population’s health and a normative goal of living in full health. The global burden of disease in DALYs by cause is given in Figure 1.2.

Figure 1.2. Global distribution of health burden by cause in percentage of DALYs (disability-adjusted life years) lost
adapted from the World Health Report (2000)



"...Urbanization will become one of the most critical issues in development in the years ahead..." (HARRIES et al., 1992). As well documented in literature (HARDOY et al., 1990; HARDOY & SATTERTHWAITE, 1992; HARPHAM & TANNER, 1995; PUGH, 1996) urbanization entails major demographic, social, cultural and environmental changes in developing countries that have a marked impact on the health and well-being of the population concerned.

Still today a large proportion of the urban population in developing countries lives in underserviced, poor quality housing with inadequate access, no financial means to cover their basic needs and no access to health care. A number of descriptive studies have documented that these urban poor suffer the worst of both worlds: malnutrition and infectious diseases, which result from underdevelopment and social as well as economic marginalization, and chronic diseases, which result from modernization and the urban setting (PRYER, 1993; SATTERTHWAITE, 1993; SONGSORE & MCGRANAHAN, 1993; WRATTEN, 1995b; BIRLEY & LOCK, 1998). In the last few years mental health problems became more and more urban problems (MCGRANAHAN et al., 1996). These problems could be related to the urban environment, resulting from insecure tenure, poor physical environment, unemployment and rural-urban migration (BIRLEY & LOCK, 1998). In addition to

external factors the different vulnerability of individuals must also be taken into consideration (refer to Section 1.1.4.).

The current concept of health is distinct from and much broader than the traditional view that emerged in industrialized societies during the mid-twentieth century. The traditional view treats health care as a synonym for health itself and places emphasis on the cure of diseases.

More than two decades ago, health authorities considered socio-economic support, such as availability of food security, clean water, appropriate housing and education, as an integral part of health development (ASHORN et al., 2000). Health begins at home in recognizing that ill-health is not inevitable and that the burden of disease is avoidable (WHO, 1978). The World Health Organization (WHO) defined health as a state of complete physical, social and mental well-being, which is much more than the mere absence of diseases and infirmity and whose attainment therefore requires far more than the supply of health services (WHO, 1993).

According to this broader definition of health, the last decade has witnessed health issues being addressed in urban development projects and programs which would previously have focused only on physical infrastructure such as slum improvement projects (HARPHAM & STEPHENS, 1992). As a result of the growing discussion of urban health in the last years, the WHO started the Healthy Cities Project (HCP / WHO, 1993). The project seeks to enhance the physical, mental, social and environmental well-being of the people who live and work in urban areas. The aim is to bring all urban sectors together in a partnership to focus on urban health and health related issues (WERNA & HARPHAM, 1995). The concept of sustainable urban development was created with the construction of urban areas as well as their maintenance in mind (HARPHAM & WERNA, 1996).

1.1.2. Urbanization and Urban Poverty

In two decades most of the population of the world and most of its economic activities will be located in urban agglomerations for the first time in history (LEISINGER, 2000). The urban population will be larger than the total world

population in 1970. The enormous concentration of people and the structure that will have to be built to accommodate them and their activities will create urban environments of unprecedented magnitude. Just building these environments will be immensely difficult, making them habitable, healthy, safe, and invulnerable to natural hazard at acceptable levels seems beyond the accomplishable (KREIMER & MUNASINGHE, 1992).

This process of urbanization leads to an increase in poverty in urban areas. In some cases the proportion of poor people living in urban areas has surpassed that in rural areas, and the absolute number of poor people living in cities increases from year to year. In 1991, the World Bank estimated that the number of urban poor would rise from 400 million to one billion at the end of the century (WORLD BANK, 1991). Today 1.2 billion out of the six billion people living on the planet live on less than US $1 a day (WORLD BANK, 2000/01).
In 1998, the World Bank estimated that the urban poor accounted for 25% of the urban population in the Third World. As a result of continuing urban growth in our days the majority of the world's extremely poor will live in urban areas (AMIS, 1995). Moreover, it is estimated that at least 600 million of the urban residents of the Third World live in what might be termed life threatening conditions, homes, and neighborhoods (WRATTEN, 1995b). One further aspect of urban poverty is that the urban poor people are much more immersed in the cash economy. They must pay for all their needs and consequently they must have a cash income. Obtaining a position in the labor market is therefore very important (DRAKAKIS-SMITH, 1996).

The World Development Report 1990 uses two income cut-off-points or international poverty lines: those with an income per capita of below US $370 per year are deemed poor, while those with less than US $275 per year are extremely poor. The 1990 calculations of the international poverty lines had to be updated. The current international poverty line stands at an average per capita consumption of US $1 per day (in 1985 dollars) as adjusted for the World Bank's purchasing power parity (PPP) estimates for 1993 (GWATKIN, 2000). PPP rates allow a standard comparison of the real price levels between countries. The upper poverty line or the US $2 a day line was calculated by doubling the amount of the lower poverty line and reflect poverty

lines more commonly used in lower-middle income countries (WORLD BANK, 2000/01).

Income inequality between the richest and poorest countries has increased dramatically over the past years and in more than 80 countries the per capita income is now lower than it was ten years ago (UNDP, 1999). The distribution of the world's gross domestic product (GDP) between rich and poor people is vastly unequal. While the richest 20% of countries have 86% of the world's GDP, the poorest 20% of countries have only 1% of the total GDP. The GDP is defined as the total value of goods and services produced in a country over a period of time. GDP measures the country's economic activity regardless of who owns the productive assets in that country. Many economists use the GDP to measure the standard of living and divide a country's GDP by its population to arrive at a GDP per head. However, the GDP per head does not take the costs of living into account (WORLD BANK, 2000). To complete the discussion, another measurement of economic activity is the GNP, the gross national product. In contrast to the GDP, the GNP is the total of incomes earned by residents of a country regardless of where the assets are located.

1.1.3. Urbanization and Urban Poverty in Africa

Poverty and suffering seem to be becoming more regional, which means that they are concentrated more in those countries, which are least able to improve conditions such as many countries in Asia (e.g. India) and in Sub-Saharan Africa (CHAMBERS, 1995). Across Sub-Saharan Africa 23% of the urban population is poor (RASHEED, 1995). The average income per capita is lower now than it was at the end of the 1960s. Furthermore, many development problems have become largely confined to Africa. These problems include lagging primary school enrollment, high child mortality and endemic diseases including malaria and AIDS, which impose costs on Africa at least twice as high as those imposed on any other developing region (WORLD BANK, 2000). Moreover, the extraordinarily high level of ethnic diversity in Africa contributes highly to Africa's growth tragedy (EASTERLY & LEVINE, 1997).
In the 1960s Africa's economy growth potential was ranked above that of East Asia's and the World Bank listed seven African countries that had the potential to reach or

surpass a growth rate of 7%. Between 1965 and 1990, however, the real per capita GNP did not grow in Africa, while in East Asia and the Pacific the per capita GNP growth was over 5% (EASTERLY & LEVINE, 1997).

Africa's place in the global economy has been eroded, with declining export shares in traditional primary products, little diversification into new lines of business and loss of skills. Africa accounts for less than 2% of world trade. Three decades ago African countries were highly independent because of their trade with a specialization in primary products. Today they are still primary products exporters but heavily aid-dependent and indebted. By the end of 1997 foreign debt accounted for more than 80% of GDP in net present value term (WORLD BANK, 2000). In Sub-Saharan Africa the situation is the worst: annual GNP per capita is the lowest at US $500 and net aid flows make up 4% of the GNP (WORLD BANK, 1999). More information on Sub-Saharan Africa in the context of urbanization and urban agriculture is given in Section 1.2.4.

Africa's experience from 1965-2000 has been one of urbanization without economic growth. This is an unique phenomenon, even across poor countries and poor growth performers. No other region has experienced such a high rate of urbanization with such a low growth performance. African data indicates a real decline in urban wages since the early 1970s, with income levels halving in many cases and a general deterioration in urban employment security and benefits (AMIS, 1990).

Over the 1970-95 period, the average African country's population increased by 5.2% per annum while its GDP declined by 0.7% per year (HICKS, 1998). Sub-Saharan Africa's growth performance has been even poorer, with real per capita GDP declining by about 0.9% per year over the period of 1980-93 (SCHIFF, 1998). With the rapidly growing population, an annual 5% growth rate is needed simply to keep the number of poor from rising. Halving severe poverty by 2015 will require annual growth of more than 7% along with a more equitable distribution of income (AMOAKO, 1999; WORLD BANK, 2000). According to Schiff (1998) Sub-Saharan countries have not adopted sufficient reforms in the macroeconomic area, factor markets, the institutional and legal framework and in the foreign exchange system which often determines the actual protection of local industry. In addition, trade instability and political instability partly explain why the GDP growth rate in Africa was lower than in other developing countries between 1970 and 1990. These instabilities

contributed to the introduction of bad policies which resulted in instability of the rate of investment and of the real exchange rate. These instabilities appear to lower the rate of economic growth (GUILLAUMONT et al., 1999).

One particular characteristic of urban poverty in African towns is the high increase of activities in the informal sector to cover at least the basic needs. This increase in the informal sector is caused by an overall economic crisis in African towns and a high number of young urban unemployed (SOUMARE & GERARD, 1999). More information on the informal sector is given in Section 1.2.1. The dramatic increase in poverty in urban Africa in recent years can not only be explained by demographic and migrational phenomena; in fact, urban poverty in Africa is very complex and there are a lot of reasons for the high number of urban poor. Box 1.2. shows an attempt to understand urban poverty in Africa.

In the past years there has been an uncontrolled increase in prices of basic needs, especially food in African towns due to a governmental lifting of price controls. In the past years a restructuring of government-owned factories in many African towns took place. This restructuring was followed by a decrease in the number of administrative jobs and a decrease in the salaries of a lot of urban residents, too. Moreover, due to widespread levels of mismanagement and corruption in African towns, there was a decrease in the quality and quantity of public services and goods, an unequal redistribution of assets, an increase in urban pollution and an unequal access to employment and resources in town (SOUMARE & GERARD, 1999).

In summary, the rate of urban population growth is particularly high in Africa, and much higher than the growth rates of industry, infrastructure and public services (AG-BENDECH et al., 1996); urban areas are therefore increasingly affected by poverty. Nevertheless it seems that urban areas still offer more hope and opportunities than rural areas especially in the Sub-Saharan region.

BOX 1.2. One explanation of poverty in Africa
modified after SOUMARE & GERARD (1999)

CHARACTERISTIC

multiplication of activities in the informal sector
due to economic crisis and unemployment in towns

REASONS

- migration
- demographic situation
- increase of prices to obtain goods of basic needs, especially food
- restructuring of government owned factories
- reduction in public services
- pollution
- mismanagement and corruption that interfere with the provision of basic services

SOLUTIONS

- governmental programs to create public jobs,
  BUT NOT part-time work that does NOT influence urban poverty
- social programs i.e. nutritional programs,
  BUT focus on the consequences of poverty only
  BUT do NOT treat the causes of poverty
- provision of basic services (infrastructure, social services) is a MUST in the fight against poverty
- micro-credit systems to foster local potential
  help in developing management capabilities and in using borrowed money in a meaningful way

COMMITMENT

Government Level
- promote an enabling environment and appropriate social and macro-economic surroundings

Community Level
- play a major role in the fight against poverty
- must be involved in activities

Individual Level
- involved in decisions to fight against poverty
- empowerment of the poor

RECOMMENDATION

- evaluate the output of former strategies and programs to improve the programs in the future
- eliminate existing projects without visible results
- start projects only with visible results
- maximize the effectiveness of existing projects rather than developing new ones
- understand better the reasons of poverty and discuss results of different projects
- control the impact of local strategies

1.1.4. Definitions and Measurements of Poverty

Poor people in almost half of the countries in the world were asked to define ill-being or poverty. People described poverty as a lack of material things, as bad experiences and as bad feelings about oneself. Although the nature of poverty varies among locations and people, there is a striking commonality across countries. Material well-being turns out to be very important. Lack of food, shelter and clothing is mentioned everywhere as critical. Alongside the material things, physical well-being also features in the characterization of well-being (NARAYAN et al., 2000a).

A person who is not poor but comments and advises on what matters to those who are poor is in a trap (CHAMBERS, 1997). Self-critical analysis, sensitive rapport and participatory methods (for detailed information on these methods refer to Chapter 5, Section 5.4.) can contribute valid insights into the lives, values, priorities, preferences and measurement methods of poor people. But it must be taken into consideration that there will always be distortions. Defining poverty as multidimensional raises the question of how to measure overall poverty and how to compare achievements obtained in different ways. What weights can be assigned to the different dimensions of poverty to allow comparisons across countries, populations, households, individuals and time? There are no easy answers. Nevertheless, in literature there are several approaches to define the standard of living or urban poverty. The main definitions to measure poverty are summarized in Box 1.3.

One of the longest existing definitions is the conventional economic definition or *RESOURCE-BASED DEFINITION*, which deals with relative and absolute poverty taking the income as a base (WRATTEN, 1995b).
If poverty is defined in absolute terms (*absolute poverty* or *poverty line)*, prevalence is primarily given to the minimum level of income needed to maintain a given standard of living. Needs are considered to be fixed at a level, which provides for subsistence, basic household equipment and expenditures on essential services such as water, sanitation, health, education and especially food (RAVALLION, 1992; RAVALLION, 1995; WRATTEN, 1995b). The poverty line is then defined as the minimum income level required to purchase the socially determined essentials for living (BLACKWOOD & LYNCH, 1994). Using this scale of measurement the extent

and depth of poverty in a population are determined. When dealing with absolute poverty or the poverty line, chronic poverty and transitory poverty have to be distinguished. Chronic poverty refers to groups or populations that are always (chronically) below the poverty line, whereas transitory poverty is used when groups face a high risk of falling into poverty for a given period of time (WORLD BANK, 2000/01). In recent years large year-to-year or month-to-month changes in poverty status have been observed with a substantial number of households moving in and out of poverty. The seasonal dimension of transitory poverty must be given a special emphasis (DERCON & KRISHNAN, 2000).

BOX 1.3. Poverty definitions, related poverty strategies and main actors
primarily based on WRATTEN (1995b), UNDP (1997), WORLD BANK (2000/01)

Resource-Based Definition	- income definition (GNP) - absolute poverty / poverty line - relative poverty (inequality, Gini-Coefficient)	**Market Based Pro-Poor Strategy**	increase the proportion of economic benefits received by the poor	World Bank
Social-Development Definition	- non-achievement of well-being - quality of life for all - indicator: Human Development Index	**Sustainable Livelihood Strategy**	create a safety net for everybody	UNDP
Freedom-Oriented Definition	- limited capability to pursue well-being - no rights, voice and power	**Resources/ Redistribution Strategy**	reduce inequality, which results from the accumulation of assets	Oxfam UNDP
		Rights/ Empowerment Strategy	assure the basic rights of the poor for survival and dignified living	IFAD Oxfam
Concept of Vulnerability	- exposure to a hazardous environment - difficulties in managing the consequences			

While there is no doubt that income is an important indicator of overall development, income-defined poverty lines, however, are very problematic for a number of reasons and human welfare can not be adequately described by income alone (HOUSE, 1991; RAVALLION, 1996; DRAKAKIS-SMITH, 1996; RAVALLION, 1998):

- Income is a measurement to identify people who are unable to achieve an acceptable standard of living, but it does not accurately measure their capacity to achieve access.
- Incomes are commonly analyzed in relation to households, but individual members of a household do no have equal command over resources to cover their special needs. Intra-household differentials often exist in control of assets. Assets in this context are the resources that individuals can call upon when needed. These include for example investment in education or health, stores in food or money and claims on other individuals (WRATTEN, 1995b). In addition, needs in general are equally difficult to define in a standardized way.
- The income level below which someone is officially ‘poor’ is rarely high enough to cover the costs of all basic necessities other than food and some basic services. Non-monetary assets and liabilities are not included.
- Comparing levels of income between countries is not unambiguous and may need complicated adjustments for differences in purchasing power.
- Comparing income or expenditures of different population groups within a country also has its difficulties when, for example, households in one group are largely subsistence-oriented while households in another group are market-oriented. Many countries set a single income level for both rural and urban areas, although the costs of basic necessities such as food are generally higher in urban areas (RAVALLION & VAN DE WALLE, 1991; WRATTEN, 1995a; AKITA & LUKMAN, 1999 / see Section 1.2.3.1.). In this context it has to be pointed out that consumption or expenditures might provide a better picture of a household’s long term standard of living. While poor people are probably purchasing and consuming only a narrow range of goods -the basic needed goods such as food, fuel for cooking, water and energy- their total income may derive from a lot of different activities often associated with strong seasonal variations (HENTSCHEL & LANJOUW, 1996).

- The poverty line is a simple head count of the number of poor people, and reveals nothing of the intensity of poverty. The poverty line ignores the inequality among the poor and the fact that the poorest may have very different needs than the poor.

If poverty is defined in relative terms (*relative poverty*) then the income of the poor is viewed relative to the overall income of the population. Income primarily refers to the income position of individuals or households in relation to each other. Changes in income structure indicate how the benefit of economic and social changes are distributed among households and certain populations. Relative poverty is a lack of the resources required to participate in activities and to enjoy living standards that are customary or widely accepted in the society in which poverty is being measured (GAIHA & DEOLALIKAR, 1993).
Distributional information can be expressed with the Gini-Coefficient. The Gini-Coefficient is a measurement of income inequality in a country. Its value ranges from zero to one. A Gini-Coefficient value of zero indicates an egalitarian income distribution while Gini-Coefficients greater than zero suggest various degrees of income inequality. Larger coefficient values are associated with greater degrees of inequality (BLACKWOOD & LYNCH, 1994). During the last three decades, countries with lower income inequality had a higher economic growth. Income inequality is inversely related to economic growth (GERSTER, 2000).

Despite the given weaknesses of the resource-based definition, income is the most frequently used proxy for overall welfare of a population. Three main reasons can be seen for its widespread acceptance and use:
First, poverty defined by income or consumption is measurable, and income is a useful indicator to identify which people are likely to lack the resources to achieve a socially acceptable standard of living. Second, it is held that the poorer people are, the more preoccupied they are with income and consumption, and with the need to gain subsistence food and basic goods in order to survive (CHAMBERS, 1995). Third, standardized definitions are useful to policy makers because they provide a uniform scale against which comparisons can be made of the prevalence and

incidence of poverty in different subpopulations. Comparative data are essential in order to target resources to the poorest groups.
In this context it is worth mentioning that in all cases an income-based poverty line is only valid when it accurately reflects the income level that an individual or a household needs to avoid poverty in their particular neighborhood.

In recent years the definition of poverty has been widened, amplifying the resource-based definition towards participatory social development definitions and more theoretically freedom-oriented definitions.
Urban poverty, then, can be seen as having many different aspects including limited asset base, inadequate provision of public services and infrastructure, inadequate protection from the law, voicelessness and powerlessness within political systems, exploitation and discrimination (SATTERTHWAITE, 2000). Poverty is much more than income deprivation. A lack of economic opportunity is only one aspect of urban poverty (AMIS, 1995; MOSER, 1995; RAKODI, 1995; WRATTEN, 1995b). This broader view of urban poverty is very important, although it is difficult to incorporate many of the above aspects into qualitative measurements of poverty.

The *SOCIAL DEVELOPMENT DEFINITION* deals with the non-achievement of well-being in a population. It considers skills and other intangible assets as well as employment and salaries. One of the key factors of the social development definition is the quality of life for everybody. Common indicators of poverty within this definition are undernourishment, premature mortality and morbidity.
The Human Development Index (HDI), published yearly since 1990 in the Human Development Report, is one tool for estimating poverty within the social development definition. The HDI is an aggregate indicator based on three components: the life expectancy at birth, schooling and the real national income per capita on the country level (UNDP, 1990).
In the UNDP report of 1997 the Human Poverty Index (HPI) was devised as an extension of the HDI. It measures deficiencies in meeting basic human needs and defines poverty as a deficiency in capabilities of central aspects of life. It incorporates four variables: the proportion of the population with a life expectancy at birth of 40 years maximum, the adult illiteracy rate, the proportion of the population

with no access to health care or clean water, and the proportion of underweight children below the age of five (UNDP, 1997).

In addition, some appreciable efforts have recently been made to develop poverty indices to measure the nature of poverty beyond the conventional headcount indicator (RASHEED, 1997). The Food Security Index (FSI), the Integrated Poverty Index (IPI), the Basic Needs Index (BNI) and the Relative Welfare Index (RWI) are useful composite indicators further illustrating the many facets, and the extent and depth of poverty, especially in Africa (RASHEED, 1997). The FSI combines measures of calorie availability in relation to requirements, with growth of per capita energy supply, food production, food staples self-sufficiency and variability of food production and consumption. The IPI combines the percentage of the population below the poverty line with the income gap ratio, which is a ratio of the income of the poor to the annual rate of growth of GNP per capita. Its value can be between zero and one. The closer the value is to one, the worse the poverty. The BNI is a composite index of education and health. Lastly, the RWI is a simple arithmetic mean of the adjusted FSI, IPI and BNI. It is both an absolute and a relative measurement of poverty (RASHEED, 1997). Measuring Africa's poverty through the use of the last two indicators clearly reveals the continent's disadvantageous situation. A total of 29 of the 42 Sub-Saharan countries are considered as 'very needy', with a BNI of lower than 0.5. And of a list of 20 'extremely vulnerable' countries, ranked lowest in terms of RWI, 17 were African (JAZIRY et al., 1992).

The *FREEDOM–ORIENTED DEFINITION* defines poverty as the limited capability to pursue well-being. It deals with vulnerability, seeing poor people as more vulnerable to unexpected, often life-threatening events than non-poor people. In large cities all over the world, poor people are the main victims of property crime, assault, rape and murder as they have no rights, voice or power. The vulnerability of poor people is further increased because the adaptive behaviors of crime and violence are inevitable with high levels of unemployment and poverty. The freedom-oriented definition, therefore, can be seen as the limited ability to survive adversity (DEZA, 2000).

Another approach to estimating poverty is the concept of *VULNERABILITY*. The general meaning of vulnerability is 'being prone to or susceptible to damage or injury'

(BLAIKIE et al., 1994). Vulnerability has two fundamental dimensions, the exposure to a hazardous event, and the difficulties in managing the consequences (CHAMBERS, 1989). Vulnerability can thus be explained by taking three co-ordinates: the risk of being exposed to crisis situations (exposure), the risk of not having the necessary resources to cope with these situations (capacity) and, the risk of being subjected to serious consequences as a result of the crisis (potentiality). These three dimensions are connected in time but influenced by different factors (DELOR & HUBERT, 2000). In other words, vulnerability is the product of factors that influence access to power and resources (WOODWARD et al., 2000).
Vulnerability is not synonymous with poverty but rather with defenselessness, insecurity and exposure to risks, shocks and stress. It is linked with assets such as human investment in health and education, and productive assets including houses and domestic equipment (WRATTEN, 1995b).

In the dimension of income and health, vulnerability is the risk that a household or individual may experience an episode of health or lack of income over time. But vulnerability also means the probability of being exposed to a number of other risks such as violence, crime or natural disasters (WORLD BANK, 2000/01). Vulnerability is a constant companion of material and human deprivation, given the circumstances of the poor and the near-poor. Risks that poor people face as a result of their circumstances, such as uncertain rainfall or precarious employment in the informal sector are causes of vulnerability. Another more important cause is the inability to reduce or mitigate risks or cope with shocks. Low levels of physical, natural and financial assets make poor people especially vulnerable to negative shocks in comparison to those with more assets who can weather these shocks as long as they are temporary (WATTS & BOHLE, 1993; WORLD BANK, 2000/01).
Measuring vulnerability is especially difficult, since the concept is dynamic and can not be measured by observing a household or a population once. In addition it is not meaningful to capture vulnerability in a single indicator. The challenge is to find indicators of vulnerability that can identify at-risk households or populations beforehand.

Urban poverty is consistently underestimated for two reasons: First, people who are falling below the income-estimated poverty line do not include those who are suffering from other forms of deprivation caused by an urban setting. Second, poverty lines are set unrealistically low in relation to living costs in urban areas. To understand poverty it is important to consider where people live and work, and which other aspects of their local context influence the scale and nature of deprivation. The poor are not a homogenous group and it is obviously necessary to make a distinction between poor and poorest people. However, apart from the HPI and IPI the standard indicators to measure poverty or the definitions of poverty provide no information on the depth of poverty.

There are also different ways, in which important players in multilateral development cooperation view poverty (SDC, 2000). For the *WORLD BANK* poverty represents a deficit situation, which includes the lack of sufficient income to cover the basic needs. The World Bank deals with the *RESOURCE-BASED DEFINITION* using *POVERTY LINES* as measurements. As an extension of that, *UNDP* defines poverty as a deficiency in the four central areas of life: income, nutrition, health and education. *UNDP* works with the *SOCIAL DEVELOPMENT DEFINITION* using the HDI and the HPI. Finally for the *OECD-DAC* (Organization for Economic Co-operation and Development-Development Assistance Committee of the OECD) poverty is primarily an economic problem. The *OECD-DAC* applies four indicators: the absolute poverty, the poverty gap ratio, the inequality measurement, and undernourishment (EGGER & GABATHULER, 1999).

In summary, poverty is multifaceted and the causes for poverty are interlinked. Poverty can not be considered in isolation. The primacy of the income/expenditures definition has changed to a definition of poverty based on the capacity of the poor to improve their condition and to consider health and education as important as income (SEN, 1998). In its poverty report in 2000/01 the World Bank defined poverty far beyond material deprivation and low levels of health and education. The inability to influence the decisions that affect one’s life, ill treatment by governmental institutions, and the impediments created by social barrier and norms are also dimensions of ill-being. Another is vulnerability to adverse shocks, natural disasters, disease and personal violence.

1.1.5. Urban Poverty Reduction Strategies

For more than 20 years McGee characterized the *SUBSISTENCE STRATEGIES* of the urban poor to cope with poverty by self-help and adaptation (MCGEE, 1976). Adaptive strategies indicate that most of the urban poor seek to adapt to the extreme poverty by maximizing their income, minimizing consumption and enlarging their social network. Self-help or positive response strategies imply that they try to achieve intra-generational mobility by escaping from squatter settlements and finding better employment in the formal sector and inter-generational mobility through children's education (MCGEE, 1976).

In 1958, the economist Galbraith already saw the widening gap between the richest and the poorest as an emerging threat to economic stability. He proposed significant investment in transportation, education and infrastructure to ameliorate these differences and postpone depression and revolution indefinitely (GALBRAITH, 1998). According to this dominant model of neo-liberal economics at the beginning of the 20th century a strong economy makes permanent social policies unnecessary. The growth process itself acts to reduce poverty, and social projects are considered a government expense rather than an investment. This would imply an allocation where the highest marginal growth of GDP can be achieved. This would also imply a completely different allocation pattern from human need orientation. However, poverty reduction strategies are linked to the vision of economy and society and are committed to solidarity with the poor. Today poverty reduction strategies are defined in their distance to the pure neo-liberal economic model. The main urban poverty reduction strategies are summarized in Box 1.3.

The *MARKET BASED PRO-POOR STRATEGY* is one reduction strategy, which is related to the resource-based or income poverty definition (WORLD BANK, 1990). This strategy is the closest to the economic model and can even be seen as a modified version of it. The market based pro-poor strategy can be defined as support of targeted poverty interventions at the macro level. The aim is to increase the proportion of economic benefits received by the poor. This is attained by labor intensive growth such as in agriculture, by an improvement of the access to social

services, and by an establishment of social safety nets. One of the most important driving forces, not only for a successful market based pro-poor strategy but for all other reduction strategies as well, are the poor people and the poor countries themselves. They have the strongest motivation for getting a positive output. The reduction of poverty is strongly linked with the empowerment and the participation of the poor.

The market based pro-poor strategy deals with the fact that 35-50% of the variation in poverty incidences across countries can be explained by variations in the GNP (LIPTON, 1998). Between two-thirds and half of the poverty variations in a country, therefore, are associated with policy, or factors other than economic growth, which leaves space for targeted poverty interventions. Since 1990 the World Bank has used the pro-poor strategy, and none of the other donors opposes this strategy (KAPUR et al., 1997). The pro-poor strategy is popular because it seems to offer a technical answer to a political problem (GERSTER, 2000). However, poverty reduction strategies must be discussed in a much broader context.

In recent years the definition of poverty has been widened from the single economic-based definition towards multi-based definitions; this process could also be seen in poverty reduction strategies. Strategies which deal with the single economic dimension of poverty and are thus aiming to reduce poverty only by improving the economic situation of the poor, are not always the only appropriate strategies to reduce poverty. In some cases they could even be problematic.

First, economic indicators, such as a household income and consumption, measure a momentary situation of the household but do not take into consideration the process which underlies and causes poverty. Second, economic indicators focus on a single aspect of the conditions of the poor, but ignore the socio-economic situation and the living conditions of poor people. Third, economic indicators, as international or global criteria to analyze the situation of the poor, disregard the right of the poor to interpret their own situation and their own priorities. And last, economic indicators and an improvement of the economic situation often only reach the least-poor whereas the poorest of the poor are not recognized.

The *SUSTAINABLE LIVELIHOOD STRATEGY* is one alternative poverty reduction strategy, which is related to the social development definition of measuring poverty

(CHAMBERS,1995). Unlike the pro-poor strategy the sustainable livelihood strategy is a radical departure from economic growth. Eventual growth effects are only side effects of this strategy, which first determines who the poor people are and then puts them at the micro level. Its aim is to set up a safety net for everybody. This is reached by determining the special needs of poor people with the help of a set of basic questions and interviews. Moreover, empowerment and participation of the poor are considered to be key factors for success.

The sustainable livelihood strategy is one of the few which distinguish between the poor and the poorest. It is also one of the few strategies which promotes the poorest of the poor by determining their special needs. Although most of the donors subscribe to and practice several approaches, it could be said that the sustainable livelihood strategy is the main strategy used by UNDP (refer to Box 1.3.).

Using the sustainable livelihood strategy, relevant policy interventions can be further divided into promotive and protective terms of social security. Protective security aims to protect against the ‘one-off shock’ associated with temporary poverty. The goal of promotive security is to increase incomes and capabilities in cases of poverty, which are permanent or structural (HARRIS et al., 1992).

A further poverty reduction strategy is the *RESOURCES AND REDISTRIBUTION STRATEGY*, which is a strategy based on the freedom-oriented definition of poverty. This strategy focuses on the redistribution of assets. Income inequality is inversely related to economic growth, and slows down poverty reduction. A recent World Bank study found that the income of the poor rises on a one to one basis with the income of the country. Economic crises, seen as periods of falling GDP, do affect the whole population equally and do not only affect the poor disproportionately. The same can be said for social spending, which does not benefit the poor disproportionately (WORLD BANK, 2000). Putting redistribution policies at the center of the program, the aim of the strategy is to reduce inequality which results from the accumulation of assets. For the resources and redistribution strategy land redistribution is one very important topic. Because of its highly sensitive political nature this strategy does not have broad support. The main donors using this strategy are *IFAD* (International Fund for Agricultural Development) and *Oxfam* (GERSTER, 2000; SDC, 2000 / refer to Box 1.3.).

Another strategy that also relates to the freedom-oriented definition of poverty is the *RIGHTS AND EMPOWERMENT STRATEGY*. The goal of this strategy is to assure the basic rights of the poor of survival and dignified living, liberty and physical security. Meeting these basic rights is non-negotiable. Having rights is one part of the strategy, but knowing your rights and using them is as important. The main emphasis of the rights and empowerment strategy, therefore, is on the empowerment of the poor and the support for their fight for a dignified life. This strategy has been widely adopted by Oxfam, UNDP, Switzerland and Germany (SDC, 2000 / refer to Box 1.3.).

To summarize, not only the very common pro-poor strategy but also all the other strategies have their own strengths and weaknesses. They overlap in large areas and are complementary in other areas. They are not keys for successful interventions but can be regarded as keys for policy improvements. Directly targeted interventions, indirect or inclusive support, and strengthening an enabling environment are complementary and not competing strategies.
Besides these poverty reduction strategies some additional principles have to be considered as well. While implementing poverty reduction strategies, direct and indirect poverty must be differentiated. Great care must be taken that the reduction of poverty in one group does not increase poverty in some other groups. Poverty reduction strategies also have to be gender sensitive and environmentally friendly, and must not replace existing programs. A lower poverty gap can not be seen as the single output of a successful poverty reduction strategy. The poverty gap measures the size of transfer, which is required to bring everyone up to the poverty line. The single goal to lower the poverty gap may have negative efforts for the poorest of the poor, because of a concentration on the least poor to maximize the cost-benefit ratio of a given transfer.

There is a wide range of poverty reduction strategies, and donors use different strategies depending on economic and social development. None of these frameworks is fixed, but they have developed over the years, as can be clearly seen in the World Bank strategy.

In the 1960s the World Bank strategy against poverty was based on promoting general economic growth. As early as the 1970s it was recognized that general economic growth did not automatically reduce poverty. The World Bank started promoting targeted development projects. In addition to these projects safety nets were created in the 1980s to support the poorest of the poor.

Only ten years ago the World Development Report viewed poverty as low consumption and low achievement in education and health (WORLD BANK, 1990). Broadly based economic growth, through liberalizing trade and markets and investing in infrastructure together with a broad provision of social services (especially in health and education), was seen as key to reducing poverty.

The experience of the last ten years, however, showed that economic growth can not be switched on or off at will and that the emphasis on social services for building human capital was perhaps too optimistic. In addition, new studies show the importance of gender, education and social inequality as a dimension of poverty (WORLD BANK, 2000/01). Attacking poverty requires broader thinking and action which goes beyond the economic domain and beyond investing in social services. Therefore the World Development Report of 2000/2001 proposes a general framework for action in three equally important areas. First, promoting opportunities by expanding the economic opportunities for poor people. Second, facilitating empowerment in strengthening the participation of poor people in political and local decision-making. And third, enhancing security by reducing the poor people’s vulnerability to ill-health and economic shocks and helping them to cope with adverse shocks when they occur (WORLD BANK, 2000/01). Today the World Bank pursues a multidimensional strategy against poverty, which means that priorities and actions taken are tailored carefully in each country’s and community’s economic, sociopolitical and cultural context.

1.2. Urban Agriculture

1.2.1. Status of Urban Agriculture with a Main Emphasis on Africa

Urban agriculture is practiced by an estimated 800 million people worldwide (SMIT et al., 1996) and provides a secure activity to many city-dwellers. In some cities, as many as one-fifth to one-third of all families are engaged in agriculture, with one-third of these having no other sources of income (LEE-SMITH, 1987; MAXWELL, 1993). It is estimated that on a global scale more than one-third of the urban area is used for agriculture and that one-third of the total consumption of vegetables, meat, fish and eggs is produced in these urban areas (SMIT, 1996).

Many different definitions of urban agriculture have been offered in the expanding literature of urban agriculture, food policy and sustainable urban development. In attempting to define urban agriculture the following elements should be included: the location of the fields in town, the type of activity (food or non-food production), the legality of urban agriculture and the stages of production (QUON, 1999). Considering these elements the following definition of home gardening in distinction to urban agriculture could be taken into consideration for this study (SMIT et al., 1996):

> *HOME GARDENING can be defined as small-scale production of vegetables, fruits, flowers and plants on small plots and is a part of the urban agriculture system.*
>
> *URBAN AGRICULTURE is an activity that produces, processes, and markets vegetables, fruits, flowers and trees in urban and peri-urban areas of a town applying intensive production methods, and (re-)using natural resources and urban wastes.*

Urban agriculture belongs to the informal sector. The term ‘informal sector’ was used first in a study about the living conditions in Accra, Ghana’s capital (HART, 1973). Hart found out that most of his interviewees would have been defined as unemployed according to official definitions, but that they nevertheless pursued some activities. These activities were then the so-called activities of the informal sector. The distinction between formal and informal income opportunities is based essentially on the distinction between wage-earning and self-employment. The key variable is the degree of rationalization of the work, whether or not work is recruited

on a permanent and regular basis for fixed rewards (HART, 1973). In connection with the dynamic urbanization and the increasing urban poverty in developing countries, the informal sector becomes more and more the predominant form of economic production among city-dwellers (IMFELD, 1995; AKKARI, 1995). Thus, it is a major source of generating income in developing, countries and it is expanding. In Sub-Saharan Africa two-third of the urban population is engaged in the informal sector and 93% of the population who started a new activity did this in the informal sector (BIT, 1991; MALDONADO, 1993; SETHURAMAN, 1997).

The variety of people and situations that have been labeled ‘informal’ is infinite. They are men and women, children, youth, adults and elderly; natives of the city or immigrants from the countryside; they work in their homes or in the streets. They perform one or more activities for income, changing rapidly from one activity to another or remaining in the same sector, when it is profitable at the moment (RIOFRIO, 1998). Because it is the only sector which shows any dynamism in Africa, the countries’ governments are trying to find a new tax base in this sector. This could seriously jeopardize the means of survival of millions of urban dwellers (MALDONADO, 1993). It has to be understood that activities of the informal sector are often only a ‘must’ against total misery (SOTTAS, 1995; FIERZ, 1995). The informal activities are a hand-to-mouth existence characterized by unevenness of expenditures over a pay period. People working in the informal sector are by definition outside of fiscal legality.

In Third World countries new urban forms are developing that are very different from Western concepts of what is urban. Urban forms reflect the economy, society and culture, which they are a part of (WHO, 1992). For example, many African cities are becoming more rural, as jobs become so scarce and income so inadequate that lower- and even middle-income groups increasingly grow parts of their own food in the city (WHO, 1992). This was noted in Nairobi, Kenya’s capital, among others, where food produced by households and access to land, on which crops can be grown became very important (LEE-SMITH et al., 1987; SAWIO, 1993). Also in Lusaka, Zambia’s capital, and Dar es Salaam, the largest city in Tanzania, many families, especially in low-income areas grow a significant proportion of their own food (RAKODI, 1988; SAWIO, 1993; DRESCHER, 1996b).

As African cities continue to grow under conditions of economic stagnation or even deterioration, they take on more and more of the qualities of their rural hinterland. Some of the evidence for this includes the increasing importance of urban agriculture (STREN, 1986).

1.2.2. History and Existence of Urban Agriculture

Urban agriculture is a recent phenomenon in only a few places. Throughout the world there is a long tradition of intensive farming within as well as on the edge of the cities. The present mix of farming systems in cities has been shaped mainly by four forces:

- continuity of historical practice
- the industrial agricultural revolution
- the post-World War II rapid urbanization
- greater expansion of low-income segments of the urban population

The first two forces are the historical roots of urban agriculture. The last two forces are mainly contemporary phenomena. The same four forces influenced and still influence urban agriculture in a more or less dominant way in most African towns. Thus the legacy of ancient and recent historical development can be seen in the way urban agriculture is practiced today.

The coupling of ‘urban’ and ‘agriculture’ into a single expression may seem contradictory, but in fact agriculture as a basic urban function is nothing new. In all parts of the world ancient civilizations developed urban agriculture systems to feed the people in their cities (MOUGEOT, 1994). Aztec, Mayan and Indian cities not only were self-reliant in perishable fruits and vegetables, but also raised grains within a confined hinterland (SMIT et al., 1996). Urban horticulture was undertaken in ancient Greece and Rome wherever water was available. In the Middle Ages in Europe crop rotation systems were being tested in farms and fields of monasteries, walled cities and castles (REYNOLDS, 1984). Further examples of early urban agriculture can be found in Ghana, China and India (SMIT et al., 1996).

The intensive production of vegetables, meat and fish in and around the city was essential to city life. Food production in urban settlements of ancient civilizations was neither a rare nor a temporary activity. Throughout most of history and in different civilizations urban populations have, to variable extents been engaged in the production of at least some of the food they required close to their living places (MOUGEOT, 1994).

At the beginning of the 20th century, a change of views arose with the industrial agricultural revolution. A strict separation between rural and urban setting, between industry and agriculture developed. In spite of this separation, studies show that urban agriculture in Africa started during the time of colonization (GOLHOR, 1995). As early as the end of the last century colonial cities were designed to include food production in the town as well as in its outskirts. Mainly high-value European crops were produced for the colonial powers, the army and the Western missionaries (VILLIEN, 1988; RAKODI, 1988; KIRONDE, 1992). It is estimated that in 1950 40% of the work force in African towns had a home gardening field (RAKODI, 1988).

Urban agriculture of today, however, is also a consequence of the contemporary forces: increasing impoverishment in the country, rural exodus and rapid urbanization. Reasons for impoverishment in the country are mainly the macroeconomic environment, which has been unfavorable to developing countries, particularly because of the price fall of agricultural export products in essential agrarian economies and because of climatic factors (DIALLO, 1993 / refer to Section 1.1.3.). Climatic factors, especially in Sub-Saharan countries, caused and still cause drought and soil erosion and, as a consequence, famine and rural-urban migration (WORLD BANK, 1993). Droughts in Sub-Saharan Africa have severe negative food security implications for lower-class segments of the population (BENSON & CLAY, 1998). The former seasonal migration of rural inhabitants has progressively turned into permanent migration, which again leads to rapid urbanization. Rapid urbanization in African towns is often caused by young people coming from the countryside. After a while in town they realize that it is not easy to find a ‘modern’ or urban activity such as being a mechanic, trader or gas station attendant. As they need money to survive, they have to remember their former activities in the village and start looking for a field to use for home gardening.

In the last half of the 20th century, urban food production and distribution systems became less and less reliable. In addition, urban hunger multiplied with urban population growth, often in a surrounding of political and economic instability. In response, urban agriculture became increasingly common in a growing number of countries.

Nevertheless, there was little international attention paid to urban agriculture until the late 1970s, and no earlier than in the late 1980s urban agriculture was exposed as a global phenomenon, thriving in diverse economies, climates and cultures (SMIT, 1996). Since the late 1950s, however, the Chinese have incorporated food production into their city planning. And Asian city-states such as Hong Kong and Singapore have evolved highly effective production-consumption systems (MOUGEOT, 1998).

The first French geographical accounts of urban agriculture in Africa were published on Central Africa in the 1960s (EGZIABHER, 1994). But still in the 1980s only a few studies of urban agriculture were carried out with an emphasis on Eastern and Southern Africa and little regard to Sub-Saharan Africa. Researchers have suggested that urban agriculture generated little interest in the past because it was seen as an temporary phenomenon, as a manifestation of rural habits and a remnant of bush life (KIRONDE, 1992).

For the past fifteen to twenty years urban agriculture has expanded globally, in many countries even more rapidly than other urban economies (SMIT, 1996). However, research on urban agriculture, and especially the economic impact of urban agriculture is still difficult to undertake, because much of what is considered urban agriculture is conducted outside normal market channels and no data are available (NUGENT, 1997).

Urban agriculture is not a recent phenomenon and is not confined to a few places. Over the years, urban agriculture became more and more common in a growing number of countries and towns all over the world, and today it exists in all continents. In Asia (YENG, 1985) urban agriculture is found in China, Singapore and Bangladesh, among other countries (BLOEM et al., 1996). In Latin America it is practiced, for example, in Cuba (MOSKOW, 1999) and Mexico (LOSADA et al., 1998). Particularly in Africa urban agriculture exists in all parts of the continent. In

East Africa it can be seen in Kenya (LEE-SMITH et al., 1987; OBARA, 1988; FREEMAN, 1991; SAWIO, 1993), Uganda (MAXWELL & ZZIWA, 1992), Tanzania (TRIPP, 1989; MVENA et al., 1991) and Mozambique (SMIT et al., 1996) among others; in Southern Africa in Zaire (STREIFFELER, 1991), Zambia (RAKODI, 1988) and Zimbabwe (KANJI, 1995); and in Sub-Saharan Africa in Cameroon (NGWA NEBASINA, 1987), Sierra Leone (TRICAUD, 1987), Nigeria (EZEDINMA & CHUKUEZI, 1999), Mauritania (GAGNEUX et al., 1999), Togo (SCHILTER, 1991), Senegal, Mali, Niger and Burkina Faso (i.e. GOLHOR, 1995).

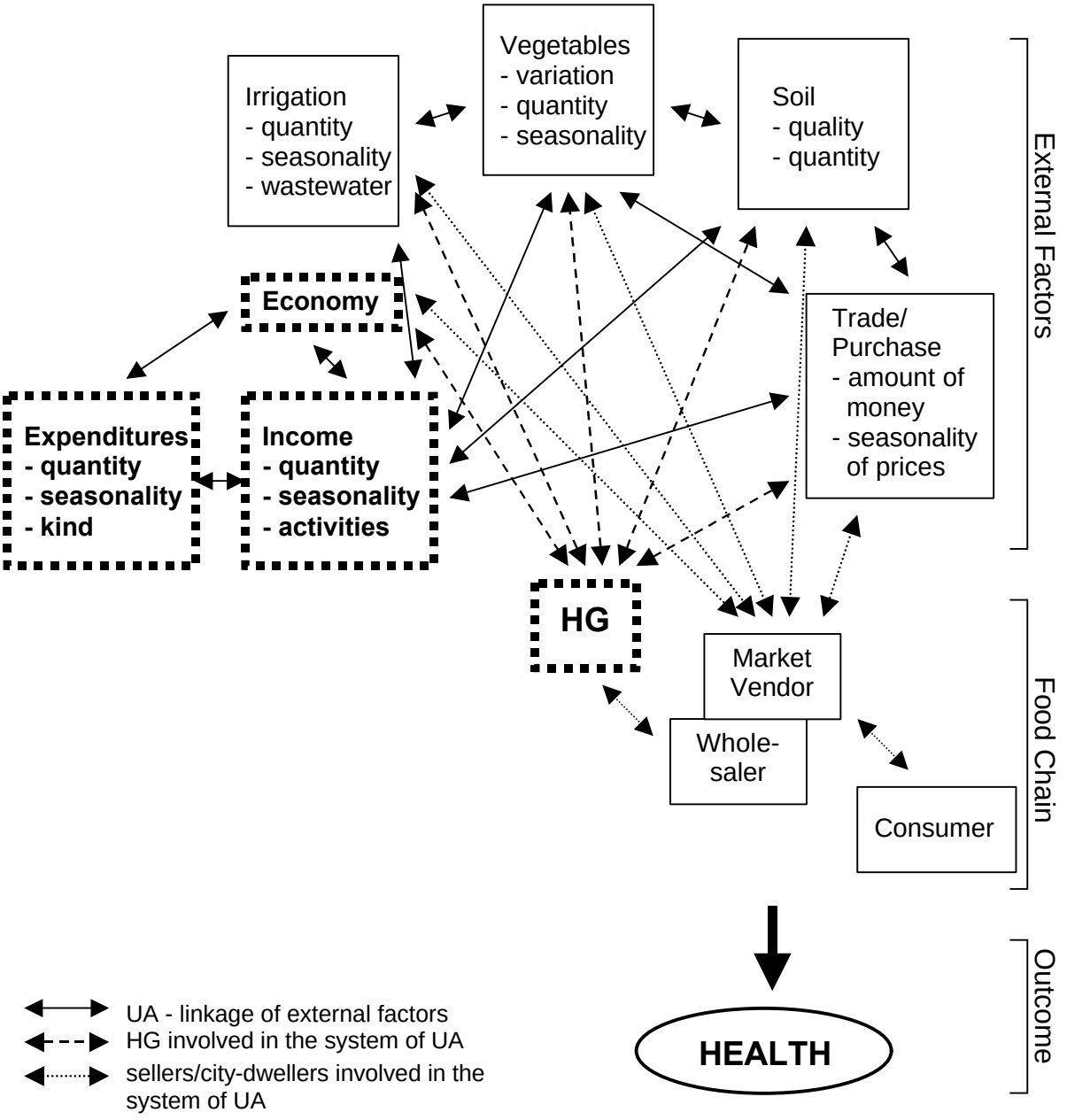
1.2.3. Urban Agriculture: Benefits and Risks

Urban agriculture is a very complex system which consists of many external factors (refer to Figure 1.3.). Therefore it must be analyzed taking into account many different aspects and views. It may provide many benefits and advantages for one group involved in this system, but at the same time it can provide risks and disadvantages for the same group or another group involved in urban agriculture.
In the discussion about urban agriculture a distinction must be made between the 'micro-view' and the 'macro-view' of analyzing the benefits and risks. The term micro-view refers to the analysis of urban agriculture in the context of the people who are engaged in this activity. The macro-view regards urban agriculture in the context of the town or the municipality where it exists. Urban agriculture provides a lot of benefits but also risks both for households engaged in urban agriculture and for the town itself. Therefore, the risks and benefits of urban agriculture to a household must be separated from the risks and benefits to the larger community, both the town, region and nation.

1.2.3.1. The Benefits of Urban Agriculture

In most developing countries, urban agriculture is dominated by small-scale producers of low-income sectors. Especially for these residents, urban agriculture is an important factor for the economy of a household; this is widely shown in literature (VASEY, 1990; SMIT & NASR, 1992; ILEIA, 1994; DRESCHER, 1996a; SMIT et al.,

Figure 1.3. The system of urban agriculture (UA) and its outcome with a main emphasis on the economic situation of home gardeners' (HG) households



1996; RABINOVITCH & SCHMETZER, 1997). Urban agriculture generates cash to cover basic needs and essential commodities and contributes to the achievement of food security. Urban agriculture can therefore be seen as both a *SUBSISTENCE PRODUCTION* and a *CASH-PROVIDING ACTIVITY*, which are the two main benefits for the people who are involved in this activity. Moreover, it helps to provide *FOOD SECURITY* for city dwellers in town, especially for the most vulnerable groups (SMIT & NASR, 1992; BROWN & JAMETON, 2000). This is maybe the most important argument in assessing the significance of urban agriculture. In the early 1980s review articles already recognized urban agriculture as an important component of urban development in making more food available for the urban poor (SACHS & SILK, 1987; HUSSAIN & LUNDVEN, 1988).

Food Security

Food insecurity occurs when people do not have physical and economic access to obtain adequate food supplies for their nutritional needs at all times (DEZA, 1999). The right of everyone to have access to safe and nutritious food is laid down in the Universal Declaration of Human Rights (FAO, 2000). Even today when the world is producing enough food to provide every person with more than 2.700 calories per day, there are still over 800 million people in the developing world who suffer from chronic under-nutrition (IPTRID, 1999). A number of factors affect the degree of food insecurity in many countries and cities, including low-income levels, a lack of physical access to food, relatively high prices for food and unfavorable weather patterns, which reduce food production in a country or region during certain periods of the year.

Africa is a highly food-insecure continent. According to Courade (2000) there are three major causes for food insecurity in Africa: first, on the micro economy level the insufficient self-production, which does not provide a household with enough food over one year; second, on the macro economy level the fact that much of the population does not have the means to buy enough food; and third, on the political level the agricultural sector often is not seen as an important sector of sustainable development in a country.

While the world per-capita cereal production increased between 1970 and 1990 from 303 to 327 kg, the production in Sub-Saharan Africa fell from 135 to 112 kg. Consequently the average cereal consumption in 1990 was over 100 kg less than the average of all developing countries, although net cereal import to Sub-Saharan Africa increased from three to nine million tons (DE HAEN & LINDLAND, 1997; SINGER, 1997).

Eighty percent of all African countries (39 out of 49) rank as severely or moderately food-insecure in accordance with the Food Security Index (FSI) of the International Fund for Agricultural Development (IFAD, 1996). Of a total of 37 countries worldwide that are classified by IFAD as 'low food security countries' 21 are in Sub-Saharan Africa. Furthermore, a large and growing number of countries have been unable to satisfy even the most rudimentary nutritional needs of their populations. A total of 33 of Africa's 42 Sub-Saharan countries have per capita energy supplies below the minimum requirements (RASHEED, 1997), and only four countries are more or less self-providing. This means that the population has the possibility to purchase most of the food coming from local production. However, a big part of the population does not have the means to buy enough food. Self-providing is therefore not synonymous with food security in these countries (COURADE, 2000).

Food insecurity is not a new problem of this century. Being more vulnerable to supply disruption or insufficiency, malnutrition or famine, food provision throughout history has been a pervasive concern of city populations (MOUGEOT, 1994). Food insecurity is a more severe problem in urban settings than in rural settings. Food insecurity grows with the proportion of the household budget that must be spent on food. The fewer the household's alternatives are for buying food, the more insecure food will be. For poor people in a city the strategies for coping with food insecurity are fewer than in rural areas. Households typically cope with difficult times by reducing the quality, quantity, and frequency of meals (BRIAND, 2000; NARAYAN et al., 2000a). It is becoming more and more common to eat only one meal a day in African cities and this undoubtedly affects people's health (VENNETIER, 1988).

Most of the food consumed in cities must be purchased, and poor families must spend as much as 50 to 90 percent of their income on food (VASEY, 1990; DRESCHER, 1996a; SMIT et al., 1996). It has been estimated that food in general costs 10-15% more in urban than in rural areas (RAVALLION & VAN DE WALLE,

1991; RAVALLION, 1992). This is regardless of the fact that the diets of the urban poor may sometimes be worse than those of their rural counterparts (BIRLEY & LOCK, 1998). Another study showed that consumers in cities spend 30% more on food on average than rural consumers, despite there being a lower average calorie intake in cities (ASADUZZAMAN, 1989). Moreover, the urban poor also spend more on the same amount of food than consumers with higher income. This is linked with inefficient shopping practices, such as smaller and therefore more expensive purchases, more frequent purchases and inadequate storage possibilities.

Urban agriculture thus provides benefits, not only for the home gardeners themselves, but also for city dwellers not directly involved in urban agriculture.
Urban dwellers in developing countries remain highly disadvantaged, having only very limited purchasing power. For these people guaranteeing the efficient distribution of low-cost nutritious food will be one of the major food security issues in the coming decade (FAO, 1996). Products grown at shorter distances from the consumer create less need for marketing, transportation and packaging than products grown at a longer distance. Vegetables grown on home gardeners' fields provide a cost advantage over rural agriculture products. Moreover, urban agriculture provides cities with fresh food without depending on the generally weakly developed infrastructure systems. In most developing countries food is imported to feed the cities. Urban agriculture can substitute for some of the imported food and provide the benefit of saving foreign exchange.

Subsistence Production

Control over food production at the household level, as in the case of home gardeners' households, provides people with more food security. The ability of self-provision is mentioned by poor people as one of the primary household strategies for dealing with material deprivation and reducing overall household insecurity (NARAYAN et al., 2000a). Food from subsistence production is usually of better quality, lower cost and is more consistently accessible than purchased food (MARSH, 1994; QUON, 1999). Few rigorous analyses are available on the nutritional impact of urban agriculture in home gardeners' households, but findings from these

are encouraging. Low and very-low income home gardeners' households were compared with equivalent households without home gardens in Kampala, Uganda; Nairobi, Kenya; and Harare, Zimbabwe. Using different methodologies to measure the relative impact of urban agriculture on food security indicators, all found that home gardeners' households achieve greater food security, particularly with regard to the nutritional status measured by caloric and protein intake, and anthropometric measurements, such as stunting and wasting (MOUGEOT, 1999). In addition, in home gardeners' households urban agriculture offers an opportunity to shift household expenditures toward other needs, such as health care and better living conditions (RABINOVITCH & SCHMETZER, 1997). Or it can contribute to savings at the household level.

Chapter 6 and Chapter 7 analyze food expenditures in home gardeners' households and in households attending an activity other than home gardening and discuss the different levels of food insecurity among households.

Cash-Providing Activity

Next to the nutritional benefits of urban agriculture, urban agriculture can also be seen as a cash-providing activity. It is one of the few income possibilities for persons with few skills and limited education. The available data suggest that the economic benefits of urban agriculture are at least as great as the nutritional benefits and that urban agriculture is an important employer in the South (LEE-SMITH et al., 1987; MVENA et al., 1991; SCHILTER, 1991).

The economic importance of urban agriculture, however, has received little attention until now. The tendency is to regard it as a subset of either rural agriculture or the informal sector, or as a temporary phenomenon. Urban agriculture is frequently not recognized in labor statistics or included in economic data collections and often goes unreported. Knowing this, it is obvious that precise figures of the economic impact of urban agriculture are difficult to obtain. However, it is probably a significant sector in more cities than those which keep official records and it is certainly more important than the results, which such records reveal. It is estimated that urban agriculture provides direct earnings for 100 million people globally (HELMORE & RATTA, 1995).

Chapter 5 deals with income of home gardeners in comparison to their counterparts without home gardens. The seasonal differences in home gardeners' incomes are emphasized.

In most developing countries the majority of home gardeners come from low-income groups. For many, urban agriculture is a relatively long-term economic activity (SANYAL, 1985). The average low-income home gardener is a member of a poor but stable urban community (RAKODI, 1988; MAXWELL, 1995). The poor who have lived in the city for a number of years have better access to resources and greater familiarity with the market and the urban economy. Home gardeners are marginally better off than the poorest of the poor. They have lived in the city long enough to have acquired the most important input of all: access to land. The land is rarely their own (see Section 1.2.3.2.), nevertheless it may be granted to them in a formal or informal lease arrangement (NUGENT, 1997).
In addition urban agriculture provides for new activities in the city. It offers an income possibility for rural-urban migrants and herein especially for those with limited mobility, few skills and little capital. Urban agriculture is therefore an effective familiar security tool for those seeking to build a future in the city (SMIT et al., 1996). As mentioned in Section 1.2.2. untrained rural immigrants return to their former activity: agriculture. Because urban agriculture is practiced by unskilled and semi-skilled people and belongs to the informal sector, it is an activity that tends to be dominated by women (SMIT et al., 1996). However, more recent studies indicate that gender ratios vary greatly from city to city, depending on cultural context, production system, land legislation and economic background (MOUGEOT, 1999).
Chapter 8 analyses the socio-economic status of home gardeners' households in comparison to households without home gardens.

Concluding the discussion of the benefits of urban agriculture, there are others and sometimes less visible advantages of home gardening which often concern the town in general.
Certain areas in some cities are not suitable for other uses due to environmental sensitivity or undesirability, but are conducive to agricultural uses (NUGENT, 1997).

And lastly urban agriculture contributes to biodiversity and air quality that can replace some of what the urban system destroys (NUGENT, 1997). Many urban areas suffer from environmental degradation. Urban agriculture can contribute to environmental restoration of these areas. The environmental impact of urban agriculture in West Africa still has to be explored (LACHANCE, 1993). Projected figures for 2020 indicate that two-thirds of the West African population will be found in urban centers (SNRECH, 1994). Ecologically viable urbanization thus seems impossible without urban agriculture.

1.2.3.2. The Risks of Urban Agriculture

Despite the given benefits, urban agriculture can also create risks, mainly for people who are engaged in urban agriculture but also for residents who provide themselves with vegetables from the home gardening sites. Some of the major risks of urban agriculture are related to *HEALTH*, *SEASONALITY* and the *LACK OF LEGISLATION*.

Health Risk

Foremost among them is the health risk, which is linked with the two natural resources that are indispensable for urban agriculture: water and soil (refer to Figure 1.3.). Crop, soil and water pollution can pose serious health risks within the urban food system. Moreover, urban agriculture is an activity with a high physical effort.

In the dry Sub-Saharan region water is extremely scarce. Therefore the fields must be irrigated with wastewater from nearby drains or open wastewater channels. This water has in general a microbiological and parasitic contamination from human excrement (FEACHEM et al., 1983; MARA & CAIRNCROSS, 1991; CAIRNCROSS & FEACHEM, 1993; CISSE, 1997; BOSSHART, 1998). Moreover, it is polluted with chemicals from nearby industrial companies in town. According to the recommendations to change the 1989 WHO guidelines the limit for water to irrigate uncooked edible vegetables should be ≤ 0.1 nematode eggs/liter and 1.000 faecal coliform bacteria out of 100 ml (BLUMENTHAL et al., 2000; BLUMENTHAL et al.,

2001). Irrigation water in the dry Sub-Saharan region generally fails to meet these requirements. The water for irrigation is never treated in any ways before use.
Moreover, the water itself can be related to health risks, because semi-permanent water surfaces offer optimal breeding sites for mosquitoes (DOLO et al., 2000; MOHAMED & BABIKER EL SAYED, 2000; SISSOKO et al., 2000). The irrigation practice of urban agriculture may therefore increase the risk of vector borne diseases, such as dengue fever, and especially malaria (LOCK & DE ZZEUW, 2001). Irrigation generally favors the development of insect vectors, but this does not necessarily lead to increased transmission and morbidity. Several studies have shown that in environments where malaria is already endemic, malaria prevalence and incidence was equal or less in irrigated rice growing areas as compared to neighboring areas without rice cultivation (BOUDIN et al., 1992; FAYE et al., 1995; SISSOKO et al., 2000).

In addition to water, soil is also related to health risks. Pathogens have a substantial survival capacity in soil (MARA & CAIRNCROSS, 1991). Lead and other heavy metals are also found in soil (MCMICHAEL, 2000).
A last health-threatening factor of urban agriculture is the home garden products themselves. In addition to the water and soil conditions, home garden products are also often exposed to pesticides. The seriousness of contaminated food can not be underestimated, considering findings from the WHO, which revealed that 60-80% of heavy metal toxin found in human bodies in urban industrial areas was the result of contaminated food rather than air pollution (BELLOWS, 1999).
It must be noted that people who rely upon their crops to feed their families or provide desperately needed incomes are not likely to abandon unsafe urban agriculture practices in the face of more immediate hardship.
Chapter 6 discusses the related health risks for people practicing home gardening in comparison to city dwellers practicing activities other than home gardening.

The additional health risks posed by urban agriculture products in developing countries need to be compared to those posed by other food sources. Conditions under which food is grown in rural areas tend to be less subject to control. In addition, rural products often are shipped over long distances and stored for long periods of time, mostly in questionable conditions. Research in Lima, Peru and

Accra, Ghana revealed that fresh products sold at markets were extensively contaminated regardless of urban or rural origin (MOUGEOT, 1999). All actors in the urban food chain, including market vendors and wholesalers, must be aware of the related health risks. Each of them has the responsibility to avoid contamination of the food sold.

Chapter 9 analyzes focus group discussions held with market vendors in the different market places in Ouagadougou. One focus of the discussions was on the perception of a related health risk in selling polluted food and the given hygienic behavior.

Seasonality

A second risk of urban agriculture is the seasonality of this activity. As with the health risk, seasonality is also linked to external determinants. Climatic factors such as temperature and rainfall influence urban agriculture in different ways at different times of the year.

Seasonal rainfalls determine completely the rhythm of life and work of all households, in which agriculture is the main economic activity. Saharan and Sub-Saharan countries are the countries most affected by this seasonality. Rainfall is restricted to the rainy season, which lasts from June to September/October and drives completely the agricultural calendar for cultivation and home gardening (refer to Figure 1.5.). Cultivation of *sorghum*, maize, millet and rice starts with sowing between May and June and ends with harvesting at the end of the rainy season in October. The cereals are not irrigated by farmers.

Home gardening fields are often located near water reservoirs in low-lying areas that are partly or totally flooded in the rainy season. Therefore home gardening is very limited in the rainy season. It starts often no earlier than the beginning of October. It is then at its peak during the dry season months between December and February. Depending completely on the quantity of annual rainfall, home gardening must stop when irrigation water runs out. This is, at the worst case, at the end of March, and in the best case at the end of April. To not have the possibility of a year-round activity has been shown to have profound implications for household economies, especially on expenditures and food prices (CHAMBERS et al., 1981).

Chapter 6 deals with seasonal differences among the predictable expenditures in home gardeners' households and households without home gardens.

Lack of Legislation and Official Acceptance

One further problem is the lack of legislation and official acceptance of urban agriculture. Outside Africa several countries have created permanent institutional programs and agencies. Purpose-specific leaseholds have been exploited in Argentina. Urban agriculture has been promoted to supply national school catering programs in Costa Rica (MOUGEOT, 1999). The Cuban Ministry of Agriculture has created an Urban Agriculture Office for Havana. Home gardeners are also supported and encouraged by the government through laws and tax reductions, such as in the cases of Japan and the Philippines (DIALLO, 1993; GOLHOR, 1995).

In Africa only a few countries have legislation that protects urban agriculture. The Greater Pretoria Metropolitan Council recently recognized specific urban agriculture food productions as legal urban land use. It has incorporated urban agriculture into the management of its urban open space system and set aside land for urban agriculture in designated sectors of the city (MOUGEOT, 1999). Zaire introduced urban agriculture as an official project using external financial assistance, thereby subsidizing access to water and drainage (TRICAUD, 1987). In the early 1980s, the Nigerian president gave permission to use all vacant public land in urban areas for cultivation without charge. In Nigeria all inputs, such as fertilizer and seeds, are tax free (GEFU, 1992). In Harare, Zimbabwe sanctions were lifted temporarily in 1992. Within two years, the cultivated area had doubled, the number of home gardeners had more than doubled, food prices had decreased and hundred of jobs had been created (SMIT, 1996).

Aside from these few positive examples, home gardeners are handed over to administrative reprisals in many African towns (GOLHOR, 1995). Many municipalities discourage or prohibit rather than promote urban agricultural activities. The basic cause of Africa's poor agricultural performance has been a systemic tendency towards urban areas in development policy, a tendency to squeeze agriculture for resources in order to finance urban industrial development. This bias grew out of the conviction that agriculture could not contribute to sustained development and that the

key to modernization lay in attaining rapid industrialization (LOFCHIE, 1997). City authorities in many countries do not take pride in having their towns appear rural. They want their cities to look modern and free of traditional practices associated with the countryside (NUGENT, 1997). Concepts of agricultural extension in the urban environment are missing because ‘real agriculture’ is thought to take place in the rural sector only (DRESCHER 1996b). Urban agriculture is perceived as an artifact of rural life that simply does not belong in cities (MAXWELL, 1995).

Directly related to the lack of acceptance and the lack of legislation is the lack of official land use. Land used for urban agriculture is more likely to be rented or borrowed than owned. It can be reclaimed at any time and on short notice. This implies a low degree of security for home gardeners and a disincentive to invest in their fields, which limits urban agriculture (VASEY, 1990; NUGENT, 1997). Since it generally occurs on ‘precarious’ land, i.e., land whose availability depends on the whim of city planners, the long term viability is not always clear (LACHANCE, 1993). Tolerance of urban agriculture varies from place to place and from period to period.

A second problem related to land use is the increasing number of people doing home gardening in town without extending the size of the fields. Poor urban residents have to find a way to sustain themselves and extend the scale but not the size of urban agriculture activity. As a consequence, urban agriculture has become less and less reliable and profitable for everyone. This problem will only increase in the future (RICHTER et al., 1995).

To conclude the discussion of benefits and risks of urban agriculture, urban agriculture will be analyzed with the common economic tool of a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis (refer to Figure 1.4.). SWOT analysis can be understood as the examination of an organization’s internal strengths and weaknesses, and its environmental opportunities and threats or risks. Strengths and Weaknesses are aspects with the ability to influence and represent the internal analysis. Opportunities and threats are aspects of the external environment, which can not be influenced but have an impact on urban agriculture.

The SWOT analysis is a general tool designed to be used either in the preliminary stage of decision making or, such as in the case of urban agriculture, as a precursor to strategic planning in various kinds of applications (JOHNSON et al., 1989; BARTOL & MARTIN, 1991).

The goal of a SWOT analysis is to match the threats and opportunities external to urban agriculture to the internal strengths and weaknesses. The aim is to maximize the strengths of urban agriculture in relation to potential opportunities, while minimizing the weaknesses and risks in order to generate viable strategic options for the future (STILES, 1999).

Figure 1.4. Analyzing urban agriculture with the strengths-weaknesses-opportunities-threats/risks (SWOT) analysis

STRENGTHS	WEAKNESSES
• cash-providing activity • subsistence production • fresh food produced for cities • improvement of environment	• related health risk • seasonal dependency • use of and dependency on many external factors / natural resources (water, soil)
OPPORTUNITIES	**THREATS/RISKS**
• income for producers • employment for few-skilled, limited-educated or unemployed residents • income opportunity for rural-urban migrants • food import substitution / food security	• belonging to the informal sector • no legislation for urban agriculture • land / field not owned by home gardeners

Urban agriculture shows more or less an equilibrium in its strengths, weaknesses, opportunities and threats/risks (refer to Figure 1.4.). Already today urban agriculture provides an opportunity for many city dwellers, especially in low advantaged

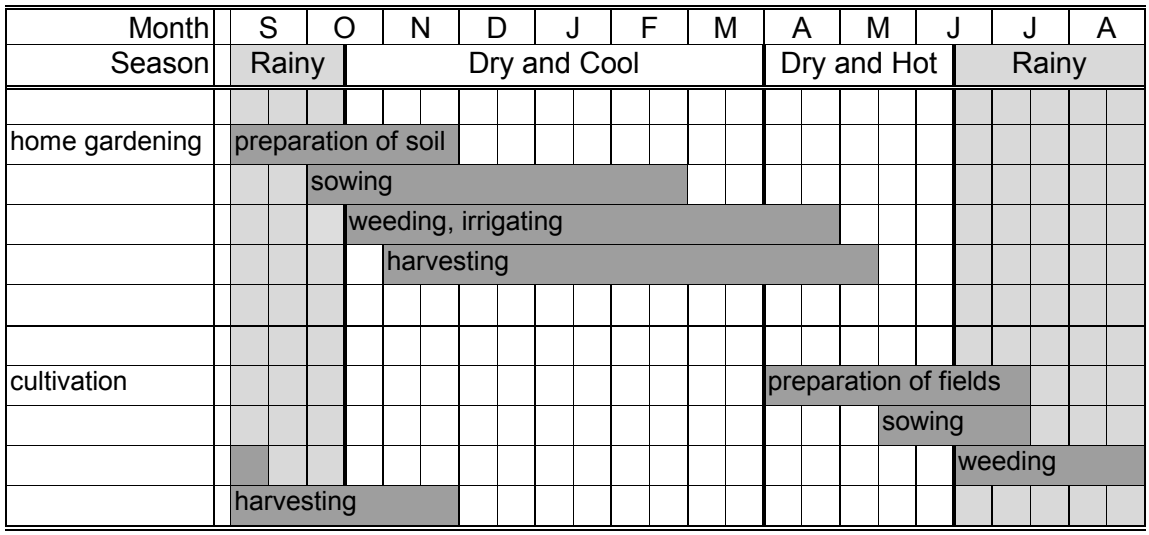
segments, to earn some money and to obtain food for their families through subsistence production. Urban agriculture has come to be recognized as an important survival strategy for the poor. However, urban agriculture could move beyond being an appendage of the informal sector and become a prosperous and accepted economic sector in cities, provided that the related risks are adequately mitigated.

1.2.4. Urban Agriculture in Saharan and Sub-Saharan Countries

Historically, home gardening has been an agricultural production system based on a fixed plot of land that includes a residence and is cultivated by the household members (BROWNRIGG, 1985). According to White and Gleave (1971) home gardens are the most common type of permanent traditional production system in Africa. They vary considerably in size, shape, intensity of cultivation, and complexity in the number of species grown. The variations depend on ecological zones, settlement patterns and socio-economic conditions.
In the drier Sub-Saharan areas home gardens consist of a less complex, more open ecosystem, in which fruits, vegetables and cereals predominate and coexist (WHITE & GLEAVE, 1971; OKIGBO, 1990). The working periods to cultivate cereals and to do home gardening do not coincidence with each other. Especially in Sub-Saharan Africa home gardening and cultivation are often practiced equally by the same people or the same household. An outline of a typical cycle of home gardening and cultivation in Sub-Saharan regions during one year is shown in Figure 1.5.

Despite agriculture's importance and enormous potential for Africa, it remains backward and undercapitalized relative to other developing regions. Less than 7% of cropped area is irrigated. The use of purchase inputs and machines is limited, and capital stock per hectare is about one-quarter of that in Latin America. Low capitalization is made worse by high transactions costs, inadequate market infrastructure and weak institutions and support services (WORLD BANK, 2000).

Figure 1.5. Outline of a typical cycle of home gardening and cultivation in Sub-Saharan regions during one year



About 300 million Africans live in a water-scarce environment. Since World War II two-thirds of Africa's agriculture soils, one-third of permanent pastures, and one-fifth of woodlands and forest have become degraded, with a productivity loss of 25% for cropland and unabated deforestation (WORLD BANK, 2000).

At the same time Sub-Saharan Africa is the region most affected by urbanization in the world (WORLD BANK, 2000). Incomes measured with the Gini-Coefficient are relatively unequal in Sub-Saharan countries (DEMERY & WALTON, 1998). (For a definition of the Gini-Coefficient refer to Section 1.1.4.) Between 1987 and 1998 the number of people in the Sub-Saharan region living on less than US $1 a day increased from an already high 217 million to 291 million. Thus, over the same period the share of the population in poverty remained at the same level of almost 50% (BADIANE & DELGADO, 1995; WORLD BANK, 2000/01). Sub-Saharan Africa is now the region with the largest share of people living below US $1 per day (WORLD BANK, 2000/01).

While in the past poverty and food shortages remained predominantly a rural problem, the proportion of undernourished people living in cities is on the rise (VON BRAUN, 1997). Insecure sources of food related with high unemployment rates and urban poverty will be one of the major problems in this region (RATTA & NASR,

1999). Urban agriculture is an activity working against this and already today it is re-surging strongly in Sub-Saharan Africa.

1.2.5. Urban Agriculture in Burkina Faso and its Capital Ouagadougou

Like the rest of the Sub-Saharan region, Burkina Faso is also undergoing intense urbanization. Growth rates have been particularly high for the country's capital, Ouagadougou, which had an annual growth rate of 6.8% in 1998 compared to 2.8% for the entire country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Thus, Burkina Faso's urban growth rate is three times higher than the corresponding rural growth rate, representing an immense challenge to food securities, sanitation, and poverty alleviation.

The main characteristics of Burkina Faso's workforce are the predominance of agricultural work and the importance of the informal sector (refer to Section 1.2.1.). The total labor force of Burkina Faso numbers five million (WORLD BANK, 2000/01). Unemployment and underemployment are widespread and many workers seek permanent or seasonal employment in richer nations (ASCHE, 1993).

Ninety two percent of the population of Burkina Faso is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion (GBIKPI, 1995). Only 0.2% of the land area is under permanent crops and 0.7% of the cropland is irrigated (WORLD BANK, 2000/01). Leading food crops are cereal grains including *sorghum*, millet, rice and maize, which occupy 87% of the cultivated area. Furthermore cotton, peanuts, fruits and vegetables are cultivated in home gardens (GBIKPI, 1995). The agricultural productivity, which is defined as the agricultural value added per agricultural worker, is very low. Between 1996 and 1998 Burkina Faso had an annual agricultural productivity of US $161, which is the lowest productivity in comparison to its neighboring countries Niger (US $195), Benin (US $534), Togo (US $539), Ghana (US $542), Côte d'Ivoire (US $1.011), and Mali (US $271 / WORLD BANK, 2000/01).

In 1996, the primary sector -agriculture- produced 40% of the GDP, and the informal sector produced 30% (LEREBOURS PIGEONNIERE & JOMNI, 1998). According to governmental statistical data, in urban areas 44% of the population is engaged in

agriculture, which includes home gardening, cultivation, animal-breeding, fishing and forestry (INSD, 1994a). Moreover, 14% of those who work have more than one activity (INSD, 1994a).

Urban agriculture was first brought to Ouagadougou by catholic missionaries. According to Djimbase they started to cultivate European vegetables in their gardens for two reasons. First, they wanted to improve the protein malnutrition state of the population. And second, together with the improvement of the food situation they wanted 'to bring the population the Bible' (DJIMASBE, 1995/96). After independence in 1960 home gardening increased very fast in town, mainly due to rapid urban population growth combined with the presence of a very large number of farmers in the urban population (DJIMASBE, 1995/96). In 1972, home gardens were first mentioned by a researcher in a geographic survey of Ouagadougou (MADL, 1972).
Home gardening activities could already be seen in Ouagadougou in the 1930s. Tanghin can be considered the first site of home gardening in the city. In Tanghin one single household started with home gardening, producing vegetables and cereals. The seeds came from the ancient king of the Mossi, the Moghbo Naba. They also exclusively provided the court of the Moghbo Naba with the products (DJIMASBE, 1995/96, KI et al., 1997).
Today there are approximately 48 different sites of home gardening in the town (CISSE, 1997). The vegetable selection is not arbitrary; it depends on local water supply, soil conditions, plot size, use of products and home gardeners' control over future use of the plots. Home gardeners in Ouagadougou grow several different kinds of vegetables: short-cycle and long-cycle vegetables, traditional and European vegetables. For a list of the most common vegetables planted during the rainy season refer to Appendix IV.

In Ouagadougou home gardening is both practiced by men and women. However, there are sites where exclusively men work. Most of the population in and around Ouagadougou belong to the ethnic group of the Mossi (see Chapter 4, Section 4.1.1.) For the Mossi, as for most ethnic groups of Burkina Faso, access to land for agriculture and living is limited to men. To obtain land for herself, a woman must either marry or borrow a field from a male member of the family (OUEDRAOGO et al., 2000).

In Ouagadougou, urban agriculture is not legally seen as a part of urban economy, it is simply an activity that is tolerated. The government does not officially permit urban agriculture, and has a specific prohibition of urban agriculture during the rainy season, especially of tall-growing crops (QUON, 1999).

2. The Project and its Approach

The present project is undertaken within the urban agriculture program 'Health impact and management of wastewater use in small-scale agriculture in urban Saharan settings; risks and potential intervention strategies'. The project is financed by the Swiss National Fund within the framework of Module 7 'Specific Program of Environment'. Ouagadougou, Burkina Faso, and Nouakchott, Mauritania, are the two study sites of the project. They are main areas of small-scale urban agriculture, also known as home gardens. Fully responsible for the project is the Swiss Tropical Institute in Bale, Switzerland, which works in close collaboration with international and local institutions. The 'Ecole Inter-Etats d'Ingénieur de l'Equipement Rural' (E.I.E.R.) and the 'Centre Régional pour l'Eau Potable et l'Assainissement à Faible Coût' (CREPA) are the two collaborating institutes in Ouagadougou. The Institute for Environment Engineering of the 'Ecole Polytechnique Federale de Lausanne' (EPFL) supports the project in Switzerland. The project consist of three phases and started in 1994.

The main *GOALS* of the project are to assess the impact of urban agriculture in towns of the Sub-Saharan region, to assess the health risks generated by the wastewater use for irrigation and to evaluate possible interventions to reduce the potential health risk.

The *FIRST PHASE* of the project (1994-95) aimed to assess the health risk of wastewater use for irrigation of small-scale agriculture in urban and periurban areas in Ouagadougou, Burkina Faso; to validate the feasibility and adequacy of the epidemiological strategy applied in Ouagadougou and in another Saharan town, Nouakchott; and to propose feasible control measures to reduce the wastewater-related health risk at the household level (CISSE et al., 1999a).

The two main objectives of the *SECOND PHASE* of the project (1995-99) were to assess the impact of home gardens on the household economy in areas of different health risk and to develop environmental and health promotional activities on the local level to reduce the potential health risk established in the first phase. All possible interventions were promoted taking into consideration the approach of

'participatory action research' or 'research-action-formation' (RAF), which is described in Chapter 5, Section 5.4.

The goal of the current *THIRD* and *LAST PHASE* of the project (1999-2001), the so-called phasing-out period, is to translate the obtained research results into development action in urban agriculture sites and among the home gardeners in Ouagadougou and Nouakchott. This goal implies specific objectives, such as assuring that the established RAF approach will guide interventions to reduce health and environmental risks in home garden areas and to evaluate and promote the experience made in the two previous phases at the scientific and public level.

Especially in Ouagadougou the project is multidisciplinary. It addresses the epidemiological, engineering, socio-cultural and economic dimensions of home gardening, emphasizing health risks associated with the use of wastewater for irrigation. Several studies have already been published on wastewater management and health risks (i.e. CISSE, 1997; CISSE et al., 1999a; CISSE et al., 1999b; CISSE et al., in press for 2001), the assessment of the perception of health and well-being in home gardeners' and non-home gardeners' households (MEYER, 1998/99), food production patterns and agricultural practices (MÜLLER, 1999), as well as the social and economic conditions of people living in and around the home gardens (OUEDRAOGO, 1998; OUEDRAOGO et al., in press for 2001), and the documentation of the installation of a cereal mill as a microproject for female home gardeners (OUEDRAOGO et al., 1998; OUEDRAOGO et al., 2000).

To complete the multidisciplinary project, the overall aim of this study is to cover the economic dimension of urban agriculture in comparison to the health status of home gardeners. As the economic factor is only one of the many determinants of the urban agriculture system (refer to Figure 1.3.), it is of interest to know how it influences the health status of home gardeners in comparison to other city dwellers. A detailed description of the general objectives and the research questions of the study is given in the following Chapter. In Part III all data obtained in this study are presented and discussed.

PART II GENERAL OBJECTIVES AND METHODS

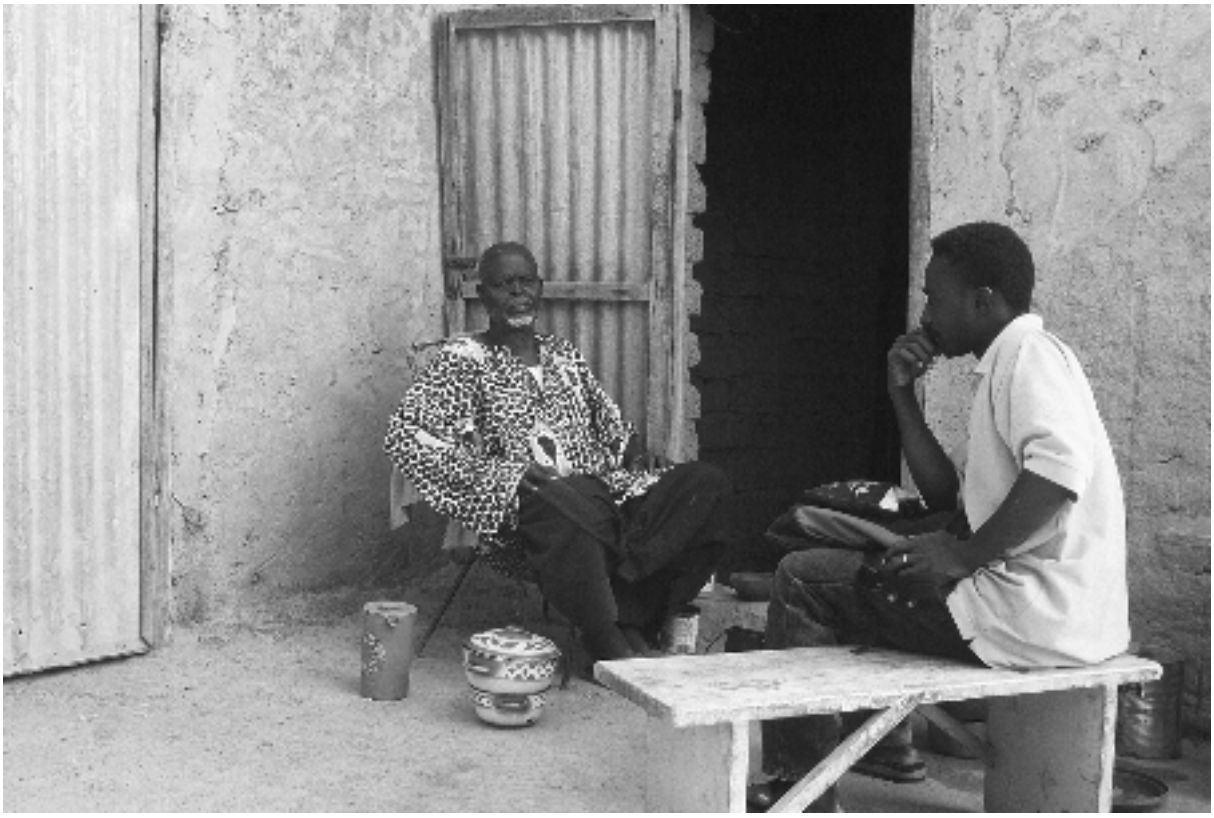


Photo 2: Interview with the oldest home gardener in Tanghin, Ouagadougou, 1999

3. Goal and Objectives

The goal of this study was:

> **To Cover the Economic Dimension of Urban Agriculture in Comparison to the Health Status of Home Gardeners.**

General Objective 1

To evaluate the economic costs and impact of urban agriculture taking three home gardening sites with different social and economic structures in Ouagadougou, Burkina Faso's capital, as an example.

General Objective 2

To identify the link between the economic impact and the health impact based on wastewater use in home gardens in Ouagadougou.

General Objective 3

To provide a feasible concept that aims at improving the economic situation of the municipality.

The pursuit of these general objectives entailed the following research aims:

(1) To establish the income situation for home gardeners and for households attending an activity other than home gardening both during the dry season and the rainy season.

(2) To discuss the predictable and unpredictable expenditures in home gardeners' and non-home gardeners' households both during the dry and the rainy season with a special emphasis on the unpredictable costs for health care.

(3) To compare the predictable costs for home gardeners' and non-home gardeners' households within the sites and for all households across the sites during the rainy season.
To work out base-case, best-case and worst-case scenarios of the financial situation (income and expenditures) in households with home gardens and their counterparts.

(4) To identify the determinants for the socio-economic differences in home gardeners' and non-home gardeners' households within the sites during the dry season and during the rainy season.
To analyze the socio-economic conditions in comparison to the health conditions in a population practicing home gardening and without home gardens.

(5) To compare the estimated income of market vendors with the estimated income of home gardeners.
To describe the different selling behavior, the consciousness of contaminated and contaminating vegetables and the types of clients in typical market places in town.

(6) Case study of vendors of different market places.

(7) To establish a feasible concept based on the key determinants to improve the economic situation in different sites in Ouagadougou.

4. Methods

4.1. Study Area

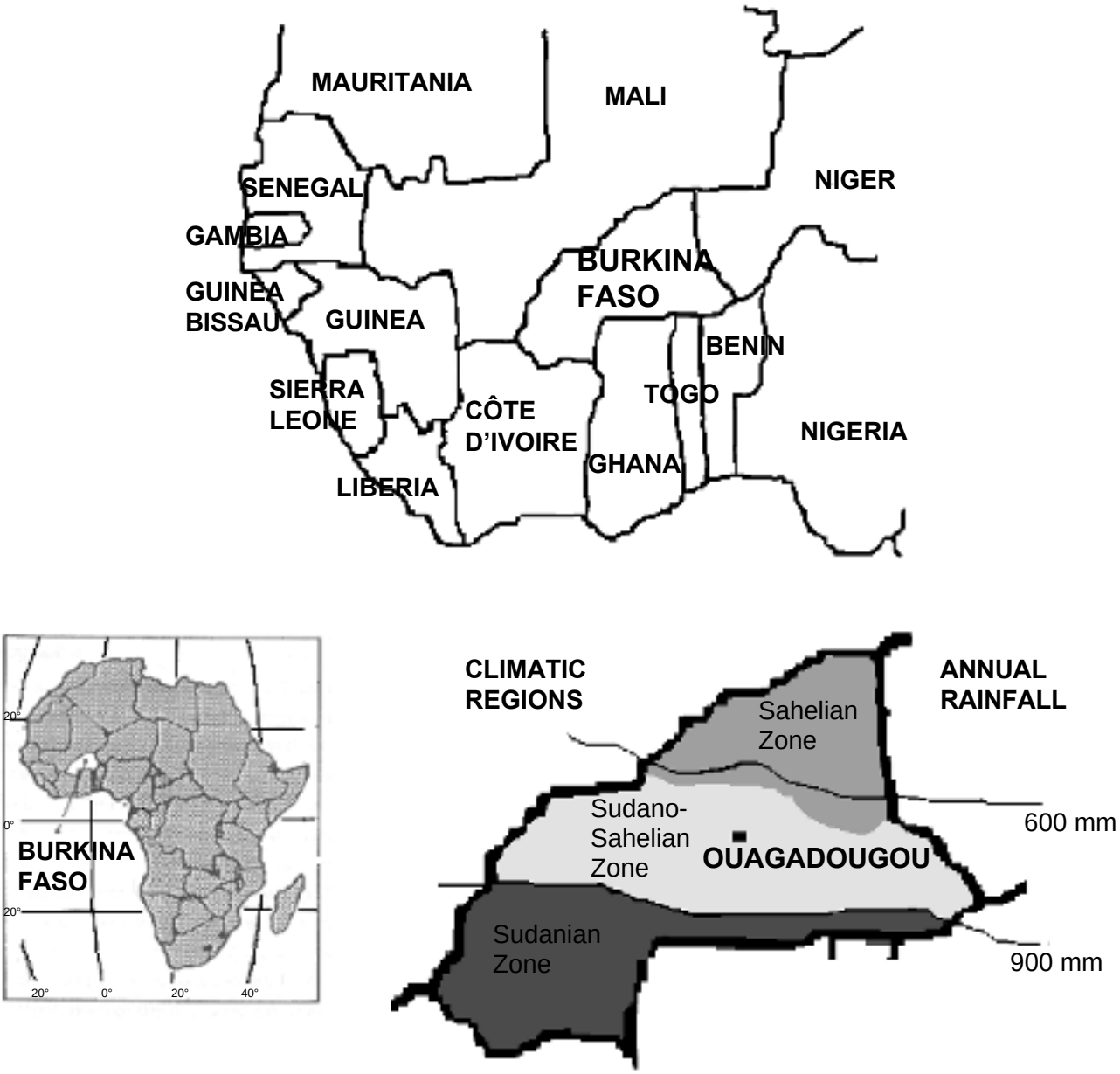
4.1.1. Burkina Faso

The study was conducted in Ouagadougou, the capital of Burkina Faso in Sub-Saharan Africa, at the end of the rainy season. To establish seasonal differences, a complementary study was undertaken at the end of the dry season. The data was collected in April 1998 and in October 1999. Additional information was recorded during a second, three-week field stay in November 2000.
The total area of Burkina Faso measures about 274.000 square kilometers. In 1999, the population was estimated at 11 million people (WORLD BANK, 2000/01), with a population growth rate of 2.8% per year and a population density of about 40 inhabitants per square kilometer country (LEREBOURS PIGEONNIERE & JOMNI, 1998). This makes Burkina Faso one of the most populated countries in Western Africa. It is situated at the southern part of the West African Sahel and is bordering Côte d'Ivoire, Ghana, Togo and Benin in the South, Mali in the North-West, and Niger in the North-East (see Figure 4.1.). In contrast to its southern neighbors, it is poorly endowed with natural resources, has very limited rainfall and no coastal access.

Burkina Faso is a Sub-Saharan country with a fairly flat surface and its land is used as for agriculture and for pasture. It lies on a plateau, which slopes mainly to the South and is situated on an altitude between 200 and 700 m. The plateau is drained to the South by the Black, Red and White Volta rivers and to the East by small rivers connecting with the Niger.

Three seasons can be distinguished: the dry, cool season from November to March; the dry, hot season from April to May and the hot, rainy season from June to October. The annual precipitation is between 800 and 1000 mm and restricted to the rainy season (LEREBOURS PIGEONNIERE & JOMNI, 1998).

Figure 4.1. Map of West Africa including Burkina Faso with its climate regions and annual rainfall
modified after Lerebours Pigeonnière & Jomni, 1998



In 1996, Burkina Faso was divided in 45 provinces with more than sixty ethnic groups of various sizes and languages. French is the official language. Mossi people represent the biggest ethnic group with approximately 50% living mainly on the central plateau, where Ouagadougou is situated (CAVIN, 1998). Their language is Morée. Other principal ethnic groups are Peul (11%), Bobo (7%), Bissa (7%), Gourounsi* (5%), Gourmantche (5%) and Sénoufo (5% / LEREBOURS PIGEON-NIERE & JOMNI, 1998).

As with most French speaking African countries, Burkina Faso is part of the zone, in which the Franc is accepted and the CFA Franc is used as official currency (KLOTCHKOFF, 1998). The Franc CFA has a fixed parity with the French Franc at 1:100. At the time of the study in October 1999 was the exchange rate 600 CFAF = US $1.

Since the declaration of independence in 1960, Burkina Faso has remained one of the poorest countries in the world with a per capita gross national product (GNP) of US $240 in 1999 (WORLD BANK, 2000/01). In 1997, it ranked 172nd among 174 countries in the HDI and recorded a HPI of 59% (UNDP, 2000 / see Chapter 1, Section 1.1.4. for a description of the HDI and the HPI). According to international poverty lines, which define people living with less than US $1 per day as very poor and people living with less than US $2 per day as poor, 61% of Burkina Faso's population is very poor and 86% is poor (WORLD BANK, 2000/01). The share of the population living below the national poverty line remained with 51% constant in the rural setting between 1994 and 1998 whereas it increased in the urban setting of Burkina Faso from 10% to 16% during the same time (MINISTERE DE L'ECONOMIE ET DES FINANCES, 2000; WORLD BANK, 2000/01). A poverty study carried out in 1997 noted that the Gini-Coefficient for Burkina Faso is with 0.63 one of the highest of the world (UNDP, 2000) and many of the poor suffer under extreme levels of deprivation.

* Gourounsi is an overall name for the ethnic groups of Lela, Nuna, Kasena, Sisala, Puguli and Ko (IZARD, 1970)

Social indicators picture a low life expectancy at birth of 44 years, 23% of the population are not expected to survive to age 15 and 40% to age 40 (UNDP, 2000). The infant mortality (under five years) is with 210 per 1.000 children higher than that of the capital, Ouagadougou, with 150 per 1.000 children (INSD, 1994b). A total of 30% of the children under five are underweight and 13% are wasting (UNDP, 2000). In a study carried out by the Ministry of Economics and Finance in Burkina Faso 47% of the children under five years were underweight and 53% were wasting (INSD, 1997a).

In Sub-Saharan countries the public expenditures on education were 3.4% of the total GNP per year. In comparison, Burkina Faso's public expenditures on education were only 1.5% of the total GNP per year in 1997 with a decrease of 0.7% since 1980 (WORLD BANK, 2000/01). The illiteracy rate of the adult population (age 15 and older) is about 80% (INSD, 1997b; WORLD BANK, 2000; UNDP, 2000). Although primary education is free of charge, only 32% of all primary-school aged children were enrolled in 1997 (INSD, 1997b). According to the Ministry of Economy and Finance (2000) this rate increased to 41% in 1999. However, girls still have a lower rate with 35%. Secondary schools charge fees. Only 13% of secondary school-age children attended school in 1997 (WORLD BANK, 2000/01).

The main reasons for poverty in Burkina Faso are its high population density, few exploitable natural resources and fragile soil. Burkina Faso suffers from two related forms of environmental damage: deforestation and soil erosion. In addition, the depreciation of the African franc currency of nearly 50% in 1994 weakened the population's financial resources. The industry remains dominated by unprofitable government-controlled corporations. Like many developing countries, Burkina Faso imports far more than it exports. Imports consist of food, petroleum, textiles, iron, steel, metal products, vehicles, electrical equipment and machinery. Exports include raw cotton, gold and livestock products. In 1998, imports were valued at US $750 million whereas exports totaled US $349 million (WORLD BANK, 2000/01). The main country for both export and import is France (HARENBERG LÄNDERLEXIKON, 1998/99). Between 1995 and 1997 Burkina Faso's total external debt was 423% of its exports (UNDP, 2000).

Nevertheless the government does not give poverty reduction a high priority in its national development agenda. Nor does it have a coherent multisectoral poverty strategy or an influential administrative agency to coordinate its implementation (UNDP, 2000).

4.1.2. Ouagadougou

Burkina Faso's capital Ouagadougou is situated in the center of the country and covers a space of about 20.000 ha. The census in 1996 revealed that 750.000 inhabitants lived in Ouagadougou with an average annual growth rate of 6.8%. Half of Burkina Faso's urban population lives in Ouagadougou, which accounts for more than 60% of the country's urban population. With approximately 35 inhabitants/ha Ouagadougou has the highest population density of the whole country. The town is divided into 30 administrative urban units (refer to Figure 4.2. / LEREBOURS PIGEONNIERE & JOMNI, 1998).
Being situated on the Sahelian border, Ouagadougou's annual precipitation can vary from 850 to 900 mm per year. The average temperature is around 24° C in January and 28° C in July. Ouagadougou is situated at an altitude of 300 m and is fairly flat.

4.2. Study Design

4.2.1. Quantitative Study

4.2.1.1. Study Area: Home Gardening Sites

There are 48 different sites of home gardening in various forms in Ouagadougou (refer to Figure 4.2.). Home gardens vary in their sizes and from season to season (CISSE, 1997). Three sites were selected for the study: Boulmiougou (see Photo 3), Tanghin (see Photos 5 and 6) and Kossodo (see Photo 4).

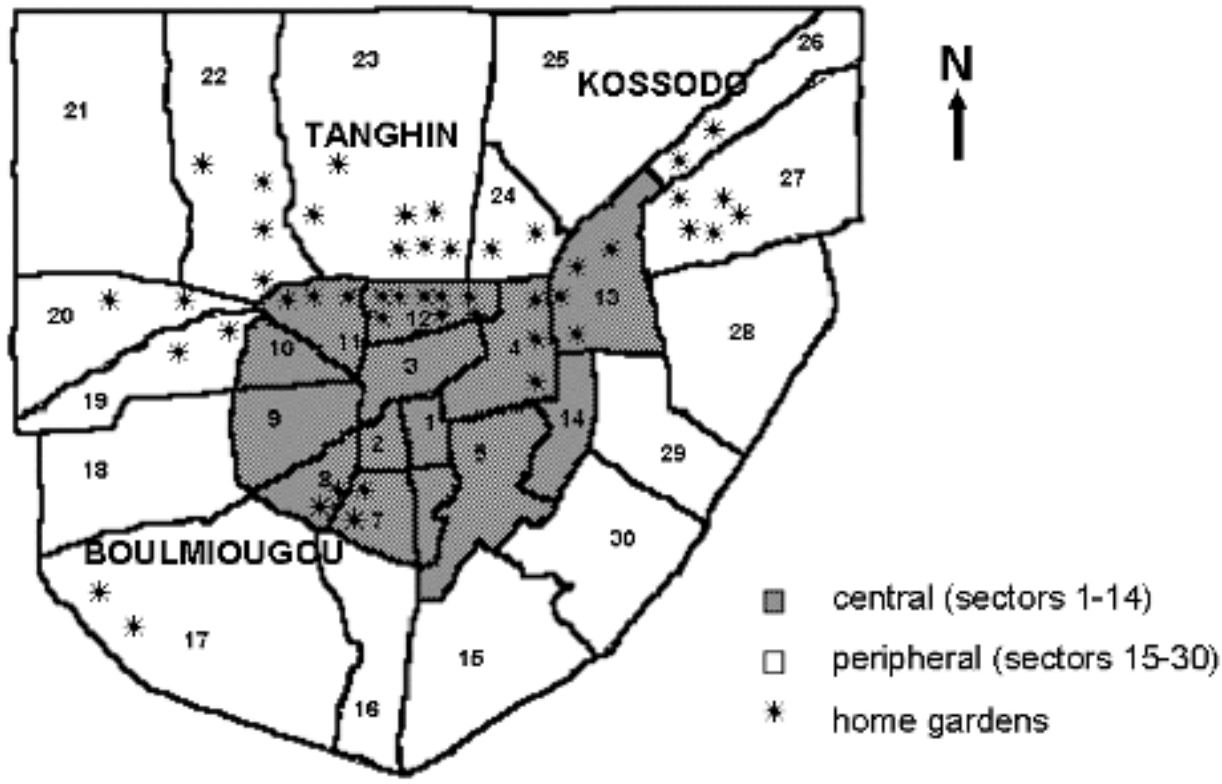
Photo 3: Home gardening site, Boulmiougou, rainy season, October 1999

Photo 4: Home gardening site, Kossodo, rainy season, October 1999

Photo 5: Cereals in the back and home gardening production in the front, Tanghin, rainy season, October 1999

Photo 6: Home gardening site, Tanghin, rainy season, October 1999

Figure 4.2. Ouagadougou with its administrative urban units (numbers) and the 48 home gardens (stars) including Boulmiougou, Tanghin and Kossodo



modified after Cissé, 1997

Together with the home gardening site of 'Canal Central', the selected ones are the main and biggest home gardening sites in town, representing more than 50% of the whole home garden area in town. Depending on the season, the area of the three sites varies from 3.290 square meters (dry season, April 1995) to 17.440 square meters (rainy season, December 1995 / CISSE, 1997). Within these three areas there are clear differences in the position of urban agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies. All three sites are situated at the outskirts of the town. Their major features are summarized in Table 4.1. Refer to Appendix IV for the most common vegetables planted at the home gardening sites in Ouagadougou during the rainy season.

Table 4.1. Characterization of the three home gardening sites Boulmiougou, Tanghin and Kossodo in Ouagadougou

	Boulmiougou	**Tanghin**	**Kossodo**
Location	South-West of the town on the main Road to Bobo-Dioulasso in Sector 17*[1]	3-4 km North of the Center at the Water Reservoir N°2 in Sector 23 *[1]	In the North-East 5 km out of the town on the Main Road to Kaya in Sector 26*[1]
Cultivation Area			
Dry Season	605a 18% of the total Agricultural Area in Town*[2]	337a 10% of the total Agricultural Area in Town*[2]	610a 18% of the total Agricultural Area in Town*[2]
Rainy Season	2.027a 12% of the total Agricultural Area in Town*[2]	3.065a 18% of the total Agricultural Area in Town*[2]	7.411a 28% of the total Agricultural Area in Town*[2]
Main Source for Irrigation	Water Reservoir*[3]	Water Reservoir / Hand-Dug Well*[4]	Mix of Wastewater of the Tannery and the Slaughterhouse or from the Brewery*[5]
Variation of Vegetables*[6]	28 Sorts of Vegetables (see Photo 7) 85% of them original European*[7]	26 Sorts of Vegetables (see Photo 8) 77% of them original European*[7]	11 Sorts of Vegetables, 50% of them original European*[7]
Average Number of Home Gardeners on the Sites	250 HGs*[3/9]	> 180 HGs*[8/9]	150 HGs*[8/9]
Sample Size			
Dry Season	102 HGs 111 NHGs*[9]	109 HGs 100 NHGs*[9]	92 HGs 99 NHGs*[9]
Rainy Season	100 HGs 102 NHGs*[9]	101 HGs 100 NHGs*[9]	103 HGs 100 NHGs*[9]

*[1] GRILLON & SOURWEMA (1992), refer also to Figure 4.2.

*[2] There were big differences in the average size of the sites between the dry and the rainy seasons and between different years. Four different measurements were undertaken in April, August and December 1995 and December 1996. For more information refer to CISSSE (1997).

*[3] TRAORE (1999) / see Photo 9

*[4] OUEDRAOGO et al. (1998) / see Photos 1 and 10

*[5] DESCONNETS (1998) / see Photos 11 and 12

*[6] ADAMA et al. (1997) estimated the selling price for European vegetables five times higher than for traditional vegetables. Their cultivation is one indicator for a higher income in the home gardeners' households.

*[7] MÜLLER (1999)
The so-called 'European vegetables' (i.e. tomatoes, carrots, lettuces) or the required seeds and cuttings were first brought to Africa at the end of the last century by the European colonial powers and the Western missionaries.

'Traditional vegetables' (i.e. *boulmboula, boulvanka, gombo*) are local vegetables, which were planted originally in Sub-Saharan Africa and have existed there for centuries.

*[8] NDERO (1996)
It is difficult to estimate the average number of home gardeners on the site of Tanghin, because there are several assumptions. According to NESTOR (Personal Information, Ouagadougou, 1999) the number of 180 in 1996 increased in the last years.

*[9] HGs = home gardeners, NHGs = non-home gardeners

Since 1960 people have been cultivating vegetables in Boulmiougou. In 1982, some of the home gardeners founded an association. Today this association has 80 members (TRAORE, 1999). Due to the relatively clean water from the nearby water reservoir (CISSE, 1997; BOSSHART, 1998) home gardening in Boulmiougou is well advanced and developed.

The current project of urban agriculture has stimulated certain associations on the home gardening sites (see Chapter 2). Two associations of home gardeners (men and women) exist in Tanghin since 1996. Comparing the socio-economic standard of the sites, Tanghin is at the second position, before Kossodo and after Boulmiougou.

Due to the lack of access to clean water for irrigation Kossodo is considered to be the most polluted site in comparison to Boulmiougou and Tanghin. Wastewater from the nearby tannery, the slaughterhouse and the brewery is used for irrigation (CISSE, 1997; BOSSHART, 1998). As a result of the problematic external conditions in Kossodo the site has the lowest socio-economic level of the three compared sites. In Kossodo the home gardeners founded an association (KONE, 1999).

In all three sites the project employed so-called animators, who assist the home gardeners in their associations. All animators have an university degree and speak both French and Morée.

Photo 7: Home gardeners in Boulmiougou produce mainly European vegetables such as salads, Ouagadougou, 1999

Photo 8: Home gardeners in Tanghin produce both European and traditional vegetables such as *boulmboula*, Ouagadougou, 1999

Photo 9: Irrigation of the fields, Boulmiougou, Ouagadougou, 1999

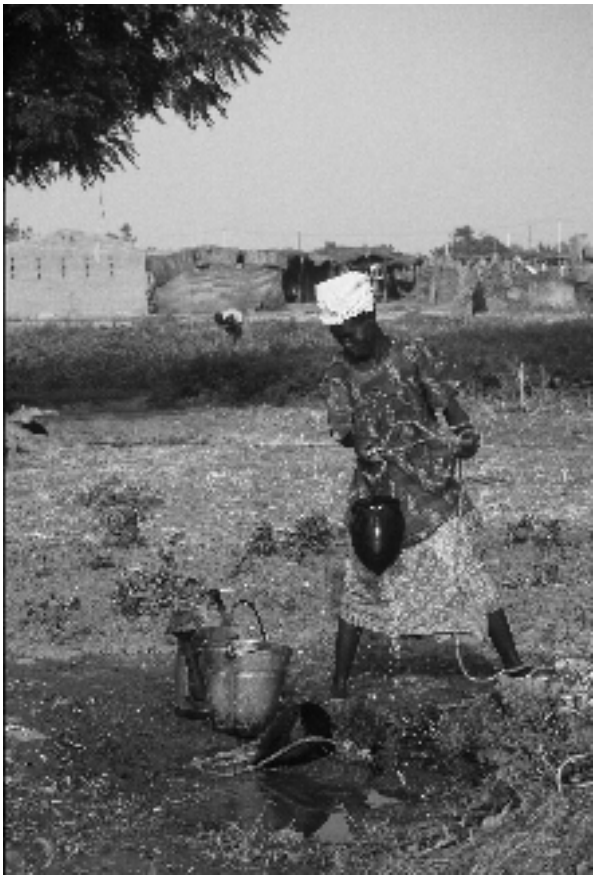


Photo 10: Drawing water out of a well, Tanghin, Ouagadougou, 1999

Photo 11: Wastewater (tannery, slaughterhouse, brewery), Kossodo, Ouagadougou, 2000

Photo 12: Open wastewater channels, home gardens, Kossodo, Ouagadougou, 2000

4.2.1.2. Study Population: Home Gardeners

The population covered in this study is represented by members of households involved in home gardening at one of the three sites and by members of households engaged in other activities than home gardening. In this study the abbreviation ‘HGs households’ is used for the home gardeners’ households while ‘NHGs households’ stands for households without home gardens, the so-called non-home gardeners’ households.

To qualify as a representative for the HGs group, the person’s first and main activity had to be home gardening. In order to achieve reliable results, the data of the HGs had to be compared to a corresponding group of NHGs. To be selected as a representative of this latter group the person had to fulfill the following conditions: they had to live in the neighborhood of the HGs and be engaged in any activity other than home gardening. Data were obtained by interviewing people in both groups. The interviewees could be male or female, married or single and head of the household. In order to obtain an average household structure in the study population the interviewees had to be older than 20 years of age.

To define a household in this study a pragmatic approach was taken according to the World Bank standardized welfare indicators (WORLD BANK, 2000). A household was defined as a group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible. Studying the literature about this topic, different and more complex definitions of households can be found (SANOU, 1993; ROOST VISCHER, 1997; SAUERBORN et al., 1996b).

It is highly probable that the same people were interviewed in both studies, especially in the HGs group, although there was no attempt to find the respondents of the study carried out after the dry season again for the post-rainy season study.

The total number of HGs at the three sites was difficult to estimate due to the enormous variations between the seasons. For example, during the rainy season often only the owners of home gardens stayed in town, while other HGs were cultivating cereals for their own needs in their villages during this time. However, it can be said that Boulmiougou had approximately 250 HGs, Tanghin 180 HGs and Kossodo 150 HGs.

The sample size for each site included approximately 100 HGs and 100 NHGs (for the exact number refer to Table 4.1.). The HGs sample size represented between 40% and 67% of the population of HGs. With the given sample size a difference in the economic status between the two groups can be detected with a standard deviation of 0.4, $\alpha = 0.05$ and a power of 80%.

4.2.1.3. Questionnaire

The purpose of the questionnaire was to collect information that can be used to study the economic impact and costs of home gardening within the seasonal variations. The focus of this study was on the income, the expenditures, the health and socio-economic status of a certain population in Ouagadougou. Information collected included the composition of the households, the living conditions, the household income and the expenditures behavior (refer to Appendix I for the full questionnaire of the rainy season).

After the dry season in 1998 a complementary household study concerning HGs and NHGs households was conducted. It consisted of 67 questions divided into five main groups: demographic data, living conditions, expenditures and income and the socio-economic situation (refer to Appendix II for the full questionnaire of the dry season and MÜLLER, 1999). It was a structured questionnaire in French. To facilitate the collection and processing of information, most of the questions were closed and pre-coded. The average interview length was around thirty minutes and it was observed that after approximately 20 minutes the concentration of the interviewees decreased immensely, which led to quality reduction of the last questions (Müller, Personal Information, Ouagadougou, 1999; SOBAL, 1982).

Utilizing this knowledge the present questionnaire was modified and amplified. It was also a structured questionnaire in French and most of the questions were closed and pre-coded. It was divided into six parts: demographic data, living conditions, activities and income, monthly expenditures, illness and leisure. One of the modification was the focus on expenditures for food. This was necessary because the expenditures for food made up more than 50% of the total household expenditures in the complementary study done in 1998 and in literature sources about Burkina Faso

(INSD, 1996; INSD, 1998; MÜLLER, 1999). To complete the total monthly costs for households, questions about related costs for schooling and clothes were added.
Some questions about the socio-economic status, such as religion, birthplace and ethnic group were deleted as they were not important in this study population. The questionnaire was divided in two types: one general and one control questionnaire. The general questionnaire contained 43 questions. The control questionnaire had the same content, with six additional questions about households expenditures for fuel for cooking, water and energy. These six questions should point out a possible seasonality in the spending behavior of the study population.
In total, both studies contained 600 questionnaires for 100 HGs and 100 NHGs at each site.

4.2.1.4. Quality Control of the Data Collected and the Interviewers

The data was collected based on a series of strict criteria: (1) the selection and the training of the interviewers, (2) a pilot study and (3) the permanent supervision of the study and the interviewers. The task of the interviewer was to collect the necessary data for the study and to fill in the questionnaire completely and conscientiously. The interviewers were selected according to following criteria: (1) fluency in French and Morée, the main languages of Ouagadougou and (2) experienced in question survey research.
Due to these restrictions the three animators (refer to Section 4.2.1.1.) of the home gardening sites were taken as interviewers. Each of them had to chose a second interviewer for his site in the complementary study carried out during the dry season in 1998. In the present study four of the six interviewers of the complementary study were chosen. Two had to be replaced, because they moved out of Ouagadougou. The three animators of the sites participated again. Two interviewers interviewed 50 HGs and 50 NHGs at each site.
Before the study started, a pilot study was carried out in both seasons in order to train the interviewers and to increase their familiarity with the questionnaire. At first, all interviewers were introduced to the questionnaire, the purpose of their work and the background of the study. Secondly, each interviewer had to complete pilot

questionnaires, which were analyzed and discussed together with a supervisor in order to avoid misunderstandings.
A supervisor had to be present all the time in order to oversee the progress of data collection, to verify the quality of work and to detect errors in the coding and collection of data.

4.2.1.5. Implementation of the Study

The study of the dry season was completed in April 1998 and the study of the rainy season in October 1999. Additional information was recorded during a second, three-week field stay in November 2000.
The HGs were interviewed either at home or at the site. The NHGs were interviewed at home or at their place of work (see Photo 2). The interviews were conducted in Morée and the questionnaires were simultaneously filled in in French. Every other day the interviewer had to hand in the questionnaires to the supervisor and the questionnaires were immediately validated. In case of misunderstandings, the results were discussed and corrected in cooperation with the interviewers. Furthermore, the supervisor accompanied each interviewer once. More visits would not have been useful, as the probability of falsifying data about income (underestimation) and expenditures (overestimation) was higher in the presence of a white person in the hope of participating in a development project (CAMPBELL, 1981). At the end of the study each interviewer wrote a final report about the interviewing work, which had potential value for the analysis.

4.2.2. Focus Group Discussions

4.2.2.1. Study Population: Market Vendors

The market vendors on the different food markets in Ouagadougou provide the city-dwellers with daily needed fresh food. They are part of the urban food chain and represent the connection between the vegetables on the sites and the vegetables at

the client's house (see Chapter 1, Figure 1.3.). With the help of focus group discussions (FGDs), their living conditions and financial situation were analyzed.

Market vendors were identified with regard to the different types of vegetables sales in Ouagadougou. Throughout personal observations and discussions with local people, four main selling forms were identified and listed in Table 4.2. First, vegetables are sold in front of supermarkets in the center of the town. Second there are night markets in a few sectors and third, there are day markets in each sector of the town where vegetables are sold. Fourth, women are selling vegetables along the main roads out of the town.

Table 4.2. Characterization of the four main selling forms of vegetables in Ouagadougou

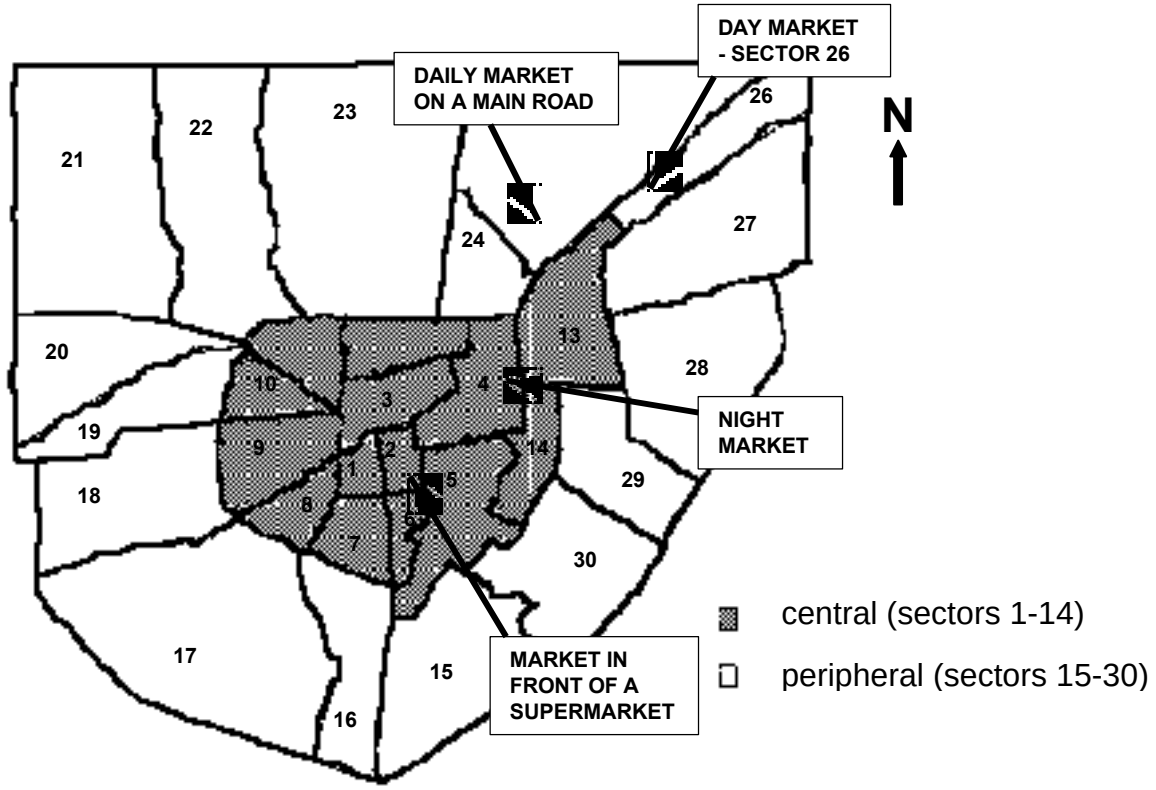
Location of the Market	Type of Market	Duration of the Market
in front of the supermarkets in the center of the town	Day Market	6.30 - 20 h
in few central sectors of the town	Night Market	17.00 - 22.00 h
along the main roads out of the town	Day Market	6.30 - 18.00 h
in each sector of the town	Day Market	8.00 - 17.00 h

For each of these four selling forms, market vendors were detected by convenience sampling, i.e., through the help of project colleagues or in the neighborhood of the principal author. Figure 4.3. shows the different location of the four selected market places in Ouagadougou.

As a first contact, market vendors were visited at their working places. Because they could only speak the local language Morée, a translator accompanied the moderator of the FGDs. At a first step the so-called head of the market was identified. Out of historical reasons, almost exclusively women are selling vegetables in Ouagadougou (MADL, 1972). The Mossi, the ethnic group the interviewed women belong to, are the dominant group of people selling fruits and vegetables in Ouagadougou. Once

the head of the market was selected, she was provided with information about the project and the recent study. Moreover, it was explained to her, why she had been selected as a participant for the FGD and the potential use of the results. Finally, it was stated very clearly that there would be no financial advantage for all potential participants.

Figure 4.3. Ouagadougou with its administrative urban units and the four different market places, where the focus group discussions (FGDs) were held
modified after Cissé, 1997



When the head of the market agreed to participate under these conditions, she was herself responsible for the further organization. First, she had to search three to five additional women for the discussion. Then second, she had to determine the day and the time of the FGD. Proposals for possible locations were made by the supervisor, but could be changed for other places.

As a second contact two days later the woman was visited again. The day, the time and the place of the planned FGD were confirmed. As further contacts almost every

day someone of the team, which organized the FGDs passed at the market. Until the day of the FGD a constant contact was maintained with the women.

4.2.2.2. Focus Group Discussions

The focus group discussion (FGD) is a group interviewing technique, which was used to obtain information about the social and economic situation of market vendors at different market types. FGDs have been used successfully to explore people's beliefs, attitudes and opinions (DAWSON et al., 1993). The aim of FGDs is to facilitate group discussions open and freely. The moderator guideline contained open-end questions to encourage a lively discussion (refer to Appendix III for the full moderator guideline). The moderator guideline was written in French. Because most of the market vendors did not speak French, the FGDs were held in Morée with the help of a translator. The moderator guideline consisted of questions, which were written for a discussion not longer than 1.5 hours.

It addressed the following topics:

1) History of becoming a market vendor and years of selling experience
2) Quantity and selection of the sold vegetables and possible changes in the variety during the dry and rainy season
3) Clients' behavior and their perception of the quality of the vegetables; importance of the presentation of the vegetables
4) Chronology of an average working day
5) Income from the vegetable sales and perception of this income

4.2.2.3. Implementation of the Focus Group Discussions

The FGDs were carried out in November 1999 and January 2000. In total, four FGDs were held with market vendors of different selling places in Ouagadougou (see Photos 13 and 14).

The team, which organized the discussions, consisted of four people:

- A moderator, who was the discussion leader and asked the questions according to the moderator guideline. She was fully responsible for the direction the focus group took during the discussion.
- A moderator translator, who translated the questions into Morée and organized the discussion with the help of the moderator.
- A translator, who translated simultaneously for the moderator the statements of the market vendors during the discussion. It was translated from Morée into French.
- An interpreter, who made a written transcript of the whole discussion in French. With the permission of the interviewed market vendors, all focus groups were recorded. Afterwards, the translation was made with the help of the recorded tapes.

Before the first FGD was held the moderator guideline was discussed extensively with the whole organization team. Everybody became as familiar as possible with the study objectives.
Beside the information obtained by the FGDs, it was equally important to gather as much information as possible throughout unstructured observations of the market vendors during the regular visits of the different market places.

At the end of the FGD each participant had to respond to a small questionnaire (refer to Appendix III/I for the original questionnaire). A socio-demographic profile of the market vendor should be drawn up by asking, i.e., for age, education, family situation and living conditions. To acquire a first idea about the economic situation of market vendors, they had to estimate their maximum and their minimum daily income.

In order to obtain valid results from the qualitative data the FGDs were all indexed and managed in the same systematic way. A synthesis of all four FGDs is given in Appendix III/II.

Photo 13: Focus group discussion held with market vendors of a night market, Sector 4, Ouagadougou, 1999

Photo 14: Focus group discussion held with market vendors of a daily market along a main road, Ouagadougou, 1999

4.3. Data Management and Statistical Analysis

All data of the questionnaire was entered using EpiInfo software (Version 6.02, CDC, United States). In this study each questionnaire was double entered to exclude data entry errors. In the complementary study every tenth questionnaire had double data entry. Moreover all data was cross-checked using a check file as well as for internal and external consistency. Data calculations were carried out using EpiInfo and SPSS (Version 9.0 for Windows 1995).

The variables of interest for determining the socio-economic impact of home gardening were income, expenditures and consumption. They were summarized using descriptive statistical measures such as median, mean, quartiles, minimum, maximum and standard deviation. These statistical measures were applied both for the dry and for the rainy season, for each site, and for HGs and NHGs households. The results usually indicate the median of the variables; if other measures were used it is stated. Expenditures and incomes were rounded.

The Mann-Whitney- or Wilcoxon-non-parametric test was used to compare the income and expenditure numeric variables between and across the sites, because the variables were not normal distributed. Categorical variables between and across the sites were compared using chi-square-test or Fisher-exact-test.

We adopt a 5% significance level (α=0.05) for rejecting the null hypothesis. Because of a greater number of tests, the p-value should not be interpreted in a confirmatory sense.

4.4. Quality Control of the Results

Many different methods, which integrate qualitative and quantitative components, are widely used to obtain valid results in epidemiology research. This kind of investigation strategy is known as triangulation. Triangulation commonly refers to the complementary use of qualitative and quantitative methods in order to overcome the errors and limitations implicit in each type of method and to validate research findings through different approaches (HAMMERSLEY & ATKINSON, 1996). Thus,

qualitative and quantitative approaches should be combined in such a way as to maximize the strengths and to minimize the limitations of each.
Within this background triangulation was used in this study in the following ways: (1) questionnaires were administered to households to gather good quantitative data, (2) focus group discussions were held with individuals to gain valuable qualitative information and (3) personal observations were made to verify reported behavior.

All data obtained in this way was compared and checked in the context of existing data of home gardening and the economic impact of urban agriculture.
First, data was justified with research data of the current project of urban agriculture. Several studies have already been completed and are discussed in Chapter 2.
Second, data was compared to official statistics, governmental data and further publications of Burkina Faso and Ouagadougou. A poverty profile of the entire country (INSD, 1996), household studies of the capital Ouagadougou and Burkina Faso (INSD, 1997a; INSD, 1997b; INSD, 1998), and a country review of Burkina Faso (COUNTRYWATCH, 1999/2000) are available among others.
Last, data was analyzed taking into account similar studies carried out across the country, in other Sub-Saharan regions and in the world (e.g. GOLHOR, 1995; DRESCHER, 1996a; EZEDINMA & CHUKUEZI, 1999; MOSKOW, 1999). Data had to be compared bearing in mind the totality of evidence or consistency. If other studies are showing similar results a strong support for causality is given, especially when they used different methods.

PART III

ECONOMIC COSTS AND IMPACT OF HOME GARDENING IN OUAGADOUGOU

Photo 15: House constructed with adobes and stabilized with trunks after the rainy season

5. Income Situation in Households With Home Gardens and Households Without Home Gardens in Ouagadougou, Burkina Faso's Capital, Both in the Dry and in the Rainy Season

5.1. Introduction

Urban agriculture is practiced by an estimated 800 million people (SMIT et al., 1996) and provides a secure activity to many city-dwellers. In some cities, as many as one-fifth to one-third of all families are engaged in agriculture, with as many as one-third of these having no other source of income (LEE-SMITH et al., 1987; MAXWELL, 1993). It is estimated that on a global scale more than one-third of the urban area is used for agriculture (see Chapter 1, Section 1.2.1.).
However, the economic importance of urban agriculture has received little attention so far. The tendency is to regard it as a subset of either rural agriculture or of the informal sector, or as a temporary phenomenon. Urban agriculture is frequently not recognized in labor statistics or included in economic data collections and often goes unreported. But it probably is a significant sector of activity in more cities than those which keep official records and it is certainly more important than the results that such records reveal. The available data suggest that the economic benefits of urban agriculture are at least as great as the nutritional and environmental benefits and that urban agriculture is an important employer and value-generating activity in the South (LEE-SMITH et al., 1987; MVENA et al., 1991; SCHILTER, 1991 / see Chapter 1, Section 1.2.3.1.).

Urban agriculture is resurging strongly in Sub-Saharan Africa, where the fastest urban growth will occur in countries least equipped to feed their cities (RATTA & NASR, 1999). In Burkina Faso urban agriculture also has an important place among the different income-generating activities. More than 48 different sites of home gardening were counted in its capital Ouagadougou (CISSE, 1997). Burkina Faso ranks as one of the least advanced countries in the world with a per capita gross national product of US $240 in 1999 (WORLD BANK, 2000/01).

The main characteristics of Burkina Faso's workforce are the predominance of agricultural work and the importance of the informal sector. The primary sector represented 40% of the GDP in 1996, the informal sector represented 30%

(LEREBOURS PIGEONNIERE & JOMNI, 1998). An overview of Burkina Faso and urban agriculture in Burkina Faso is given in Chapter 1, Section 1.2.5. and in Chapter 4, Section 4.1.1.

Income is commonly defined as a command over resources over time or as the level of consumption that can be afforded with retaining capital intact. One of the longest existing definitions of poverty, the resource-based definition, takes income as the base for measurements (see Chapter 1, Section 1.1.4.).

When poverty is defined in absolute terms, people are classified as poor when their income is less than that required to meet certain defined needs (PIACHAUD, 1993). Needs are considered to be fixed at a level, which provides for subsistence and expenditures on essential services (RAVALLION, 1995; WRATTEN, 1995b). The poverty line is then defined as the minimum income level required purchasing the socially determined essentials for living (BLACKWOOD & LYNCH, 1994). The absolute definition is commonly used by the World Bank and governments.

Although income is an important indicator of well-being, income-defined poverty lines are problematic for several reasons. The seasonal dimension of income and income generating is often under-perceived. Particularly for people engaged in agriculture many adverse factors affecting a solid income coincide with the rainy or the dry season: hard agricultural work, lack of water, shortage of food, scarcity of money. Many countries set a single income level for both rural and urban areas, although the costs of basic necessities, such as food are generally higher in urban areas. (WRATTEN, 1995a). Despite the given weaknesses, income is still the most frequently used proxy for welfare. One of the main reasons for this is that income is measurable and helps thus to identify people who are likely to lack the needed resources. Nevertheless, consumption or expenditures might provide a better picture of a household long term standard of living (MUSGROVE, 1979; HENTSCHEL & LANJOUW, 1996). While poor people are probably purchasing and consuming only a narrow range of goods -the basic needed goods such as food, fuel for cooking, water and energy- their total income may derive from a lot of different activities often associated with strong seasonal variations (HENTSCHEL & LANJOUW, 1996). During the last few years the definition of poverty has been widened amplifying the resource-based definition towards participatory social development definitions and more theoretically freedom-oriented definitions (see Chapter 1, Section 1.1.4.).

The World Development Report 1990 first used two income cut-off-points or poverty lines to measure the degree of poverty (WORLD BANK, 1990; WORLD BANK, 2000/01). People, who are living with less than US $1 per day are considered as ‘extremely poor’ and those who are living with US $2 per day are considered as ‘poor’ (WORLD BANK, 1990; WORLD BANK, 2000/01).
As a result of continuing urban growth in our days the majority of the world’s absolutely poor will live in urban areas (AMIS, 1995). Poverty and suffering seem to be becoming more regional. Although the number of people living on less than US $1 per day declined substantially in the mid of the nineties, new estimates indicate that Africa is now the region with the largest share of people living below US $1 per day (WORLD BANK, 2000). In Sub-Saharan Africa the share of the population which lives below the poverty line is estimated to be as high as 50% (BADIANE & DELGADO, 1995). Reasons for poverty, particularly poverty in urban African, are discussed in Chapter 1, Section 1.1.2.f.

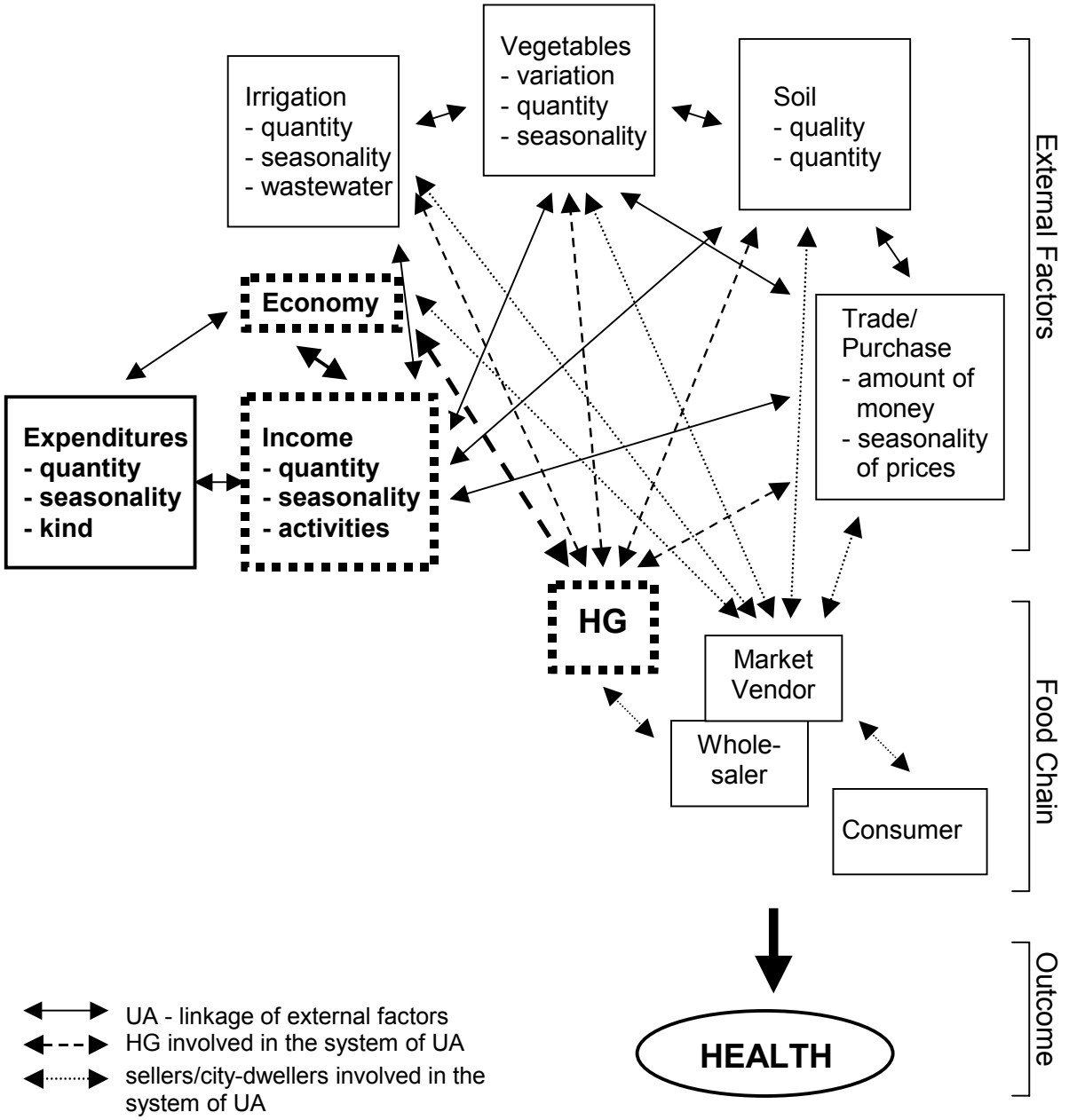
In this context the income-generating aspect of urban agriculture becomes more and more important (refer to Figure 5.1.). However, not only income, but many other factors, such as the quantity and quality of water for irrigation and of the soil, the trade possibilities, seasonal variations and predictable as well as unpredictable household’s expenditures are part of the urban agriculture system. All these factors are difficult to influence from outside, but they all influence each other in different ways (refer to Figure 5.1.). This can cause income insecurity or even income loss in households, which are involved in urban agriculture.
Urban agriculture may also influence the health status of the population practicing this activity (see Figure 5.1.). Polluted irrigation water (i.e. bacteria and parasites / CISSE, 1997; BOSSHART, 1998), contaminated soils (MARA & CAIRNCROSS, 1991) and contaminated vegetables (CISSE, 1997) may increase the health risk for the home-gardeners. Chapter 6, Section 6.3.2.3.f. deals with the expenditures for medical care and the frequencies of illnesses in home gardeners’ households. Thus, it is recommended to work out how the income situation in home gardeners’ households influences their health status.

The overall aim of the present study is to compare the economic situation and health status of home gardeners' households with those of households attending an activity other than home gardening. Within this aim the purpose of this chapter is to examine the income structure among different activity possibilities in Ouagadougou, Burkina Faso over an entire year.

The chapter focuses on the occupational-specific income differences between home gardeners and people attending to an activity other than home gardening. Based on a minimum level of income (poverty line) the chapter will also show the distribution of poor among these different working and, therefore, income possibilities.

As in agricultural work a certain seasonal variations in the income was expected, the second focus is on season-specific differences in the income situation of home gardeners' and non-home gardeners' households. Based on the data of a complementary study carried out after the dry season, income estimations in the dry as well as in the rainy season will be regarded. A complete picture of the income situation in home gardeners' households over an entire year will be given.

Figure 5.1. The system of urban agriculture (UA) and its outcome with a main emphasis on the income of home gardeners' (HG) households



5.2. Methods

5.2.1. Burkina Faso and its Capital Ouagadougou

Fieldwork for this study was conducted in Ouagadougou, the capital of Burkina Faso in Sub-Saharan Africa, at the end of the rainy season. To establish seasonal differences a complementary study was undertaken at the end of the dry season. The data was collected in April 1998 and in October 1999. Additional information was recorded during a second, three-week field stay in November 2000.

Burkina Faso is situated at the southern part of the West African Sahel, has no coastal access, almost no natural resources and its land is used as for agriculture and for pasture. In 1999, the population was estimated at 11 million, with a population growth rate of 2.8% per year (WORLD BANK, 2000/01).

The basis of Burkina Faso's economy is agriculture. About 92% of the population is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion. Since its independence in 1960, Burkina Faso has remained one of the poorest countries in the world and ranks only 172 of 174 countries in the Human Development Index (HDI) of the United Nations Development Program (UNDP, 2000). The main reasons for this low rank are its high population density, few exploitable natural resources and fragile soil. Social indicators are very low. Life expectancy at birth is 44 years, infant mortality (under five years) is 210 per 1.000 and the GNP per capita is US $240 (WORLD BANK, 2000/01).

Ouagadougou with its 750.000 inhabitants (in 1996) and with an average annual growth rate of 6.8% lies in the center of the country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Being situated at the Sahelian border, its annual precipitation can vary from 850 to 900 mm per year and is restricted to the rainy season from June to October (LEREBOURS PIGEONNIERE & JOMNI, 1998). The average temperature is around 24°C in January and 28°C in July (see Figure 4.1.).

5.2.2. Home Gardening Sites

There are 48 different sites of home gardening in Ouagadougou (see Figure 4.2.). Home gardens vary in their sizes and from season to season (CISSE, 1997). Three

sites (Boulmiougou, Tanghin and Kossodo) were selected for the study. Within these three areas there are clear differences in the local position of urban agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies. All three sites are situated on the outskirts of the town. More detailed information on the three home gardening sites can be found in Chapter 4, Section 4.2.1.1. Refer to Appendix IV for the most common vegetables planted at the home gardening sites in Ouagadougou during the rainy season.

5.2.3. Study Population

The population covered in this study is represented by members of households involved in home gardening at one of the three sites and by members of households engaged in an activity other than home gardening but who live in the neighborhood of the home gardeners. A household was defined as a group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible. It is highly probable that the same people were interviewed in both studies, especially in the HGs group, although there was no attempt to find the respondents of the study carried out after the dry season again for the post-rainy season study. In this study the abbreviation ‘HGs households’ is used for the home gardeners’ households, while ‘NHGs households’ stands for households without home gardens, the so-called non-home gardeners’ households.
More information on the study population can be found in Chapter 4, Section 4.2.1.2.

5.2.4. Questionnaire

The purpose of the questionnaire was to collect information that can be used to study the economic impact and costs of home gardening within the seasonal variations. The study focused on the income, the expenditures, the health and socio-economic status of a certain population in Ouagadougou in the dry season and in the rainy season. Information collected included the composition of the households, the living conditions, the household income and the expenditures behavior. The

questionnaire was a structured questionnaire in French and most of the questions were closed and pre-coded. In total, both studies contained 600 questionnaires for 100 HGs and 100 NHGs at each site.
For more information on the questionnaire refer to Chapter 4, Section 4.2.1.3. Refer to Appendix I for the full questionnaire of the rainy season and to Appendix II for the full questionnaire of the dry season.

5.2.5. Quality Control of the Data Collected and Implementation of the Study and Data Management

The data collection was based on a series of strict criteria: (1) the selection and the training of the interviewers, (2) a pilot study and (3) the permanent supervision of the study and the interviewers. All data of the questionnaire was entered using EpiInfo software (Version 6.02, CDC, United States). Data calculations were carried out using EpiInfo and SPSS (Version 9.0 for Windows 1995).
The Mann-Whitney- or Wilcoxon-non-parametric test was used to compare the income and expenditure numeric variables between and across the sites, because the variables were not normally distributed. Categorical variables between and across the sites were compared using chi-square-test or Fisher-exact-test. These statistical measures were applied both for the dry and for the rainy season, for each site, and for HGs and NHGs households. Because of a greater number of tests, the p-value should not be interpreted in a confirmatory sense. The results usually indicate the median of the variables; if other measures were used it is stated.
More detailed information on these topics can be found in Chapter 4, Sections 4.2.1.4.f.

5.2.6. Income Estimation

All of the difficulties of measuring expenditures -recall bias, seasonality, long questionnaires- apply to a much greater extent to the measurement of income. Income is often a more sensitive topic than consumption, especially since the latter is more obvious to friends and neighbors than the former (DEATON, 1997). It is always difficult to obtain accurate results about the income for several reasons. First, there

is a general unwillingness in a population to speak about income because it is normally a private matter. Second, there is a fear of tax audits and the fear that income data will be given to or used by the internal revenue office. Third, there is some recall bias in income surveys, because people answer with the intention of participating afterwards in possible interventions. And fourth, one of the most important reasons is the unawareness of the exact household income. For a large number of households, which are involved in agriculture or in the informal sector of casual jobs, business income and expenditures are difficult to collect and are likely to be subject to error (SWAMINATHA, 1995). Moreover income, especially in the agricultural and informal sector can vary extremely over the months. Due to seasonal variation, an average monthly income does not always reflect the average income of the entire year.

Taking all of these difficulties into consideration it was decided that the triangulation strategy would obtain the most correct figures representing the income of the HGs group. The following three approaches were used: (1) the directly estimated average monthly income approach, (2) the indirectly estimated average monthly income approach and (3) the personal observation of the study population and classification of the socio-economic status of HGs and NHGs households.

The household unit was taken as the measurement unit. The household or family unit is typically viewed as the most appropriate unit of measure because families share incomes and expenditures (BLACKWOOD & LYNCH, 1994).

As a *1ST APPROACH*, the so-called directly estimated average monthly income approach, HGs and NHGs were asked for their main and side activities, both in the rainy and in the dry season.
In the present study they had to estimate the single income for each activity for both the rainy season 1999 and the previous dry season 1999. To calculate the monthly income the reported income from a seasonal activity was divided by six, the reported income from a weekly activity was multiplied by four or from a daily activity by 25. The sum of all single incomes was used to obtain the total monthly income.

In the complementary study in the dry season in 1998 HGs and NHGs had to estimate their total income within one season (MÜLLER, 1999). To obtain the total monthly income this sum was divided by six.

As a *2ND APPROACH*, the so-called indirectly estimated average monthly income approach, HGs were asked about their incomes from selling vegetables. In the study of the rainy season 1999 the interviewees were asked to name the different types of vegetables, the number of fields used for cultivating each vegetable and the purchase price of one field. The purchase prices were standardized for one year and corrected for inflation. When there were purchase units other than a field (i.e. buckets) it was calculated how many of these units were approximately one field.
Incomes and expenditures were deflated with a monthly consumer price index and refer to November 1999 prices (600 CFAF = US $1).
In the complementary study of the dry season 1998 the same approach was used, but the supervisor counted the number of fields with the different vegetables of each HG directly at the site (MÜLLER, 1999). In order to estimate the total income gained by selling vegetables in the dry season or in the rainy season the purchase price for one field was multiplied by the number of fields for this vegetable. To obtain the monthly income it was assumed that the season lasted six months and the total amount was therefore divided by six. The sum of all purchase prices reflected the total monthly income gained by selling vegetables, which should also reflect the total indirectly estimated income of HGs households.

As a *3RD APPROACH*, personal observations of the study population and a classification of the socio-economic status of HGs and NHGs households were made. So-called indicator questions about the socio-economic status of the household (equipment of the house, electrical appliances, means of transportation) helped to validate the answers given for the monthly estimated income. More information on the socio-economic status of HGs households in comparison to NHGs households are found in Chapter 8.

After balancing all of these approaches -directly estimated monthly income, indirectly estimated monthly income, personal observations, socio-economic status, and final reports of the interviewers- a fairly exact statement was given about the average

monthly income in HGs and NHGs households in this study and in the complementary study carried out in 1998.

During and after the rainy season a lot of people -most of them HGs- were cultivating their own cereals (millet, maize and rice). It was of interest to find out if they were earning any money by selling their own cereals. First, people were asked if they were both cultivating and selling cereals. Second, they were asked for the type of cereals, the number and units (25kg, 50kg, 100kg) of bags they were selling and the different prices they were charging for them. Finally, in order to calculate the monthly income the same estimation as for vegetables was made. For each cereal the number of bags was multiplied by the price for its unit. The sum of all purchase prices reflected the total monthly income gained by selling cereals.

5.2.7. Quality Control of the Results

Many different methods, which integrate qualitative and quantitative components, are widely used to obtain valid results in epidemiology research. This kind of investigation strategy is known as triangulation. Triangulation was used in this study in the following ways: (1) questionnaires were administered to households to gather good quantitative data, (2) focus group discussions were held with individuals to gain valuable qualitative information and (3) personal observations were made to verify reported behavior. All data was compared to existing data of urban agriculture, and especially to data about the economic impact of urban agriculture. Several studies have already been completed and are discussed in Chapter 2 and in Chapter 4, Section 4.4.

5.3. Results and Discussion

The following section will explain the average monthly income of households engaged in home gardens (HGs households) and in households engaged in an activity other than home gardening (NHGs households). To reveal possible seasonal variations, income estimations of the study carried out after the rainy season 1999 will be compared with income estimations of the complementary study carried out after the dry season in 1998.

5.3.1. Income Structure in the Rainy Season 1999

The study population was asked to define poverty. Especially in the lower socio-economic classes (refer to Chapter 8 for a discussion about the different socio-economic classes) poverty was highly related to the lack of money:

> *"Poverty is if I don't have money."*
> HG (male, aged 24, socio-economic class 1/2) in Boulmiougou
> Trader (male, aged 44, socio-economic class 1/2) in Boulmiougou
> Part-time worker (male, aged 30, socio-economic class 1/2) in Kossodo

5.3.1.1. Home Gardeners

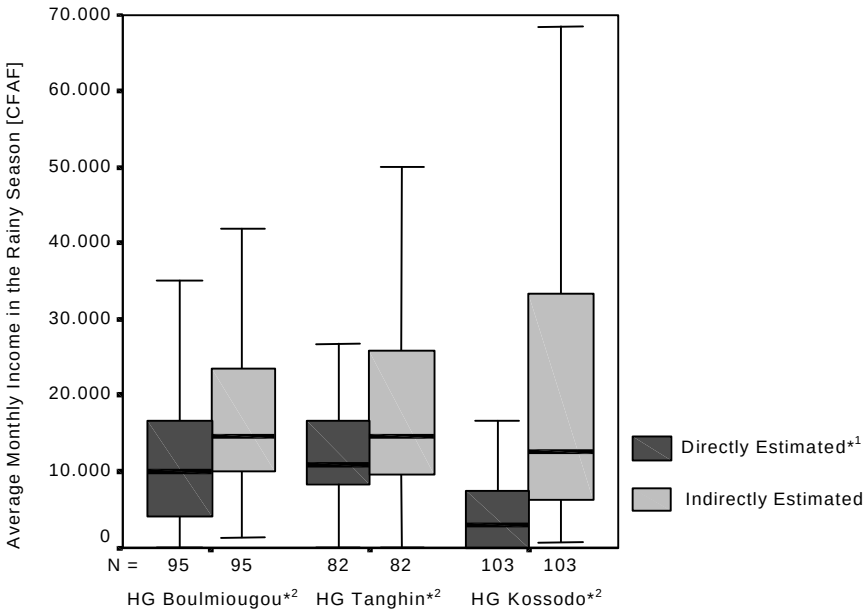
5.3.1.1.1. Monthly Income from Vegetables

Three different approaches were used to obtain the income of HGs households: The directly estimated average monthly income of a household during the rainy season was obtained by summing up the incomes estimated by the interviewee from all activities during this season. The indirectly estimated average monthly income was obtained by using the selling prices for the different vegetables. The figures of this study can be considered to be an approximation of the monthly income earned by households in the six months prior to the study. In addition, each of the HGs and the NHGs households was categorized by socio-economic class (see Chapter 8).

In each of the three sites the directly average monthly income was estimated to be lower than the indirectly average monthly income (refer to Figure 5.2.). The directly estimated average monthly income in HGs households was very similar in Boulmiougou and Tanghin, with 9.600 CFAF (Q_{25}-Q_{75}: 4.200-16.700 CFAF) and 10.800 CFAF (Q_{25}-Q_{75}: 7.100-16.700 CFAF), respectively. In Kossodo the directly estimated average monthly income was significantly lower than in the two other sites, with 3.000 CFAF (Q_{25}-Q_{75}: 0-7.500 CFAF, $p<0.001$).

The indirectly estimated average monthly income in HGs households was more homogenous across the three sites: 14.600 CFAF in Boulmiougou (Q_{25}-Q_{75}: 10.000-23.900 CFAF), 14.500 CFAF in Tanghin (Q_{25}-Q_{75}: 9.600-26.400 CFAF), and 12.600 CFAF in Kossodo (Q_{25}-Q_{75}: 6.000-33.400 CFAF).

Figure 5.2. Directly estimated average monthly income in comparison to the indirectly estimated average monthly income in home gardeners' (HG) households in Boulmiougou, Tanghin and Kossodo during the rainy season



*1 Directly estimated average monthly income differed significantly between HGs households in Boulmiougou and Kossodo, respectively Tanghin and Kossodo ($p<0.001$).

*2 Directly estimated and indirectly estimated monthly incomes differed significantly in each of the three sites ($p\leq0.001$).

Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

Comparing the directly estimated incomes with the indirectly estimated incomes in each of the three sites, the indirectly estimated incomes were always higher. The difference was especially big in Kossodo (9.600 CFAF). In Tanghin and Boulmiougou the monthly levels of income obtained with the two approaches were more similar, with a difference of 3.700 CFAF in Tanghin and 5.000 CFAF in Boulmiougou. Nevertheless in each of the three sites the monthly level of income from the two approaches differed significantly ($p \leq 0.001$).

The HGs households in each of the three sites underestimated their monthly incomes. One could assume that the interviewed HGs did not honestly answer the pertinent questions. This assumption did not reflect the personal observations and the statements given by each interviewer in the final reports, however. In the reports each interviewer had to assess the sincerity of the answers given, and all of them emphasized that the people who were willing to participate in the study gave honest answers to the questions in the questionnaire. One could therefore assume that incomes generated by urban agriculture were very difficult to assess due to their extreme variations from month to month. HGs income can differ from month to month because it depends on the quantity of vegetables cultivated in each month, but also because it depends on the market demand for certain kinds of vegetables in each month. This situation is concisely illustrated by the following account of a HG (male, aged 24) in Boulmiougou:

"What is a big economic risk? Not selling your vegetables."

According to the World Bank (2000/01), Burkina Faso's monthly GNP per capita only belongs to 12.000 CFAF or US $20 and is one of the lowest in the world. This is comparable to the estimation of the monthly income of HGs households in this study, as they earned on average between US $14 (direct estimation) and US $24 (indirect estimation) per month.

A few studies were conducted to investigate the income of HGs households. They all emphasized the increase in the household's cash income due to urban agriculture. In Bamako, the capital of Mali, HGs earned between 5.600 CFAF and 245.600 CFAF per month (ZALLE, 1999). These amounts depend on the size of their home gardens

and whether they owned the gardens or not. In Dar es Salaam, Tanzania, incomes obtained from urban agriculture were larger than regular salaries for 67% of the respondents. The individual home gardeners' annual average profit was estimated at 1.6 times higher than the annual minimum salary (SAWIO, 1993). In Addis Abeba, Ethiopia, all urban cooperative farmers showed incomes well above those of half of the city's population (EGZIABHER, 1994). And in Lomé, Togo, the mean monthly income of a home gardener was found to be equal to ten minimum salaries (MOUGEOT, 1999).

The HGs of the cited studies had higher incomes than the HGs in Ouagadougou during the rainy season and the dry season (refer to Section 5.3.2.2.2.). Moreover, in comparison to the NHGs households, the HGs households in Ouagadougou had lower average monthly incomes (refer to Section 5.3.1.2.2.), which was contrary to the other studies as well.

5.3.1.1.2. Monthly Income from Cereals

The interviewed HGs households were asked how much they earn when they sell their cereals. A total of 78% (n=237/304) of HGs cultivated cereals such as millet, maize and rice, but only 11% (n=32/304) sold parts of their own cereals. Cultivation was almost exclusively used to achieve food security. Those few HGs who sold parts of their cereals earned, on average, 1.000 CFAF per month.

In this context the importance of food subsistence production in relation to the real income in HGs households has to be emphasized. Food subsidies in eating their own vegetables and their own cereals, especially in the rainy season, may indirectly increase the income of the HGs households. An extensive survey of subsidy programs found that income transfer from food subsidies tends to provide 15-25% of the real income of low-income households (VON BRAUN, 1997). In this study food subsidies in eating vegetables and cereals obtained by subsistence production were not asked for. However, the different expenditures for vegetables and cereals in the rainy and in the dry season were asked for. Chapter 6, Section 6.3.1.2. discusses the seasonal variations in the expenditures for food.

5.3.1.1.3. Home Gardeners' Activities

During and shortly after the rainy season the fields for home gardening were partially inundated and HGs could not fully work there. For this reason 79% of the interviewed HGs in the three sites had more than one activity in the rainy season. Another widespread activity of most HGs during this season was the cultivation of their own cereals either on the home garden fields or in the villages they originally came from. (See Photos 16-19 for HGs of the different sites of Ouagadougou.)

The first activity of 52% (n=52/100) HGs in Boulmiougou was home gardening and of 47% (n=47/100) cultivation. In Tanghin the percentage was similar: as a first activity 47% (n=47/101) of the HGs mentioned home gardening and also 47% (n=47/101) cultivation. Only in Kossodo was cultivation the dominating first activity in 87% (n=90/103) of the HGs households and only 1% (n=1/103) answered with home gardening. In average years Kossodo is the site most affected by inundation (Kone, Personal Information, Ouagadougou, 1999).

The question about their second activity was answered by most of the HGs either with home gardening or cultivation. In Boulmiougou the relation was 40% home gardening (n=40/100) to 14% cultivation (n=14/100), in Tanghin 28% (n=28/101) to 27% (n=27/101) and in Kossodo 80% (n=82/103) to 5% (n=5/103). Other second activities include animal breeding or preparing 'tresse' (artificial plaits) for the hair-dresser (see Photos 20 and 21).

In order to earn some money many HGs had third activities during the rainy season as these words of one HG (female, aged 35) clearly show:

> *"During the dry season I'm a home gardener, and during the rainy season I do a lot of small activities such as selling sweets."*

In Boulmiougou 5% (n=5/100) of the HGs had a third activity, in Tanghin it was 7% (n=7/101) and in Kossodo as many as 23% (24/103). Third activities include working in small trades and animal breeding and less frequently also working as mechanics and night-guards.

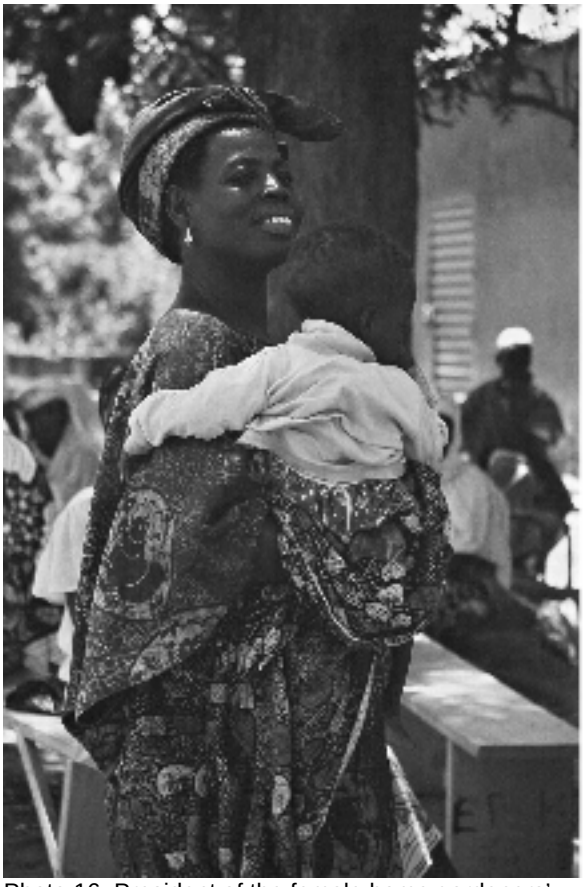


Photo 16: President of the female home gardeners' association, Kossodo, Ouagadougou,1999

Photo 17: Home gardener answering the questionnaire, Kossodo, Ouagadougou, 1999

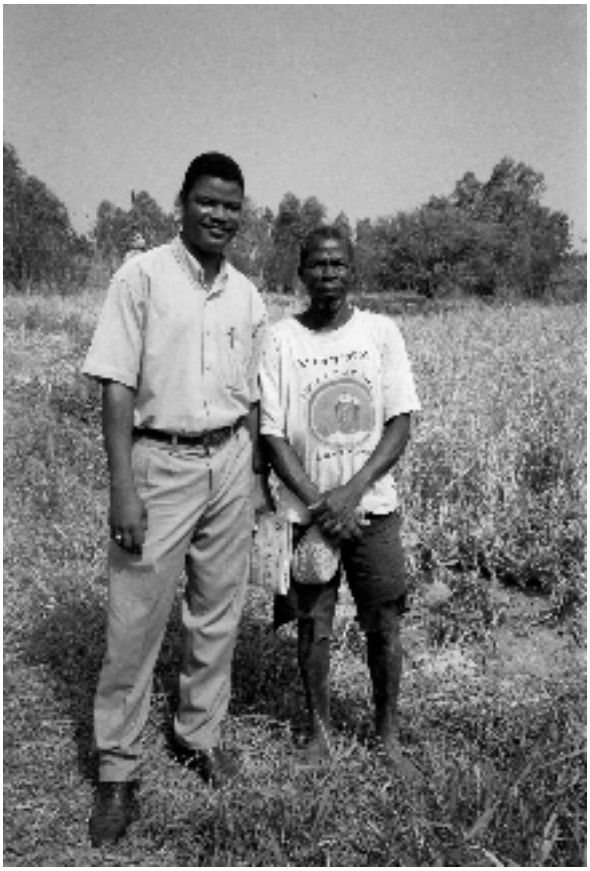


Photo 18: Animator and president of the male home gardeners' association, Kossodo, 2000

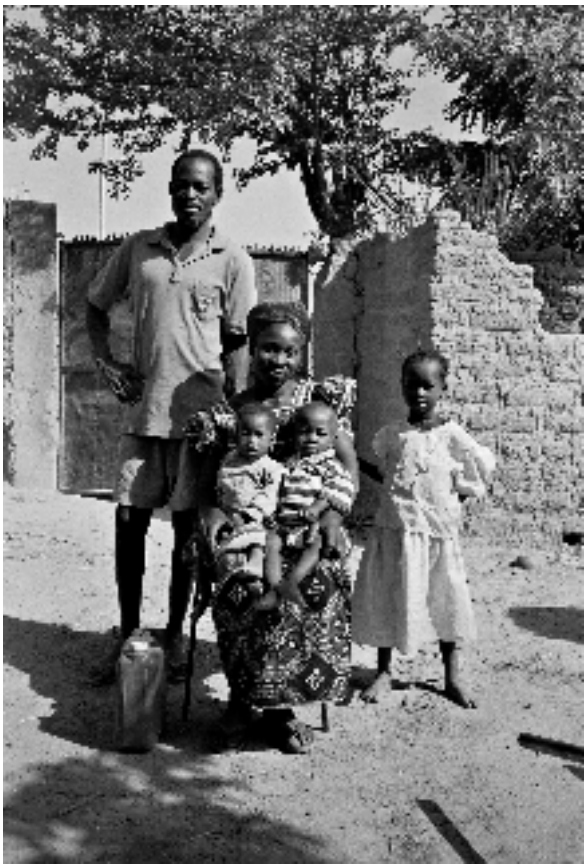


Photo 19: Home gardener with parts of his family, Tanghin, Ouagadougou, 2000

Photo 20: 2nd activity of home gardeners: producing ‘tresse‘ for the hair dresser, Tanghin, 2000

Photo 21: 2nd activity of home gardeners: animal breeding, Tanghin, 2000

Photo 22: Micro-credit project: ‘bogolan’ or mud cloth, Tanghin, 2000

Photo 23: Micro-credit project: food-stall, Kossodo, 1999

To summarize, the HGs households in Boulmiougou had the highest indirectly estimated average monthly income by selling vegetables in comparison to the two other sites and only very few of them had a third activity in the rainy season. In contrast to that, the HGs households in Kossodo had a very low income by selling vegetables and, thus, almost one-fourth of them must look for a third income-generating activity to cover their basic needs.
In addition, the results of this study were similar to the results of another study, in Burkina Faso, in which 14% of the working group in urban areas had more than one activity (INSD, 1994a).

5.3.1.2. Non-Home Gardeners

5.3.1.2.1. Non-Home Gardeners' Activities

The interviewed NHGs households were also asked about their first and their second activity. In contrast to the HGs households few NHGs households had second activities. In Boulmiougou and Kossodo only 3% and in Tanghin 20% of the NHGs had second activities.
The NHGs activities were divided into ten classes: trader, worker, mechanic (see Photo 25), part-time worker, housewife, cultivator, animal-breeder and other activities (refer to Table 5.1.). 'Trader' was defined as a person selling goods in a shop or market place or in the streets of Ouagadougou. Goods sold ranged from selling cigarettes and trifles, to unprepared and prepared food, to tissues and carpets. The classification 'worker' included people who practiced a trade, such as tailor, plumber, hair-dresser or electrician (see Photos 24, 26 and 27). An 'animal-breeder' was defined as a person buying animals when they were very young and selling them when they were grown up. Typical animals used for breeding were chicken, guinea fowls and pigs. Cows were bred less frequently, because their buying price is normally higher than those of the other mentioned animals.

Between one-third and one-half of all activities in each of the three sites belonged to the traders and workers classes. The two classes represented together between 40% and 70% of all activities in all three sites.

Photo 24: Tailor in his shop, Ouagadougou, 1999

Photo 25: Mechanic with his workshop, Ouagadougou, 1999

Photo 26: Tailor in the streets of Ouagadougou, 1999

Photo 27: Hair dresser's shop on a day market, Ouagadougou, 1999

Table 5.1. Distribution of the estimated monthly income of non-home gardeners' (NHGs) households among the ten different activity classes and proportion of the different activity classes between the non-home gardeners (NHGs) in Boulmiougou, Tanghin and Kossodo

	Monthly Income / Activity [CFAF]	n	Boulmiougou NHGs n=102 Activity in [%]	Tanghin NHGs n=100 Activity in [%]	Kossodo NHGs n=100 Activity in [%]
Trader	75.000	71	20	29	22
Worker	37.000	83	17	38	27
Mechanic	37.500	30	8	14	8
Night-guard	25.000	15	6	6	3
Part-time Worker	28.000	13	6	2	5
Housewife	0	21	5	0	16
Cultivator	9.400	22	3	8	11
Animal-breeder	50.500	2	0	1	1
Others	65.000	45	35	2	7
Monthly Income / Site [CFAF]			50.000	38.800	25.000

The so-called 'others' class contained all persons who followed other activities which did not match the nine given classes. In this class the professions of government officer and teacher were represented four to five times. All other activities, such as nurse, driver, policeman or waiter were represented only once or twice.

5.3.1.2.2. Non-Home Gardeners' Monthly Income

The absence of material things and the inability to obtain them are two of the main factors of poverty, as it was defined by a part-time worker (male, aged 32, socio-economic class 1/2) in Kossodo:

"You are poor if you don't have the means to buy what you need."

The interviewed NHGs were asked to estimate their own income. Due to the diversity of activities, the directly estimated average monthly income in the NHGs group varied

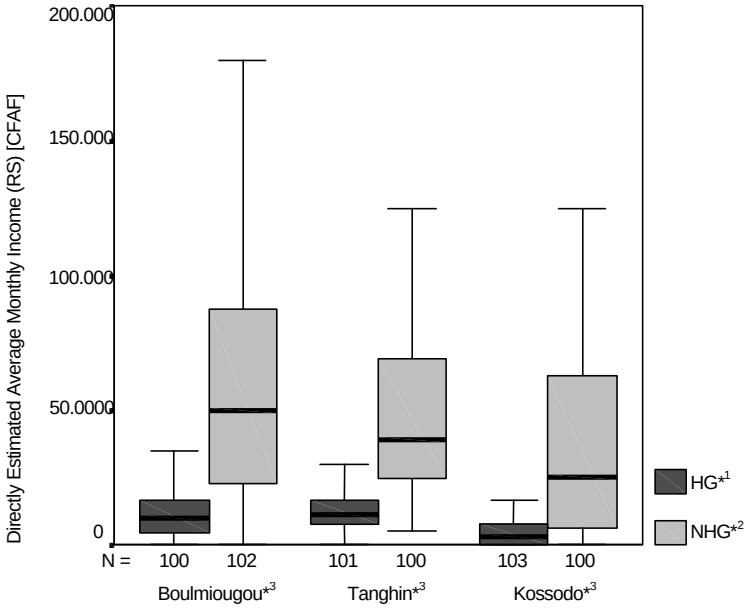
a lot (refer to Table 5.1.). The class of trader had the highest directly estimated average monthly income: 75.000 CFAF (Q_{25}-Q_{75}: 40.000-150.000 CFAF). When the class of ‘animal-breeder’, which had an average income of 50.500 CFAF, was not taken into account because of the low number of people representing it (n=2), the classes of mechanic and worker would have the second highest directly estimated average monthly income, with 37.500 CFAF (Q_{25}-Q_{75}: 20.000-65.600 CFAF) and 37.000 CFAF (Q_{25}-Q_{75}: 22.500-62.500 CFAF), respectively.

The directly estimated average monthly income of NHGs households also varied between the three sites (refer to Table 5.1.). The NHGs households in Boulmiougou had the highest directly estimated monthly income, earning 50.000 CFAF (Q_{25}-Q_{75}: 22.100-87.500 CFAF). In Tanghin they earned 38.800 CFAF per month (Q_{25}-Q_{75}: 25.000-69.500 CFAF) and in Kossodo only 25.000 CFAF (Q_{25}-Q_{75}: 6.300-62.500 CFAF). The directly estimated average monthly income thus differed significantly between Boulmiougou and Kossodo (p=0.002) and between Tanghin and Kossodo (p=0.005). It is also worth mentioning that only in Boulmiougou was the class of ‘others’ fairly large, representing 35% of the NHGs households in this site. In Boulmiougou a lot of NHGs households who were interviewed had a directly estimated average monthly income of over 130.000 CFAF and exclusive activities such as bank-director, civic engineer or computer specialist.

It is important to note that despite the differences in the income of NHGs households, in each of the three sites the directly estimated average monthly income was significantly higher in NHGs households than in HGs households ($p<0.001$, refer to Figure 5.3.).

To summarize, for at least half of the year, during the rainy season, the income generated by home gardening was lower than that of any other activity in the NHGs group. On average only 9% (n=28/302) of the NHGs households (because of zero income, housewives were not involved in this calculation) earned less than 14.100 CFAF or less than the indirectly estimated average monthly income of all HGs households. This indirectly estimated income was still higher than the directly estimated average monthly HGs income, with 8.300 CFAF.

Figure 5.3. Directly estimated average monthly income in home gardeners' (HG) households in comparison to non-home gardeners' (NHG) households in Boulmiougou, Tanghin and Kossodo during the rainy season (RS)



*[1] Directly estimated average monthly income differed significantly between HGs households in Boulmiougou and Kossodo, respectively Tanghin and Kossodo ($p<0.001$).
*[2] Directly estimated average monthly income differed significantly between NHGs households in Boulmiougou and Kossodo ($p=0.002$) and Tanghin and Kossodo ($p=0.005$).
*[3] Directly estimated average monthly income differed significantly between HGs and NHGs households in Boulmiougou, Tanghin and Kossodo ($p<0.001$).
Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

Another study in a rural setting in Burkina Faso showed that a higher share of income from non-cropping activities means a higher total household income (REARDON et al., 1992). Urban agriculture can be seen as a market-oriented activity, but it has to be noted that income from urban agriculture is low (MAXWELL, 1995). This fact is strongly supported by the results of the present study.

5.3.2. Income Structure During the Dry Season in 1998 in Comparison to the Rainy Season in 1999

5.3.2.1. Non-Home Gardeners

The distribution of the activities in NHGs households did not differ between the dry and the rainy season. The classes of trader and worker represented between one-third and one-half of all activities in each of the three sites in the dry season as well as in the rainy season. It was interesting to discover that the directly estimated monthly incomes of these two classes were almost the same in the rainy season as in the dry season. During the dry season the traders class had the highest directly estimated average monthly income, with 77.600 CFAF (Q_{25}-Q_{75}: 50.600-155.600 CFAF), and this was only 2.600 CFAF higher than in the rainy season. The workers class, which includes the mechanics, had the second highest directly estimated average monthly income (30.000 CFAF, Q_{25}-Q_{75}: 20.000-68.800 CFAF). In this case the amount was 7.000 CFAF lower than in the rainy season.
These results show that incomes generated by activities other than home gardening remain stable over a long period of time. These incomes did not depend on different seasonal conditions and were guaranteed over the whole year. Due to this income security NHGs households could manage their monthly expenditures in a more secure way, too. This means that in the case of unpredictable expenditures (such as for an illness), these households did not automatically sink under their subsistence minimum, because they could count on the regular income in the following months.

There were registered variations in the directly estimated average monthly income in NHGs households between the rainy season in 1999 and the dry season in 1998. In the dry season of 1998 the HGs households in Boulmiougou earned an average of 28.000 CFAF per month (Q_{25}-Q_{75}: 20.000-38.000 CFAF). In Tanghin they earned 51.000 CFAF per month (Q_{25}-Q_{75}: 24.000-100.000 CFAF) and in Kossodo they earned 30.000 CFAF (Q_{25}-Q_{75}: 18.000-42.500 CFAF).
These differences in the incomes did not show seasonal variations in the NHGs incomes. They rather depend on the fact that the NHGs households that were interviewed in the dry season were most likely not the same as those interviewed in the rainy season. Moreover, little information was available about the income in

NHGs households in Boulmiougou and Kossodo. In the complementary study of the dry season only 35 and 18 NHGs, respectively, answered the question about their directly estimated average monthly income.

5.3.2.2. Home Gardeners

5.3.2.2.1. Home Gardeners' Activities in the Dry Season

The HGs households were asked about their different activities during the dry and the rainy season. In the dry season, the first activity of almost 100% of the HGs was home gardening. The frequency of further activities declined, too. In Boulmiougou only 8% (n=8/102) of the examined HGs had a second activity, which was mostly night guarding. In Tanghin 29% (n=32/109) of the HGs had a second activity. Trading (n=14) and animal breeding (n=5) were the favored activities. In Kossodo 23% (n=21/92) of the HGs had a second activity, which was in most cases animal breeding. None of the HGs had a third activity. A HG (aged 54, male) of Kossodo explained the different earning possibilities in this way:

> *"I'm a cultivator during the rainy season and a home gardener during the dry season. I also breed animals."*

Night guarding and animal breeding in particular, but in some cases also trading, depending on the kind of trade, can be done in parallel to the work in the home gardens. Night guarding will be done before and after the work on the fields and animal breeding in general does not take a lot of time.

To summarize, the dry season is the peak season for practicing home gardening, especially the months between December and February. During this season the HGs spent most of their working hours on their fields. To raise the monthly household income, they practiced second activities, which could be done outside of the working hours of home gardening.

5.3.2.2.2. Comparison of the Income Structures of the Two Seasons

In the study carried out after the rainy season and in the complementary study carried out after the dry season the income in HGs households was determined using both a direct estimation of their monthly income, based on their own estimation and an indirect estimation of their monthly income, based on their vegetables sold.

Directly Estimated Average Monthly Income in HGs Households Both During the Dry and Rainy Season

The directly estimated average monthly income was, in two of three sites, higher in the dry season than in the rainy season. It varied significantly in Boulmiougou between 20.000 CFAF in the dry season and 9.600 CFAF in the rainy season ($p<0.001$) and in Kossodo between 8.300 CFAF to 3.000 CFAF ($p<0.001$). Only in Tanghin was the directly estimated average monthly income, at 10.800 CFAF, equivalent in both seasons (refer to Figure 5.4. / right graph).

Indirectly Estimated Average Monthly Income in HGs Households Both During the Dry and Rainy Season

The indirectly estimated average monthly income of the HGs households in Boulmiougou was 56.400 CFAF (Q_{25}-Q_{75}: 34.900-75.900 CFAF) during the dry season. This was significantly higher than the 14.600 CFAF estimated for the rainy season ($p<0.001$, refer to Figure 5.4. / left graph). In Tanghin the indirectly estimated monthly income was more or less equivalent in both seasons, with 12.800 CFAF (Q_{25}-Q_{75}: 4.800-28.800 CFAF) in the dry and 14.500 CFAF in the rainy season. The HGs in Kossodo, however, had a significantly lower indirectly estimated monthly income in the dry season, with 4.500 CFAF (Q_{25}-Q_{75}: 2.100-12.200 CFAF) than in the rainy season, with 12.600 CFAF ($p<0.001$). The year 1998, in which the complementary study was carried out, was a particularly difficult year, with an unusual lack of water in the dry season. All HGs had to stop planting vegetables earlier than in average years. As the HGs households in Kossodo depend on wastewater for irrigation, which comes from the nearby tannery, the slaughterhouse

and the brewery, they were more affected by this situation than the other two sites, which could take at least part of their water for irrigation from water reservoirs (see Section 5.3.3.).

The HGs of Boulmiougou had the highest indirectly estimated average monthly income of the three sites (refer to Figure 5.4. / left graph). This result could lead to the assumption that home gardening is more profitable for the HGs of Boulmiougou than for the other sites visited during the study. This assumption is emphasized by the following quotation of a HG (aged 22, male) of Boulmiougou:

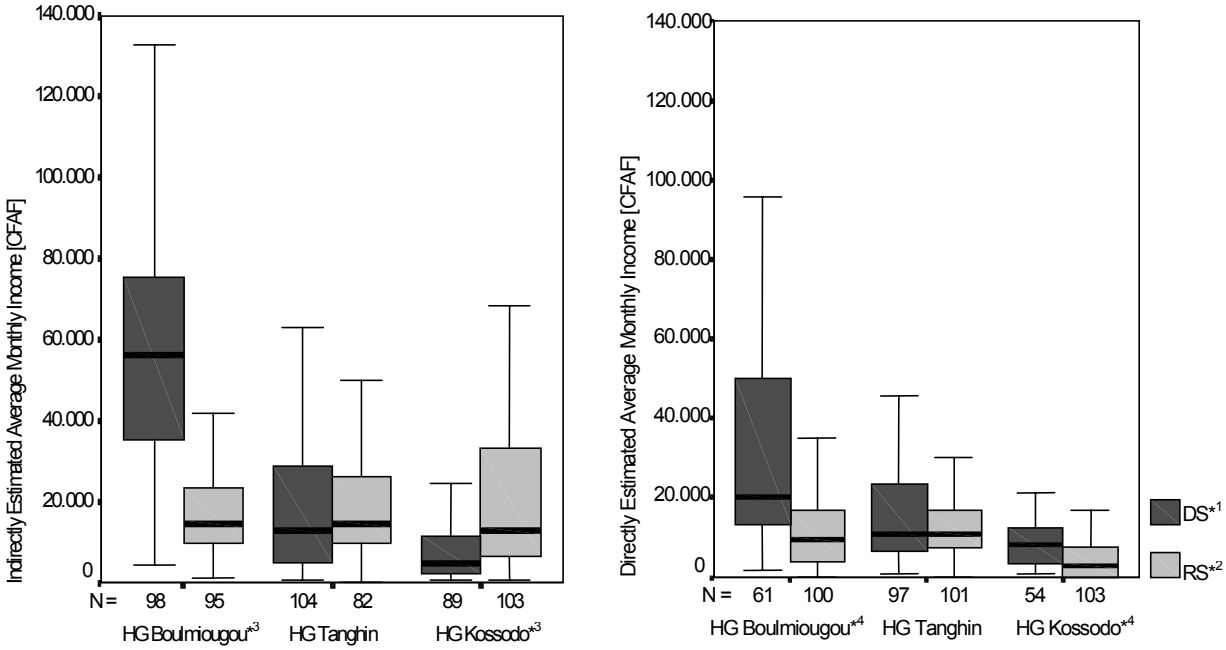
> *"First I worked as a plumber, but the income was not high enough. So I became a home gardener. My motorcycle, my house, my clothes, my food, these are all fruits of home gardening."*

Directly Estimated Average Monthly Income in Comparison to the Indirectly Estimated Average Monthly Income in HGs Households Both During the Dry and Rainy Season

In each of the three sites the HGs households underestimated significantly their average monthly income in the rainy season ($p \leq 0.001$). The HGs of Boulmiougou ($p < 0.001$) and Tanghin ($p = 0.045$) underestimated their average monthly income also in the dry season. Only the HGs of Kossodo had a lower indirectly than directly estimated average monthly income in the dry season (refer to Figure 5.4. / both graphs).

Seasonal variations in the income structure of HGs households could be seen with both approaches. With the exception of the indirectly estimated monthly income in Kossodo, all HGs households earned on average more money in the dry season than in the rainy season. A projection solely based on the amounts of the dry or of the rainy season used to calculate the yearly income would not reflect the real income situation. HGs income would be either over- or underestimated.

Figure 5.4. Comparison of the average monthly income estimated with both approaches in home gardeners' (HG) households in Boulmiougou, Tanghin and Kossodo both during the dry (DS) and the rainy season (RS)



*1 Directly estimated and indirectly estimated average monthly incomes differed significantly in HGs households in Boulmiougou ($p<0.001$) and Tanghin ($p=0.045$) in the dry season.
*2 Directly estimated and indirectly estimated average monthly incomes differed significantly in HGs households in each of the three sites in the rainy season ($p\leq0.001$).
*3 Indirectly estimated average monthly income differed significantly in HGs households in Boulmiougou and Kossodo between the dry and the rainy season ($p<0.001$).
*4 Directly estimated average monthly income differed significantly in HGs households in Boulmiougou and Kossodo between the dry and the rainy season ($p<0.001$).
Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

These results stress the need to carry out studies in all relevant seasons to assess the most probable income structure. The significance of the seasonal variation in income for HGs is vividly described in the following quote:

> *"Poverty is the lack of money and the lack of rain."*
> HG (male, aged 45, socio-economic class 1/2) in Tanghin

The result of the dry season was the same as that of the rainy season when comparing the directly estimated average monthly income of HGs households with

that of NHGs households. Although the HGs households estimated their average monthly income higher in the dry than in the rainy season, their average monthly income was still lower than that of NHGs households in the dry season. In each of the three sites and in both seasons NHGs households earned more than HGs households. With the exception of the households in Boulmiougou in the dry season, the difference in income was in all three sites and both seasons significant ($p<0.001$).

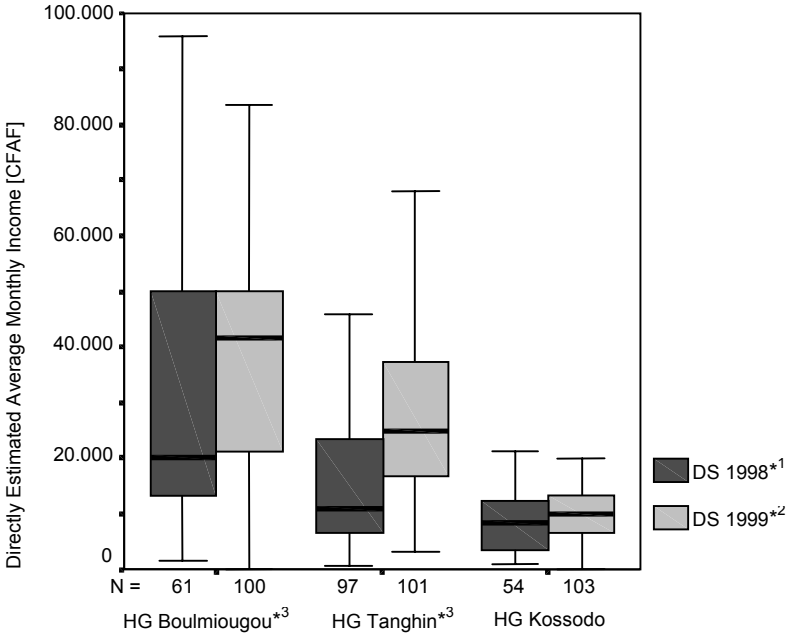
5.3.3. Income Structure During Two Dry Seasons in 1998 and 1999

To work out seasonal differences, the incomes obtained in the study after the rainy season 1999 were compared, in the previous sections, with the incomes of a complementary study carried out after the dry season in 1998. As the income of the latest season is generally more prominent in people's minds than the incomes of earlier seasons, and in order to guarantee the same study conditions, the income estimation of the preceding season of both studies were used. It is generally recommended for household surveys to ask the interviewees about a period not older than six months prior to the study (WHO, 1988).

In addition to the income estimation for the rainy season 1999, the HGs were also asked about their income estimation for the preceding dry season 1999. The significantly different directly estimated average monthly incomes in HGs households during the two dry seasons in 1998 and in 1999 will be discussed in the following section. In each of the three sites HGs households estimated their average monthly income in the dry season 1999 as higher than in the preceding dry season 1998 (refer to Figure 5.5.).

In Boulmiougou the difference was significant ($p<0.001$): 41.700 CFAF (Q_{25}-Q_{75}: 21.100-37.500 CFAF) in the dry season 1999 and 20.000 CFAF in the dry season 1998. In Tanghin HGs households earned 25.000 CFAF (Q_{25}-Q_{75}: 16.700-37.500 CFAF) in the dry season 1999 instead of 10.800 CFAF in the dry season 1998 ($p<0.001$). The difference in Kossodo was only slight: 10.000 CFAF (Q_{25}-Q_{75}: 6.700-13.300 CFAF) in the dry season 1999 and 8.300 CFAF in the dry season 1998.

Figure 5.5. Comparison of the directly estimated average monthly income in home gardeners' (HG) households in Boulmiougou, Tanghin and Kossodo in the dry seasons (DS) of 1998 and 1999



*1 Directly estimated average monthly income differed significantly between each of the three sites in the dry seasons in 1998 (between Tanghin and Kossodo p=0.002, between the other sites p<0.001).
*2 Directly estimated average monthly income differed significantly between each of the three sites in the dry seasons in 1999 (p<0.001).
*3 Directly estimated average monthly income differed significantly between the dry seasons of 1998 and 1999 (p<0.001).
Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

These results confirmed the fact that the income of the HGs households depends absolutely on external factors such as the quantity of water, which is different from season to season, but also from year to year. HGs households can not count on the same external factors or the same quantity of water and, thus, the same amount of income from one year to the next.

Home gardens must be irrigated with water from nearby water reservoirs or wells. These two water sources are filled up with rainwater in the rainy season once a year; afterwards they are used as water sources until they run dry, which happens normally at the end of the dry season. There are not enough water reservoirs available in town to collect all the rainwater during the rainy season. In addition, the

water reservoirs are not protected from the sun and therefore a lot of the collected rainwater evaporates in the hot, dry season.
The home gardening cycle depends completely and crucially on the quantity of rainwater for irrigation. (Figure 1.5. shows a typical cycle of home gardening.) This is vividly described by a HG (aged 36, female) in Tanghin:

> *"We start with this* [further activity other than home gardening] *when the water runs out and we have to stop irrigating the fields. We do these activities until we can start again with home gardening."*

The year 1998 was a particularly difficult year with an extraordinary lack of water. The preceding rainy season was weak, with a small amount of rainfall. Then, the 21st edition of the African Cup of Nations (CAN) was held during the last three weeks in February 1998. During this time thousands of spectators, the 16 football teams with their delegations, officials, guests and sponsors resided in Ouagadougou and consumed a lot of water. Hectoliters of water were used to obtain green football fields.
In average years, such as in 1999, HGs can irrigate their fields until the end of April. The year 1998 did not represent an average year, because rainwater ran short as early as the beginning of April. The HGs had had even fewer income possibilities in that year than in other years.

The directly estimated average monthly income differed between the three sites significantly both in the dry season in 1998 and in the dry season in 1999 (refer to Figure 5.5.). The HGs households of Boulmiougou had the highest directly estimated average monthly income of the three sites. The HGs households of Kossodo had the lowest directly estimated average monthly income. The HGs of Boulmiougou also had the highest directly estimated average income in the rainy season.

To summarize, only due to their activity the HGs households had a lower estimated monthly income than their NHGs counterparts in each of the examined sites and in the dry season as well as in the rainy season. The HGs income varied from season to season in one year, but also between two successive dry seasons. In addition to the seasonal variation in income, the HGs incomes also varied from site to site. In regard to the external factors (i.e. quantity and quality of the water for irrigation, soil,

variation of vegetables / refer to Figure 5.1.), which differed in each of the examined sites, the HGs households could not be seen as a homogenous group.

In Ouagadougou, the purchase price of European vegetables is much higher than the purchase price of traditional vegetables (ADAMA et al., 1997 / see Chapter 4, Section 4.2.1.1.). According to a previous study of home gardening in Ouagadougou, the HGs charge the same prices in all home gardening sites in town (DJIMASBE, 1995/96). Thus, the amount of income may also differ according to the different types of vegetables on the three sites.

The HGs of Boulmiougou cultivated mainly European vegetables, which were almost exclusively produced to be sold directly on the local markets in town or to wholesalers. Furthermore, they had the monopoly of the production of strawberries in Burkina Faso (Traore, Personal Information, Ouagadougou, 1999). In Tanghin HGs households cultivated both European and traditional vegetables. Traditional vegetables dominated the vegetable pattern of the HGs in Kossodo. The HGs households in Boulmiougou had the highest and the HGs households in Kossodo the lowest estimated average monthly income in this study.

With these results it is fair to assume that income generated by home gardening depends both on the season and on external factors, which influence the home gardening sites in a different manner. Thus, there is a need to carry out household studies on several periods over one year and on different home gardening sites in order to obtain valid results about the economic impact of home gardening.

5.4. Summary and Conclusion

In Sub-Saharan Africa, where on average 50% of the population lives below the poverty line and the number of urban poor is still increasing, urban agriculture is resurging strongly (SMIT et al., 1996; RATTA & NASR, 1999; WORLD BANK, 2000/01). In this context it is necessary to obtain more knowledge about the income structure of different activities and the distribution of the poor among these different activities. Income is still the most frequently used proxy for poverty or welfare.

The aim of this study was to examine the income situation of HGs households in comparison to NHGs households in Ouagadougou over an entire year. In addition a possible relationship between the economic situation and the health status of HGs households was examined.

The average monthly income in HGs households differed by season, site and even approach. In each of the examined sites the income estimations from vegetables sold was higher than the income estimations made by the interviewees. In addition, the income of the HGs households was higher in the dry than in the rainy season. HGs income varied between the three sites also, due to the external factors, which vary from site to site (refer to Figure 5.1.). The income generated by home gardening depends, thus, both on the season and the external factors, which influence each of the home gardening sites in a different manner.
Seasonal variations in households' economic data were also seen in another study in Burkina Faso (SAUERBORN et al., 1996a). There, the expenses for seeking care differed between the months of the dry season and those of the rainy season. A sole projection of one single month would not reflect the annual expenses for health (SAUERBORN et al., 1996a). The same pattern could be seen in this study and it would be not appropriate to make a projection of the annual income based solely on the monthly income in the rainy or dry season.

Despite the difficulties in estimating the monthly income in HGs households and the differences in the income between the dry and the rainy season and between the three sites, nothing influences the fact that the estimated average monthly income in

NHGs households was higher than in HGs households. This could be seen for the dry as well as for the rainy season in each of the three sites. The income generated by home gardening was lower than the income generated from any activity other than home gardening. In the rainy season only 9% of the NHGs households earned less than the indirectly estimated average monthly income of HGs households, which was still higher than the directly estimated HGs income.

The US $1-per-day and the US $2-per-day cut-off points or poverty lines are commonly used to measure the degree of poverty (WORLD BANK, 2000/01). According to this study HGs earned on average US $0.6 a day and therefore fell into the category of ‘extremely poor’. With US $2 a day NHGs belonged to the next class, categorized as ‘poor’. These international poverty lines, however, have to be regarded very carefully and they could be very misleading. They imply that the income needed to avoid poverty is not only the same in all locations within a country, but also the same in all countries. This could cause a large underestimation of the scale of poverty and especially the scale of urban poverty, because the income-level needed to avoid poverty is much higher than US $1 a day in most urban regions (SATTERTHWAITE, 2000).
With this background, an internal comparison of income or the level of poverty should, thus, have more validity than an external or international comparison of income or poverty. According to the international poverty standard, both the HGs and the NHGs households would be considered to belong to poor classes, despite the fact that they were in two different poverty classes. Therefore a main emphasis of the results should lie on the fact that each month HGs households earned only half of the income NHGs households earned in the same month.

The results of this study complemented the results of the project of urban agriculture (see Chapter 2). The overall aim of this study was to cover the economic impact of home gardening in comparison to the health status of HGs. In all three sites, in HGs and NHGs households, and in the rainy as well as in the dry season malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases were most often named as the most recent illness. Furthermore, the average number of days of illness was equivalent in all examined households. In the whole study population

children had the highest frequency of illness in a household (see Chapter 6, Section 6.3.2.3.f.).
Considering these results it could be assumed that a lower income in HGs households did not represent a risk factor for a lower health status in the HGs population.

Lessons learned from this study in Ouagadougou have scientific and practical implications for other home gardening sites as well, since home gardening exists in an ever growing number of countries and towns all over the world. With an emphasis on developing countries where agriculture is seen as the main economic activity of households, home gardening exists in Asia (YENG, 1985), in Latin America (LOSADA et al., 1998) and particularly in Africa (i.e. MAXWELL & ZZIWA, 1992; OBARA, 1998; STREIFFELER, 1991).
In all countries, home gardening depends on many external factors (see Figure 5.1.). All these determinants are difficult to influence and have a different priority for different countries, towns and even sites. In Sub-Saharan countries many external factors, which influence the urban agriculture system show a similar pattern. These factors are mainly linked to seasonal rainfall and the lack of water at a certain time of the year. Thus, the data obtained in this study can also be used as a base for research and intervention possibilities in other countries of Sub-Saharan Africa.

Further research is necessary to clarify the hypothesis that different incomes do not influence the health status of a population. A useful approach would be a ‘case-control’ study to establish potential risk factors (here: income obtained either by practicing home gardening or by practicing an activity other than home gardening) and associations (here: health status). HGs households with a low monthly income should be taken as the case group and NHGs households with a low monthly income should be taken as the control group. Further data would be obtained by comparing the frequency, the type and the duration of the illnesses. The study carried out in Ouagadougou showed that the site of Tanghin had the biggest homogeneity between HGs and NHGs households. In comparison to the two other sites the differences in the income and spending behavior were smaller. Because case-control studies are more prone to bias, such as selectional bias, it is very important that with exception of the potential risk factor, all other determinants are represented equally

in the two study groups. For a case-control study in Ouagadougou the site of Tanghin should therefore be taken as the reference site. As the external factors could influence each site differently, the proposed case-control study should be done taking a multi-country approach. Based on a standardized study protocol for each country the case-control study should include other countries of the Sub-Saharan zone. At least two more Sub-Saharan countries, i.e., one with coastal access such as Senegal, and one interior country such as Mali, should be included. Furthermore an extension on one country in Asia and one in Latin America could also be taken into account. To obtain valid results in this case-control study it is important to work with the same standardized protocol in all study areas.

When translating the study results into possible interventions the 'participatory action research' approach should be used (MAYER & QUELLET, 1991; TANNER et al., 1999). This is an approach to social research that regards change and development as its ultimate aim. It reaches this aim by building an iterative process between actors and researchers. It starts with the creation of the partnership of all concerned and continues by identifying the key issues and solutions through a problem-solving approach whereby often the research process itself represents interventions. The population concerned identifies the problems and the priorities and decides on the kind of intervention measures. Substantial experience with this approach in development programs could be gained in agriculture (ENDA-GRAF, 1993) and in urban areas focusing on environmental issues.

In Ouagadougou as well as in any other Sub-Saharan town the external factors on the different home gardening sites can not be totally transferred from one site to another. One result, however, can be generalized: If the external factors, which are mainly the quality of the water for irrigation and the soil, are acceptable on a home gardening site then the HGs activities at this site should be strengthened, and if they are unacceptable then the HGs at this site should look for another income-generating activity as well. Home gardening could be continued as a kind of subsistence production. In both cases the interventions would consist of granting micro-credits. Still today it is very difficult for poor people to obtain money for purchase or emergency spending, as they do not have access to savings, credit and insurance services. They could turn to traditional savings and loan associations with

limited credit volumes or to private moneylenders with horrible interest rates of up to 120 percent (ADLER, 2001).

Different forms of credit have been used for a very long time. The traditional forms of credit are mainly ‘credit given as goods’, ‘social credits’ and ‘tontines’, which are all free of interest. A credit given as goods is barter with cereals or vegetables, in which the trade is not exchanged at the same time. The social credit is almost exclusively used among women and kept secret from other people. Before a family ceremony such as a baptism or a wedding in a household the women of this household borrow money from other women in the neighborhood to organize the ceremony. Immediately after the ceremony is held, the money is paid back without interest (DIARRO DOKA, 1998). Another form of credit without paying interest is the so-called tontine, which is a rotating private saving system. The members of these tontines, which are mostly women, meet at fixed intervals, usually weekly or monthly, and pay in a certain sum of money agreed at the beginning of the round. The total amount collected is loaned to a different member in fixed intervals. The sequence of the members who receive the money is determined in advance by consensus or the money collected is auctioned and all members of the current round who have not yet received a loan may bid for it (DIARRO DOKA, 1998; SIKA & STRASSER, 2001). One of the big weaknesses of this system is the unreliability of the participants. Once they have obtained the money they may stop paying their amount regularly (ROOST VISCHER, 1997). Furthermore the amount loaned out is generally small, because the pay-in period is very short.

In addition to the traditional forms of credit, there are micro-credits, which generally charge interest. Several forms of micro-credits exist. In ‘solidarity groups’ clients join a group to receive access to financial services, which are primarily credits. In the ‘linkage model’ members of a self-help group enter into a group contract with a bank that provides savings and credit services to the group (ZELLER, 2001). And finally probably the most powerful form of micro-credits is ‘micro-banks’ with individual financial contracts. Micro-banks provide loans to individuals for about 20-30% interest so they will have a profit margin of about 10-20% to cover their costs (SCHMIDT, 2001). The success of micro-banks depends on well-trained staff, a capable leader and sophisticated control mechanisms (NITSCH, 2001).

Micro-credits start normally with a small amount of money. This should be paid back within a fixed time and with a fixed amount of interest. When the first credit is reliably paid back, a second credit of a higher amount can be given (DIARRO DOKA, 1998; MAGA MAAZOU, 1998; MARIUS-GNANOU, 1998). The aim is to support small personal activities where only low resources are needed to start this activity and the success of the activity is relatively quickly seen. There are studies that suggest that access to micro-credits has the potential to significantly reduce poverty (KHANDKER, 1998; ZAMAN, 2000). On the other hand there is also research, which argues that micro-credit has minimal impact on poverty reduction (MORDUCH, 1998). The evidence of reducing vulnerability is clearer. The provision of micro-credits has been found to strengthen crisis-coping mechanisms, diversify income earning sources, build assets and improve the status of women (HASHEMI et al., 1996; MONTGOMERY et al., 1996; MORDUCH, 1998).
Successful examples of credit schemes have been found in all regions and they include for example investment in income-generating activities for women in Bangladesh, farming cooperatives in Zimbabwe and housing initiatives in The Gambia (OXFAM, 1995). One of the best-known credit schemes is the Grameen Bank in Bangladesh, which since 1983 has been giving credit mainly to the landless and to poor women (BORNSTEIN, 1995; ZELLER, 2001).

In the case of Ouagadougou, in home gardening sites where the external factors for home gardening are acceptable and the production of vegetables has the potential to reach economic growth for the households and people involved, micro-credits should be used to strengthen HGs activities related to urban agriculture. This situation is given in Tanghin and Boulmiougou, where water to irrigate is relatively less polluted (CISSE, 1997). The aim of the micro-credits should be to increase the income of HGs over a whole year by increasing the productivity of the sites. Three practical investigations appear most feasible. First, micro-credits could be used to buy the more expensive seeds for the more profitable European vegetables such as carrots and cucumbers. Second, micro-credits could be used to change the vegetable pattern by buying cuttings for more profitable vegetables and fruits such as strawberries. Third, micro-credits could be used to invest in the equipment for home gardening. The help of motor pumps to facilitate the irrigation of the fields would free

capacities to cultivate and irrigate more fields on one site, increasing the quantity of the vegetables.

On the other hand, in sites where the external conditions are on a worst-case scenario and urban agriculture is used more as a subsistence production rather than an income-generator, micro-credits should be used to help HGs to start a new activity, which is more profitable over the whole year. With the mix of wastewater of the nearby tannery, the slaughterhouse and the brewery such a worst case is given in Kossodo. One HG of this site (male, aged 68) described it clearly:

> *"It is mainly the wastewater of the tannery, which destroys our vegetables. Once this water is drained off we can't work anymore. However, with the wastewater of SO.B.BRA.* [government-owned brewery] *we can still work."*

In Kossodo some HGs women already participate in a micro-credit project supported by the above-mentioned project. The women had to suggest an amount of money together with a concrete plan for what they want to do with the money. A group of the HGs association discussed each suggestion on the base of its feasibility and the cost of financing and distributed the money to the HGs. Credits were generally given for amounts between 1.000-5.000 CFAF. The women had to pay back the whole credit with an interest of 5% per year within one to six months (KUELA, 1999). This system showed its first successes in a busy food-stall in front of the tannery (see Photo 23). A lot of workers go there especially for lunch and the break-even point for the food-stall is almost achieved. Other micro-credits were used to start animal breeding. Grilled pork is a common and popular dish in Burkina Faso. Pigs grow quickly, they do not need special food, and there is always a demand for them (Personal Observation, Ouagadougou, 1999). These first successes confirm the opinions about women's participation in micro-credits in the literature (for another micro-credit project see Photo 22). Over the years it was observed that women deal better with micro-credits than men and that they take the chance to ameliorate the living conditions for their family and children due to this system (MARIUS-GNANOU, 1998). Today next to literacy programs, micro-credits are seen as the most important supporting measures for women attending to the informal sector (WAAS, 1995).

These first visible successes in the home gardening site of Kossodo show that micro-credits have to be continued and extended in order to create income possibilities, which guarantee the purchase of at least the minimum level of basic needs. A big help in strengthening the micro-credits would be the alphabetization of people involved in this system. In Ouagadougou almost 80% of the interviewed HGs were unable to read and write. Still today an external supervisor was responsible for the administrative issues in handling the micro-credits. Once the supervisor was not available, it was neither possible to grant a new micro-credit nor was it possible to pay back the borrowed money. Thus, reading and writing skills would help HGs to organize the micro-credits in a more efficient way without having to rely on external help.

Micro-credits can be seen as an appropriate intervention possibility in poverty reduction programs in the context of urban agriculture in the Sub-Saharan region. During the last three decades, countries with lower income inequality had a higher economic growth. Income inequality is inversely related to economic growth (GERSTER, 2000). Incomes measured with the Gini-Coefficient* are relatively unequal in Sub-Saharan countries (DEMERY & WALTON, 1998). The aim of poverty reduction programs should therefore be to increase the proportion of economic benefit received by the poor and to reach the most possible income equality.

In conclusion, micro-credits force local potential. Micro-credits at the level of the different urban agricultural sites appear to be a feasible and demanded strategy. Carefully tailored to each site, they could increase the income of HGs households and might reduce the seasonal variation in income by increasing productivity as well as identifying new income-generating activities. A carefully directed process of participatory action research could assist in such site-specific credit schemes. All interventions should improve the economic conditions in HGs households, so that they are at least comparable with the economic situation of NHGs households.

* The Gini-Coefficient is a measure of income inequality in a country. The value of the Gini-Coefficient ranges from zero to one. A Gini-Coefficient value of zero indicates an egalitarian income distribution while Gini-Coefficients greater than zero suggest various degrees of income inequality. Larger coefficient values are associated with greater degrees of inequality (BLACKWOOD & LYNCH, 1994).

6. Estimate of the Monthly Expenditures for Home Gardeners' and Non-Home Gardeners' Households Within the Sites and for All Households Between the Sites Both During the Dry Season and the Rainy Season

6.1. Introduction

The population of urban areas in developing countries is growing by about 3.4% per annum (WORLD BANK, 2000). By 2025 the human population will be predominantly urbanized with 60% of the population living in urban areas. Sub-Saharan Africa is the region most affected by urbanization. This region has an annual growth rate of 2.8% in the total population and 5.8% in the urban population (WORLD BANK, 2000). The same process can be seen in Burkina Faso, where the urban growth rate of the capital, Ouagadougou, is three times as high as the corresponding rural growth rate (LEREBOURS PIGEONNIERE & JOMNI, 1998 / see Chapter 1, Section 1.1.).

In the context of dynamic urbanization in developing countries, it is the informal sector, which becomes the predominate form of economic production among city-dwellers. One activity of the informal urban economy is urban agriculture, also known as home gardening (LANDAUER & BRAZIL, 1990, SMIT et al., 1996). The importance of home gardening for the economy of households is widely shown in literature (i.e. DRESCHER, 1996a; SMIT et al., 1996; RABINOVITCH & SCHMETZER, 1997 / see Chapter 1, Section 1.2.3.1.).
All over the world there is a long tradition of urban agriculture (see Chapter 1, Section 1.2.2. and Section 1.2.4.). Mainly four forces have shaped the present mix of home gardens in cities: the continuity of historical practice, the industrial agricultural revolution, the post-World War II rapid urbanization, and the greater expansion of low-income segments of the urban population. The first two forces are the historical roots of urban agriculture. The last two forces are mainly contemporary phenomena.

Although urban agriculture exists in each of the five continents in almost every country (see Chapter 1, Section 1.2.2.), only a few countries, and most of these not situated in Africa, have created permanent institutional programs and have a

legislation that protects urban agriculture (GEFU, 1992; SMIT, 1996; MOUGEOT, 1999 / see Chapter 1, Section 1.2.3.2.).
For the majority of countries, home gardening is an activity that is merely tolerated, but it is not legally seen as a part of the urban economy. This is the case in Ouagadougou. The government does not officially permit urban agriculture, but still has a specific prohibition against urban agriculture during the rainy season, especially for tall-growing crops (QUON, 1999).

Especially in countries of the Sub-Saharan region, urban agriculture is a consequence of increasing impoverishment, rural exodus and rapid urbanization. There are a lot of reasons and possibilities for the current (urban) poverty, which are discussed in Chapter 1, Section 1.1.3. One reason for poverty in the Sub-Saharan region, which will be pointed out in this chapter, is the given climatic factors there. Climatic factors especially in Sub-Saharan countries, including Burkina Faso, cause drought and soil erosion and, as a consequence, famine and rural-urban migration (WORLD BANK, 1993). Permanent migration leads to rapid urbanization and rapid urbanization leads to a high number of poor and mostly unskilled urban residents. They have to think back to their formal rural activity and extend the scale of urban agriculture activity (refer also to Chapter 1, Section 1.2.2. and 1.2.3.1.).
However, once engaged in agriculture people have to struggle with the same problems they had in the countryside. These problems are linked to climatic factors such as high temperatures, scarce rainfall and lack of water for irrigation at certain times of the year. Seasonal rainfalls completely determine the rhythm of work for home gardeners in Sub-Saharan countries. (Figure 1.5. shows a typical cycle of home gardening.) At the end of the rainy season, between December and February, home gardening has its annual peak. Depending on the quantity of rainwater available to irrigate the fields, home gardeners usually have to stop with their activity in April. This has been shown to have profound implications for household economies, such as expenditures and food prices (CHAMBERS et al., 1981).

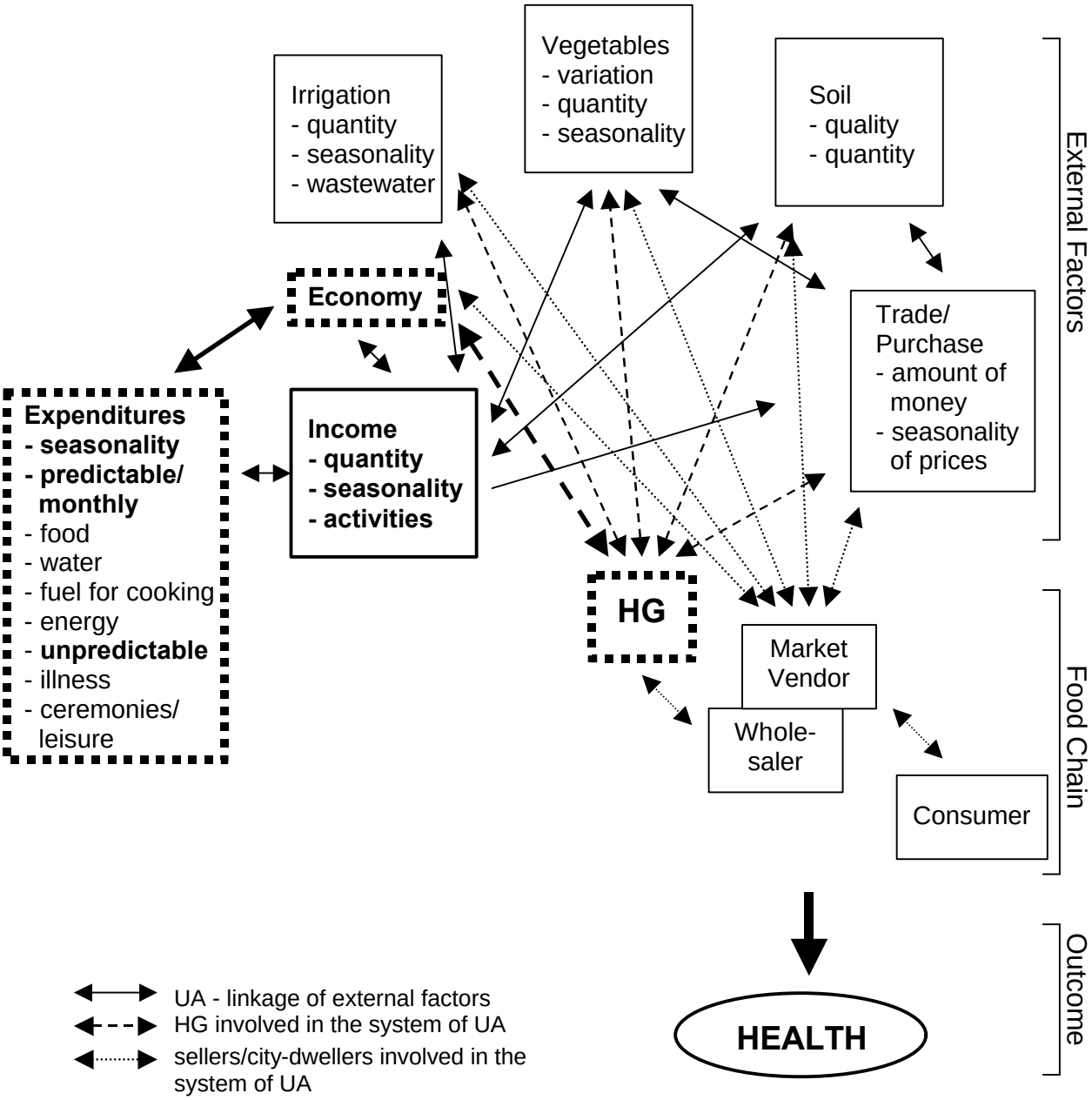
As seen in Figure 6.1. in Sub-Saharan countries and towns, such as Ouagadougou, urban agriculture depends on the quantity, the quality and especially the seasonal variation of water for irrigation. But water for irrigation is only one of the many external determinants that influence the urban agriculture system. Others are the

quantity and quality of vegetables, the soils, the different trade possibilities and the economic situation (expenditures versus income) of the home gardeners' households. All of these external factors -water, soil, variation of vegetables, household income and expenditures- have different priorities during one entire year. Their availability and their importance must be regarded differently for the dry and for the rainy season.
In addition, all of these determinants may have a certain influence on the health status of the population, which is involved somehow in the urban agriculture system. And in addition, the health status of home gardeners may differ between the dry and the rainy seasons (refer to Figure 6.1.).

There are only a few studies that account for seasonal variations in the economic situation and the health status of households. Most field studies are carried out in the dry season and these results are generalized for the whole year (SAUERBORN et al., 1996a). However, great caution is warranted when results from the dry season are used to make generalizations. Chambers (1981) used the term 'seasonal bias', which can occur when making linear projections of economic variables that fluctuate substantially with seasons. To obtain a more objective view of the health status in relation to the household's economic situation in an entire year it is necessary to look at all relevant seasons separately.

The aim of this chapter is to look at how the economic factor, as one of the many external factors of the urban agriculture system, is responsible for the health status in home gardeners' households in comparison to non-home gardeners' households. Based on the data of a complementary study carried out after the dry season in 1998 and data carried out after the rainy season in 1999, one entire year will be analyzed. The chapter focuses on seasonal-specific differences in the monthly expenditures in households with and without home gardens. Both predictable monthly costs such as for food, and unpredictable future costs, such as for medical care will be discussed.

Figure 6.1. The system of urban agriculture (UA) and its outcome with a main emphasis on seasonal variations in the expenditures of home gardeners' (HG) households



6.2. Methods

6.2.1. Burkina Faso and its Capital Ouagadougou

Field work for this study was conducted in Ouagadougou, the capital of Burkina Faso in Sub-Saharan Africa, at the end of the rainy season. To establish seasonal differences a complementary study was undertaken at the end of the dry season. The data was collected in April 1998 and in October 1999. Additional information was recorded during a second, three-week field stay in November 2000.

Burkina Faso is situated at the southern part of the West African Sahel, has no coastal access, almost no natural resources and its land is used as for agriculture and for pasture. In 1999, the population was estimated at 11 million, with a population growth rate of 2.8% per year (WORLD BANK, 2000/01).

The basis of Burkina Faso's economy is agriculture. About 92% of the population is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion. Since its independence in 1960, Burkina Faso has remained one of the poorest countries in the world and ranks only 172 of 174 countries in the Human Development Index (HDI) of the United Nations Development Program (UNDP, 2000). The main reasons for this low rank are its high population density, few exploitable natural resources and fragile soil. Social indicators are very low. Life expectancy at birth is 44 years, infant mortality (under five years) is 210 per 1.000 and the GNP per capita is US $240 (WORLD BANK, 2000/01).

Ouagadougou with its 750.000 inhabitants (in 1996) and with an average annual growth rate of 6.8% lies in the center of the country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Being situated at the Sahelian border, its annual precipitation can vary from 850 to 900 mm per year and is restricted to the rainy season from June to October (LEREBOURS PIGEONNIERE & JOMNI, 1998). The average temperature is between 24°C in January and 28°C in July (see Figure 4.1.).

6.2.2. Home Gardening Sites

There are 48 different sites of home gardening in Ouagadougou (refer to Figure 4.2.). Home gardens vary in their sizes and from season to season (CISSE, 1997).

Three sites (Boulmiougou, Tanghin and Kossodo) were selected for the study. Within these three areas there are clear differences in the local position of urban agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies. All three sites are situated on the outskirts of the town. More detailed information on the three home gardening sites can be found in Chapter 4, Section 4.2.1.1. Refer to Appendix IV for the most common vegetables planted at the home gardening sites in Ouagadougou during the rainy season.

6.2.3. Study Population

The population covered in this study is represented by members of households involved in home gardening at one of the three sites and by members of households engaged in an activity other than home gardening but who live in the neighborhood of the home gardeners. A household was defined as a group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible. It is highly probable that the same people were interviewed in both studies, especially in the HGs group, although there was no attempt to find the respondents of the study carried out after the dry season again for the post-rainy season study. In this study the abbreviation ‘HGs households’ is used for the home gardeners’ households, while ‘NHGs households’ stands for households without home gardens, the so-called non-home gardeners’ households.
More information on the study population can be found in Chapter 4, Section 4.2.1.2.

6.2.4. Questionnaire

The purpose of the questionnaire was to collect information that can be used to study the economic impact and costs of home gardening within the seasonal variations. The study focused on the income, the expenditures, the health and socio-economic status of a certain population in Ouagadougou in the dry season and in the rainy season. Information collected included the composition of the households, the living conditions, the household income and the expenditures behavior. The

questionnaire was a structured questionnaire in French and most of the questions were closed and pre-coded. In total, both studies contained 600 questionnaires for 100 HGs and 100 NHGs at each site.
For more information on the questionnaire refer to Chapter 4, Section 4.2.1.3. Refer to Appendix I for the full questionnaire of the rainy season and to Appendix II for the full questionnaire of the dry season.

6.2.5. Quality Control of the Data Collected and Implementation of the Study and Data Management

The data collection was based on a series of strict criteria: (1) the selection and the training of the interviewers, (2) a pilot study and (3) the permanent supervision of the study and the interviewers. All data of the questionnaire was entered using EpiInfo software (Version 6.02, CDC, United States). Data calculations were carried out using EpiInfo and SPSS (Version 9.0 for Windows 1995).
The Mann-Whitney- or Wilcoxon-non-parametric test was used to compare the income and expenditure numeric variables between and across the sites, because the variables were not normally distributed. Categorical variables between and across the sites were compared using chi-square-test or Fisher-exact-test. These statistical measures were applied both for the dry and for the rainy season, for each site, and for HGs and NHGs households. Because of a greater number of tests, the p-value should not be interpreted in a confirmatory sense. The results usually indicate the median of the variables; if other measures were used it is stated. More detailed information on these topics can be found in Chapter 4, Sections 4.2.1.4.f.

6.2.6. Calculation of All Monthly Household Costs

6.2.6.1. Calculation of the Total Monthly Predictable Costs in a Household

Because of recall bias during the interview and, more likely, unawareness of the interviewees of their exact expenditures, it is always difficult to estimate the total monthly predictable costs of a household. These difficulties were the reason for taking more than one approach to obtain the most correct figure representing the

total monthly predictable costs of HGs households in comparison to NHGs households both during the dry season and the rainy season.
The household unit was taken as the measuring unit. The household or family unit is typically viewed as the most appropriate unit of measure because families share income and expenditures (BLACKWOOD & LYNCH, 1994).

As *1ST APPROACHES*, HGs and NHGs were asked what they spent on each of the following consumer items: *FOOD, DRINKING WATER, FUEL FOR COOKING* and *ENERGY*. In order to obtain the total monthly predictable expenditures, the sum of all single expenditures was calculated. Predictable costs were costs, which had to be paid regularly and in this study they were calculated per month. Incomes and expenditures were deflated with a monthly consumer price index and refer to November 1999 prices (600 CFAF = US $1).
Care must be taken not to interpret expenditures, which are made for inputs or investments into household production as consumption. If one includes expenditures on inputs into household production, and the income from household is in turn devoted, at least in parts, to expenditures, then double counting occurs, and the expenditures aggregate is overstating the actual welfare level achieved by the household (HENTSCHEL & LANJOUW, 1996). This was the reason not to include expenditures for fertilizer and seeds in the total expenditures for HGs households.

In Sub-Saharan Africa and therefore for the study population in Ouagadougou *FOOD* or the typical dish is Tô, with a viscous or leaf sauce. Tô is a kind of porridge made with millet, maize and less frequently rice. The sauce is normally made with a vegetable base, either of tomatoes or traditional vegetables such as *gombo* or *oseille*.
Depending on the available money the sauce can further contain meat, such as chicken or pork. It is also possible to put fish in the sauce, either entire pieces or only heads or tails.
The study population was asked for the daily expenditures for the three cereals (rice, millet and maize) needed to prepare the Tô. They were also asked about their own production of all of these cereals and the daily expenditures for the sauce. To estimate the monthly costs for food the daily costs were multiplied by 30.

In order to gain a better understanding of the average purchase prices for food, about 100 households of the study population were interviewed again in a second, short field stay in November 2000. They were asked about the purchase prices for meat, fish, European and traditional vegetables. European vegetables are ,i.e., tomatoes, carrots or lettuce. The seeds and cuttings were first brought to Africa at the end of the last century by the European colonial powers and the Western missionaries. Traditional vegetables are, i.e., *boulmboula, boulvanka* or *gombo.* They were planted originally in Sub-Saharan Africa and have existed there for centuries. The interviewees estimated the purchase prices for food both for the dry season and for the rainy season. For the original version of the questionnaire refer to Appendix V.

In order to obtain the monthly costs for *DRINKING WATER, FUEL FOR COOKING* and *ENERGY* the interviewees were first asked for the main source of these items. There are four possibilities for obtaining drinking water in Ouagadougou: at a tap at home, at a public well in the quarter, by a water seller and at a hand-dug well. The different types of fuel for cooking are wood, gas, charcoal, kerosene and millet stalk. The two sources for energy are either petrol or electricity. The study population had to separately estimate the monthly expenditures for each of these items.

As further *APPROACHES*, personal observations of the study populations were made, and the socio-economic status of HGs and NHGs households were classified. The study population was asked to report on their household goods, their electrical appliances (refrigerators, fans, radios and TVs), and their means of transportation (bicycle, motorcycle and car). The household goods, electrical appliances and means of transportation were indicators of the level of lodging and the economic level in the different households of the study population. These indicators helped to validate the answers given for the total monthly predictable expenditures and should allow an analysis of the dependency of the household, its fragility and its vulnerability to external influences (TIBOUTI et al., 1993). Moreover, the final reports of each interviewer emphasize the cooperation and the honesty of the people interviewed (for more information refer to Chapter 4, Section 4.2.1.5.).

After balancing between all of these approaches -estimation of each of the total monthly expenditures, personal observations, socio-economic status, final reports- a fairly exact statement was given about the total monthly predictable costs in HGs and NHGs households in this study and in the complementary study carried out in 1998.

6.2.6.2. Calculation of the Total Monthly Unpredictable Costs in a Household

The total monthly costs of a household consist of the total monthly predictable costs, which are described in Section 6.2.6.1. and the unpredictable costs.
Unpredictable costs were defined as costs, which occur irregularly in a household and can not be foreseen in advance. The two most important unpredictable expenditures in this study were for leisure and for illnesses. In order to estimate all monthly costs in a household, the unpredictable costs mentioned by the study population were calculated per month.
To obtain a fairly exact statement of the unpredictable coming costs in HGs and NHGs households, the approach to estimate these costs was also complemented by personal observations and the classification of socio-economic status in the study population (see Section 6.2.6.1.).

Calculation of the Unpredictable Costs for Leisure

In this study the unpredictable costs for leisure were defined as expenditures for going out, for example to the cinema or dancing, and the expenditures for tobacco and alcohol. In the complementary study carried out after the dry season 1998 the unpredictable costs for leisure were defined as expenditures for holidays and family celebrations.
To calculate the monthly costs for holidays and family celebrations a distinction was made between these two events in the complementary study.
Holidays were recurrent events, such as Christmas, New Year, Ramadan/Tabaski and Easter. To calculate these costs the interviewees were asked for the latest holiday, which was Christmas or Ramadan in the majority of the households and for

their expenditures. As both events occurred approximately three months before the interviews were held, to estimate the monthly costs for a holiday the given costs were divided by three (MÜLLER, 1999).

In contrast, family celebrations were family events, which were not predictable and, therefore, not calculable over the year. Family celebrations were events such as baptisms, weddings or funerals. To estimate the monthly costs for family ceremonies only the expenditures for the ceremony, which was held in the last month of the study (April 1998), were taken into account (MÜLLER, 1999).

In the complementary study it was seen that the costs for family celebrations and holidays represented a big part of the expenditures for leisure. However, they did not deal with the total leisure costs, which must include expenditures for going out, i.e., to the cinema and dancing. Therefore, in this study the interviewees were asked for the number of times they went out per month and their expenditures. They were asked for the costs for cinema and dancing separately. They were also asked for the monthly costs for alcohol, soft drinks and tobacco. It was assumed that the monthly expenditures for going out would include possible expenditures for holidays and family celebrations. It was not very likely that a lot of holidays influence the unpredictable costs in the rainy season, because the two most important holidays in Ouagadougou, Christmas and Tabaski, were celebrated in the dry season of the year. Moreover, family ceremonies were generally celebrated after the harvest was done in the beginning of the dry season.

Calculation of the Unpredictable Costs for Medical Care

Next to the costs for leisure the costs for medical care were the second largest part of the total unpredictable costs in households of the study population.

In the complementary study, two steps were taken to obtain the monthly costs for illness. The interviewees were first asked for the last spell of illness that had occurred in their households. Second, they had to estimate the amount they spent to treat this illness. To calculate the monthly costs for treatment only the expenditures for illnesses that had occurred in the last month of the study were taken into account (MÜLLER, 1999).

In the study carried out after the rainy season two additional steps were taken to obtain the monthly costs for illness. First the study population was asked for the costs to treat the most recent illness. Second they were asked for the total number of ill people in their household in the last three months. The calculation of the monthly cost of illness was based on the assumption that the total number of ill people in a household in the last three months was equivalent to the absolute number of ill people in the rainy season. The rainy season as well as the dry season was defined as lasting six months. To finally estimate the monthly costs for illness, the given number of ill people was multiplied by the costs for the last treatment and this amount was divided by six.

6.2.7. Frequency of Illnesses

In the post-rainy season survey the study population was asked about the last illness in their households. In the complementary study after the dry season the study population was asked about illnesses, which occurred in the last month of the study (April 1998). The response of the interviewees provided an indication of a self-perceived health status of the family members who had been ill. The responses, thus, did not necessarily reflect the health status as defined through external observations based on measures like mortality or medical examinations. In recent years, more and more health professionals have begun to consider self-perceived health status as a measure of a person's 'true' health situation (GWATKIN, 2000).

All illnesses which occurred in the months from May to October 1999 were taken as illnesses of the rainy season. All illnesses of April 1998 were taken as illness episodes of the dry season.

The reported illnesses were grouped into six categories. These categories were chosen according to a slight adaptation of the international classification of diseases, published by the WHO, which is now in the tenth revision (WHO, 2001). The international classification of diseases (ICD-10) was designed to promote international comparability in the collection, processing, classification and presentation of mortality statistics.

The following six categories were chosen in this study: malaria, gastro-intestinal diseases, respiratory diseases, diarrhea, headache and other diseases. Gastro-

intestinal diseases were defined as all of the diseases, which involve the digestive system, such as stomach-ache and stomach-cramps. The classification ‘respiratory diseases’ regarded diseases that involve the respiratory system, such as difficulties in breathing, cough and cold. The so-called ‘others’ class contained diseases, which did not match the given five categories, such as accidents, fractures or gynecological disorders.

6.2.8. Quality Control of the Results

Many different methods, which integrate qualitative and quantitative components, are widely used to obtain valid results in epidemiology research. This kind of investigation strategy is known as triangulation. Triangulation was used in this study in the following ways: (1) questionnaires were administered to households to gather good quantitative data, (2) focus group discussions were held with individuals to gain valuable qualitative information and (3) personal observations were made to verify reported behavior. All data was compared to existing data of urban agriculture, and especially to data about the economic impact of urban agriculture. Several studies have already been completed and are discussed in Chapter 2 and in Chapter 4, Section 4.4.

6.3. Results and Discussion

This chapter describes the monthly expenditures in households engaged in home gardening (HGs households) compared to households engaged in other activities (NHGs households). The emphasis of the study lies on seasonal-specific differences of these costs (refer to Figure 6.1.).

First, the monthly predictable costs and their distribution will be described taking into account the differences in costs between and within the sites during the two seasons. These costs had to be paid monthly by each household and were, therefore, calculated per month. The total monthly predictable costs were costs for food, drinking water, fuel for cooking and energy, either electricity or kerosene. As the cost for school and clothes were only asked in this study, a comparison with the data provided by the complementary study was not possible. These costs are discussed in Chapter 7.

Second, in addition to the total monthly predictable costs the unpredictable future costs for leisure and health care, will also be analyzed. Again, seasonal-specific differences between these costs will be discussed.

6.3.1. Monthly Predictable Costs

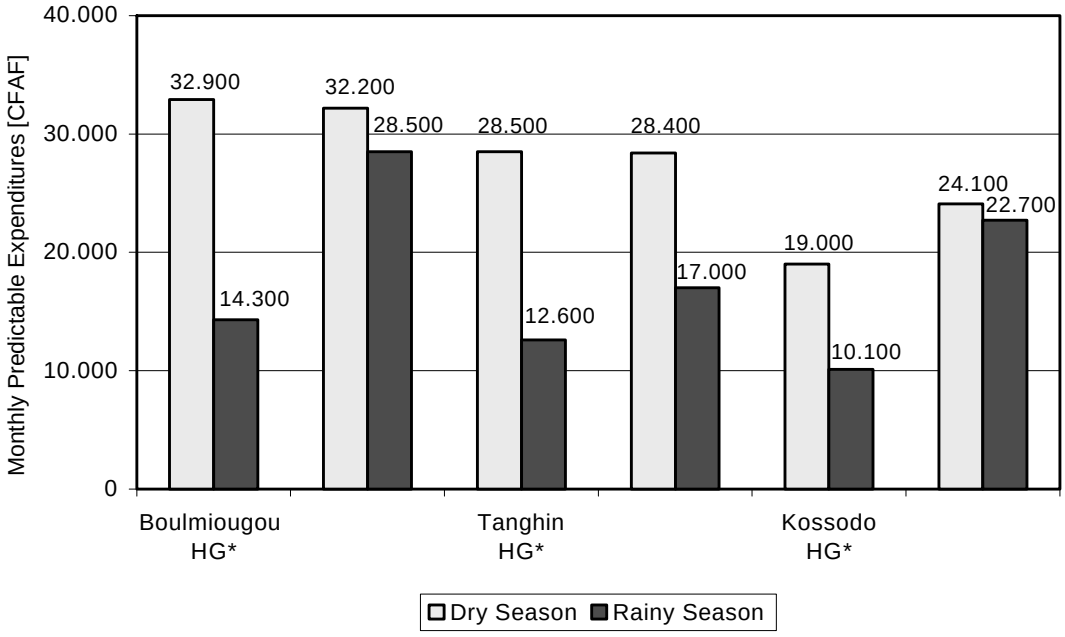
6.3.1.1. Monthly Predictable Costs and their Variations Between the Households, Sites and Seasons

The total monthly predictable costs for all households at the three sites differed extremely between the dry season and the rainy season. These differences were exclusively due to the different spending behaviors of HGs households between the two seasons, which were significant in all three sites ($p<0.001$).

During the dry season in Boulmiougou HGs households spent a total of 32.900 CFAF monthly (Q_{25}-Q_{75}: 21.900-43.100 CFAF) whereas during the rainy season they spent only 14.300 CFAF (Q_{25}-Q_{75}: 10.600-19.200 CFAF). This is a difference between the two seasons of 18.600 CFAF per month (refer to Figure 6.2.). In Tanghin the difference was even higher (15.900 CFAF), with 28.500 CFAF (Q_{25}-Q_{75}: 21.200-40.400 CFAF) in the dry season and 12.600 CFAF in the rainy season (Q_{25}-Q_{75}: 9.000-17.500 CFAF). In Kossodo HGs households had lower monthly

expenditures than at the two other sites during the entire year. But it was nevertheless possible to see a significant difference between the two seasons. In the dry season HGs households spent 19.000 CFAF (Q_{25}-Q_{75}: 13.200-34.400 CFAF) and in the rainy season they spent 10.800 CFAF (Q_{25}-Q_{75}: 8.700-12.800 CFAF).

Figure 6.2. Monthly predictable costs including food, drinking water, fuel for cooking and energy in home gardeners' (HG) and non-home gardeners' (NHG) households in Boulmiougou, Tanghin and Kossodo, and a comparison of the dry and the rainy season



* Monthly predictable expenditures differed significantly between the dry and the rainy season ($p<0.001$).

The total monthly predictable costs for NHGs households, however, did not seem to depend much on seasonal variations. In Boulmiougou NHGs households spent 32.200 CFAF per month (Q_{25}-Q_{75}: 25.000-41.800 CFAF) in the dry season and 28.400 CFAF per month (Q_{25}-Q_{75}: 17.500-42.100 CFAF) in the rainy season. In Kossodo NHGs households spent 24.100 CFAF per month (Q_{25}-Q_{75}: 16.500-38.900 CFAF) in the dry season and 22.700 CFAF per month (Q_{25}-Q_{75}: 12.600-42.000 CFAF) in the rainy season. Only in Tanghin NHGs households had significantly

higher expenditures in the dry season, with 28.400 CFAF (Q_{25}-Q_{75}: 19.900-38.400 CFAF) than in the rainy season, with 17.000 CFAF (Q_{25}-Q_{75}: 12.200-21.500 CFAF).

One interesting finding was that during the dry season the total expenditures in HGs households did not differ significantly from the expenditures in NHGs households (refer to Figure 6.3. / left graph). HGs households spent 27.800 CFAF (Q_{25}-Q_{75}: 17.100-39.300 CFAF) in the dry season, which was close to the amount that NHGs households spent in this season, with 29.300 CFAF (Q_{25}-Q_{75}: 20.000-39.600 CFAF). The results of the study of HGs and NHGs households in the rainy season were contrary to the findings from the dry season (see Figure 6.3. / left graph). The monthly expenditures in HGs households were significantly lower (11.900 CFAF, Q_{25}-Q_{75}: 9.300-16.900 CFAF) than in NHGs households (20.900 CFAF, Q_{25}-Q_{75}: 14.100-36.900 CFAF).

To summarize, HGs households were much more dependent on seasonal variations during the year than NHGs households were. This fact was mainly derived from the different monthly expenditures for food in the two seasons (refer to Figure 6.3. / right graph). In HGs households as well as in NHGs households the expenditures for food were the most important factor of all household expenditures, which was confirmed by a HG (male, aged 35) in Tanghin, who said:

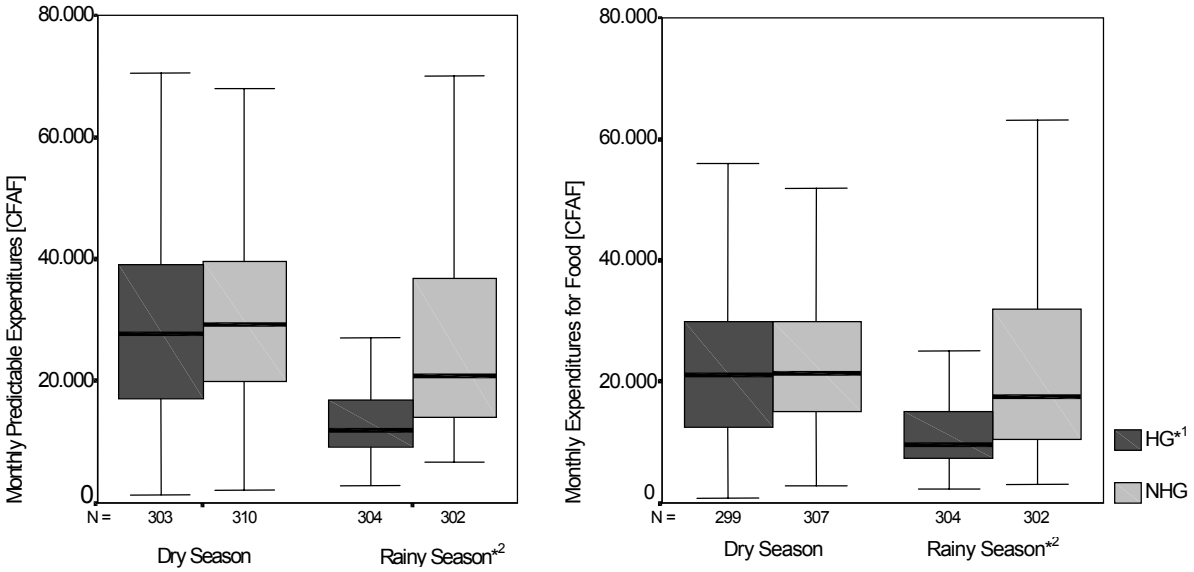
"The dominant part of our expenditures is food costs."

In HGs households, however, these expenditures doubled during the dry season and will be discussed in detail in Section 6.3.1.2. NHGs households had constant monthly predictable costs in both seasons over the entire year. It was not possible to see a dependency on seasonal variations (refer to Figure 6.3. / right graph).

Seasonal variations over the year depend on external factors, which vary from season to season and can rarely be influenced by individuals. External factors include annual rainfall, which is limited to the months of the rainy season, the quantity of water to irrigate the fields over the year, different cultivation patterns both in the dry and the rainy season and the different qualities of soils. Generally, urban agriculture depends more on these external factors than other activities in town do.

Therefore, the HGs households in Ouagadougou were exposed to seasonal variations more than other working groups with different income-generating activities.

Figure 6.3. Monthly predictable expenditures (left graph) and monthly expenditures for food (right graph) and their comparison between home gardeners' (HG) and non-home gardeners' (NHG) households both during the dry and the rainy season



*1 Total monthly predictable expenditures and monthly expenditures for food differed significantly between the dry and the rainy season in HGs households ($p<0.001$).
*2 Monthly predictable expenditures and monthly expenditures for food differed significantly between HGs and NHGs households in the rainy season ($p<0.001$).
Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}

In literature vulnerability has a commonplace meaning as 'being prone or susceptible to damage and injury' (BLAIKIE et al., 1994). Two fundamental dimensions can be distinguished, the exposure to a hazardous event, and the difficulty in managing the consequences of such an event (CHAMBERS, 1989).

Taking this definition as a base, it can be argued that seasonal variations seem to be such a hazardous event for the HGs but not for the NHGs households. As a consequence their monthly expenditures in the dry season reach the same level as those of the NHGs, but HGs did not have many opportunities to reduce these expenditures. Not only the HGs of Ouagadougou, but also everybody who is involved in the urban agriculture system, especially in Sub-Saharan countries, has to struggle

with these seasonal variations which make them more vulnerable than those who do not depend on external determinants. Many household studies ignore the seasonal dimension of expenditures (DERCON & KRISHNAN, 2000). However, this study emphasizes the importance of an inter-temporal dimension of economic studies. Different degrees of vulnerability and season-to-season changes of the economic status of HGs households were observed.

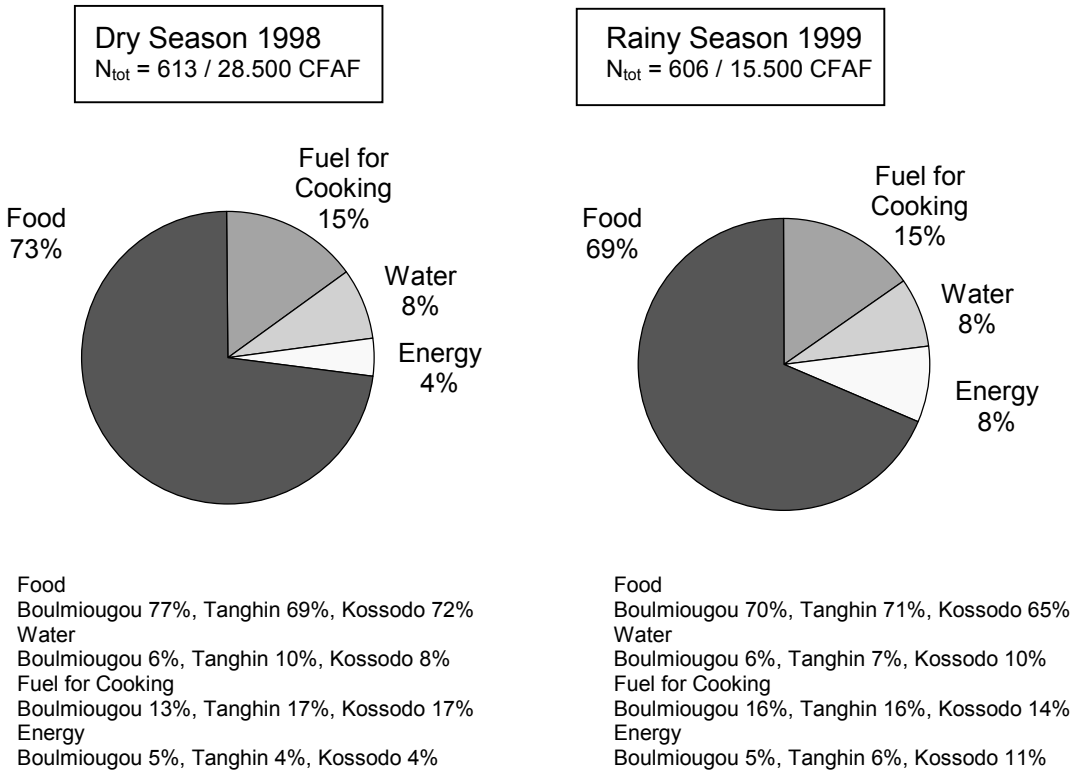
In contrast to the differences in monthly predictable costs between HGs and NHGs households, the distribution of these costs was similar in all three sites for both seasons (for exact percentages refer to Figure 6.4.). When analyzing the dry and the rainy season separately, all households in each of the three sites and HGs and NHGs households in the sites had approximately the same distribution for food, drinking water, fuel for cooking and energy. However, comparing the two seasons (refer to Figure 6.4.) the percentage of the monthly predictable costs varied for two of the four items discussed -food and energy- by more than 4%.

First, the percentage of the total expenditures spent on food in the dry season was 73% (21.300 CFAF), and it was 69% (12.500 CFAF) in the rainy season. In the dry season the expenditures for food increased significantly and made up two-thirds of the total predictable costs. Food costs and their seasonal variations will be discussed in detail in the following section.

The second change in the distribution of the total costs revealed in this study and compared to the data of the complementary study was the increase in the costs of energy. In the dry season the percentage of the expenditures that was spent on energy was 4% and in the rainy season it was 8%. In numbers this means that the monthly expenditures for energy nearly doubled, from 1.200 CFAF in the dry season of 1998 to 1.800 CFAF in the rainy season of 1999.

This increase was more likely to be caused by a time difference than by a seasonal difference. The present study was carried out 18 months after the complementary study of the dry season. During this period Ouagadougou underwent the normal infrastructure expansion of all towns. The number of electrical connections to private households increased significantly in the period between the 1998 study and this study. Moreover, the amount spent on electricity increased significantly between 1998 and 1999 (see Section 6.3.1.5.).

Figure 6.4. Proportion of the monthly predictable costs of the whole study population both during the dry and the rainy season



Food
Boulmiougou 77%, Tanghin 69%, Kossodo 72%
Water
Boulmiougou 6%, Tanghin 10%, Kossodo 8%
Fuel for Cooking
Boulmiougou 13%, Tanghin 17%, Kossodo 17%
Energy
Boulmiougou 5%, Tanghin 4%, Kossodo 4%

Food
Boulmiougou 70%, Tanghin 71%, Kossodo 65%
Water
Boulmiougou 6%, Tanghin 7%, Kossodo 10%
Fuel for Cooking
Boulmiougou 16%, Tanghin 16%, Kossodo 14%
Energy
Boulmiougou 5%, Tanghin 6%, Kossodo 11%

6.3.1.2. Food Costs and their Seasonal Variations

Food insecurity is a very important factor in defining poverty:

> *"Poverty is the inability to cover your basic needs and the absence of enough food."*
> HG (male, aged 56, socio-economic class 1/2) in Tanghin

In all three sites the expenditures for food represented more than half of the total monthly predictable costs. This result is also underlined by the words of a HG (male, aged 68) in Kossodo:

> *"It' s for food that we have to spend money first*...[ ]...*It's food which takes the most of our money."*

Furthermore, the proportion of the total expenditures spent on food was higher, at 73%, in the dry season than in the rainy season at 69% (refer to Figure 6.4.). All numbers are expressed in Table 6.1.

Other studies of household expenditures carried out in Burkina Faso and Ouagadougou between 1996 and 2000, had results similar to those of this study. In the study in 1996 the percentage spent on food in urban regions was, on average, 47% of the total monthly costs. Moreover, a socio-economic classification of the interviewed population was developed. The 'richest' socio-economic class, with a monthly income over 92.277 CFAF, spent 35% of their total costs on food, the 'poorest' socio-economic class, however, with a monthly income lower than 27.619 CFAF, spent 53% of their total costs on food. Unfortunately, this study did not contain absolute numbers regarding the food costs (INSD, 1996).

Another study of household expenditures in Ouagadougou found that the costs for food were only 33% of the total monthly costs. However, in absolute numbers each person spent 5.690 CFAF per month for food (INSD, 1998). In this study the average number of household members was six persons. Taking this number as a base, according to that study in 1998, a household would spend 34.140 CFAF each month just for food. Those expenditures would be still higher than in this study where a household spent between 12.400 CFAF and 21.300 CFAF depending on the season. In the last study, undertaken by the ministry of economy and finance, households spent on average 52% of their total expenditures, or 32.600 CFAF per month for food (MINISTERE DE L'ECONOMIE ET DES FINANCES, 2000).

The argument that the urban poor spent more than 50% of their income on food (VASEY, 1990; DRESCHER, 1996a; SMIT et al., 1996) was confirmed by the studies mentioned above and the present study.

Moreover, other household studies undertaken in developing countries also underline the results. In Asia, in a garbage slum in Seoul, Korea, food costs represent 59% of the total monthly household income. A difference was noted between the households with the lowest income, which spent 65% of their incomes on food, and the households with the highest income, which spent 38% (KIM, 1995). In Bangkok, Thailand, the lowest-income families spent 60% of their incomes on food (MOUGEOT, 1994). Low-income households in Dar es Salaam, Tanzania, spent 85% of their incomes on food (SAWIO, 1993). Findings from a study carried out in Conakry, Guinea, show that food costs represent 53% of the total monthly

household expenditures, with differences between the richest socio-economic class spending 38% and the poorest class spending 64% (KEITA et al., 1999). And poor urban Kenyan households spent 40-50% of their household costs on food and cooking (LEE-SMITH et al., 1987).

Table 6.1. Monthly costs for food in the whole study population, in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo both during the dry and the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*
Dry Season								
Study Population		23.100	21.300	13.800-30.000	780	116.500	13.500	606
HGs		22.100	21.000	12.500-30.000	780	67.800	12.400	299
NHGs		24.000	21.400	15.000-30.000	2.700	116.500	14.400	307
Boulmiougou	HGs	25.700	24.000	16.400-32.200	9.000	67.800	11.700	102
	NHGs	28.800	25.500	18.600-34.100	9.000	116.500	15.900	109
Tanghin	HGs	21.800	21.700	13.600-28.300	780	53.500	11.200	109
	NHGs	21.700	19.900	14.300-28.100	2.700	55.500	11.100	100
Kossodo	HGs	18.300	13.900	8.100-27.200	2.500	54.600	13.600	88
	NHGs	21.000	17.000	10.900-28.700	3.000	79.500	14.500	98
Rainy Season								
Study Population		16.900	12.500	9.000-20.200	2.200	72.300	12.300	606
HGs		12.000	9.700	7.500-15.000	2.200	46.000	6.600	304
NHGs		22.000	17.500	10.600-32.000	3.000	72.300	14.500	302
Boulmiougou	HGs	14.700	12.100	9.000-18.000	3.000	46.000	7.900	100
	NHGs	27.100	25.200	13.500-38.400	4.000	72.300	15.800	102
Tanghin	HGs	12.600	11.700	8.100-15.700	2.200	33.400	6.100	101
	NHGs	15.500	14.400	10.100-19.100	4.900	36.900	7.000	100
Kossodo	HGs	8.500	7.500	6.000-9.500	3.000	29.100	3.800	103
	NHGs	23.200	19.000	9.000-34.100	3.000	69.500	16.300	100

* Number of interviewees.

During the rainy season the whole study population spent per household 12.500 CFAF monthly on food, which was significantly lower than the 21.300 CFAF spent monthly per household during the dry season ($p<0.001$, refer to Table 6.1.). This difference is derived from the different spending behaviors of HGs households during the two seasons. In the dry season HGs (21.000 CFAF) and NHGs households

(21.400 CFAF) spent more or less the same amount on food per month (refer to Figure 6.3. / right graph and Table 6.1.). In the rainy season HGs households had significantly lower expenditures for food than in the dry season ($p<0.001$). In the rainy season the monthly expenditures for food differed significantly between HGs (9.700 CFAF) and NHGs households (17.500 CFAF, $p<0.001$, refer to Figure 6.3. / right graph and Table 6.1.).

There are three main reasons for the different food expenditures during the two seasons.

First, the typical dish in Burkina Faso and, therefore, for the study population in Ouagadougou is Tô, a porridge with sauce (see Section 6.2.6.1.). Often the cereals are bought in bags of 25, 50 or 100 kg, which is less expensive than the daily purchase of smaller amounts. The cereals, particularly rice, which is the most expensive cereal and often only eaten on Sundays or holidays, are also sold in smaller portions, for instance, ‘tine’ (24 kg) or ‘plat’ (3 kg).

During and shortly after the rainy season prices for cereals are usually the lowest of the whole year. According to several cereal sellers on different markets in Ouagadougou, after the rainy season in 1999 100 kg rice cost 25.000 CFAF on average, while 100 kg maize and millet each cost 12.000 CFAF. In the dry season the prices can amount to up to 27.000 CFAF for 100 kg of rice and 16.000 CFAF for 100 kg of millet or maize. The quotations of the prices did not vary from one cereal seller to another (Personal Information, Ouagadougou, 1999).

The price fluctuation could be one reason for the difference of 11.300 CFAF ($p<0.001$) in food costs in HGs households between the dry and rainy season. In NHGs households the monthly expenditures for food were 3.500 CFAF higher in the dry than in the rainy season.

The second reason could be the given cycle of cultivation of cereals. In Ouagadougou, as in all Sub-Saharan countries, cultivation of cereals is done with rainwater exclusively during and shortly after the rainy season. During this period HGs households can consume their own products and do not have to pay for cereals. Most of the HGs households (78% of the interviewed HGs households during the rainy season) cultivated their own cereals either in their home gardens or in the villages they come from (refer to Chapter 7, Section 7.3.2.).

The HGs cultivate cereals to provide a subsistence, and cultivate vegetables to provide a further income, as a HG (male, aged 35) of Tanghin explained:

> *"I cultivate to stock my own millet and do home gardening to earn some money*...[ ]...*Family health, children's schooling, clothes and other expenditures are all covered with this money."*

As the cereals do not last until the next harvest, people are forced to buy cereals in the dry season. Unfortunately, at the moment it is impossible for the people to stock their cereals in order to avoid the higher purchase prices in the dry season and to sell their cereals at higher prices later during the dry season.

A third reason for the seasonal variations in food cost could be the cycle of cultivating vegetables. Tô consists of a cereal porridge eaten with sauce. This sauce normally contains a selection of spices, vegetables, fish and/or meat. Among these ingredients meat and European vegetables are the most expensive. European vegetables cost always more on the daily markets than the traditional vegetables. Moreover, in Sub-Saharan countries, such as Burkina Faso, the local production of vegetables comes to a complete halt at the end of the dry season. Vegetables have to be imported from other West African countries or from Europe, which is more expensive than using vegetables from the local production because of unfavorable exchange rates, high import taxes and transport and storage costs (SMIT et al., 1996). On local markets in Ouagadougou the European vegetables cost one to four times more in the dry season than in the rainy season and traditional vegetables are also priced slightly higher (average price estimation of 100 different households, Ouagadougou, 2000).

The cycle of home gardening depends completely on the quantity of rainwater, which only falls in the rainy season, since it is used for irrigation purpose. The duration of home gardening therefore varies. On average water runs dry at the end of April. Then HGs households have to buy their vegetables on the local markets.

In summary, HGs households were capable of providing cereals and vegetables for themselves in the rainy season. They spent half as much in food as NHGs households. Thus, the view that home gardening reduces the vulnerability to food crises in HGs households (BOS, 1994; DRESCHER, 1996a; SMIT et al., 1996) is confirmed for the rainy season of the year.

However, in the dry season the food costs in HGs households were about the same as in NHGs households. The subsistence production of cereals and vegetables was interrupted; HGs households ran out of stored food and had to purchase the daily food at a time when prices were the highest.

As the HGs households had only a slightly higher estimated average monthly income during the dry season than during the rainy season, their expenditures coverage rate -the estimated monthly income divided by the predictable monthly expenditures- was lower in the dry season than in the rainy season. The HGs households had expenditures coverage rates of 70% (directly estimated average monthly income) and 118% (indirectly estimated average monthly income) in the rainy season. They had lower expenditures coverage rates of 45% (directly estimated average monthly income) and 62% (indirectly estimated average monthly income) in the dry season, while the NHGs households had expenditures coverage rate of 179% in the rainy season (directly estimated average monthly income) and 126% (directly estimated average monthly income) in the dry season.

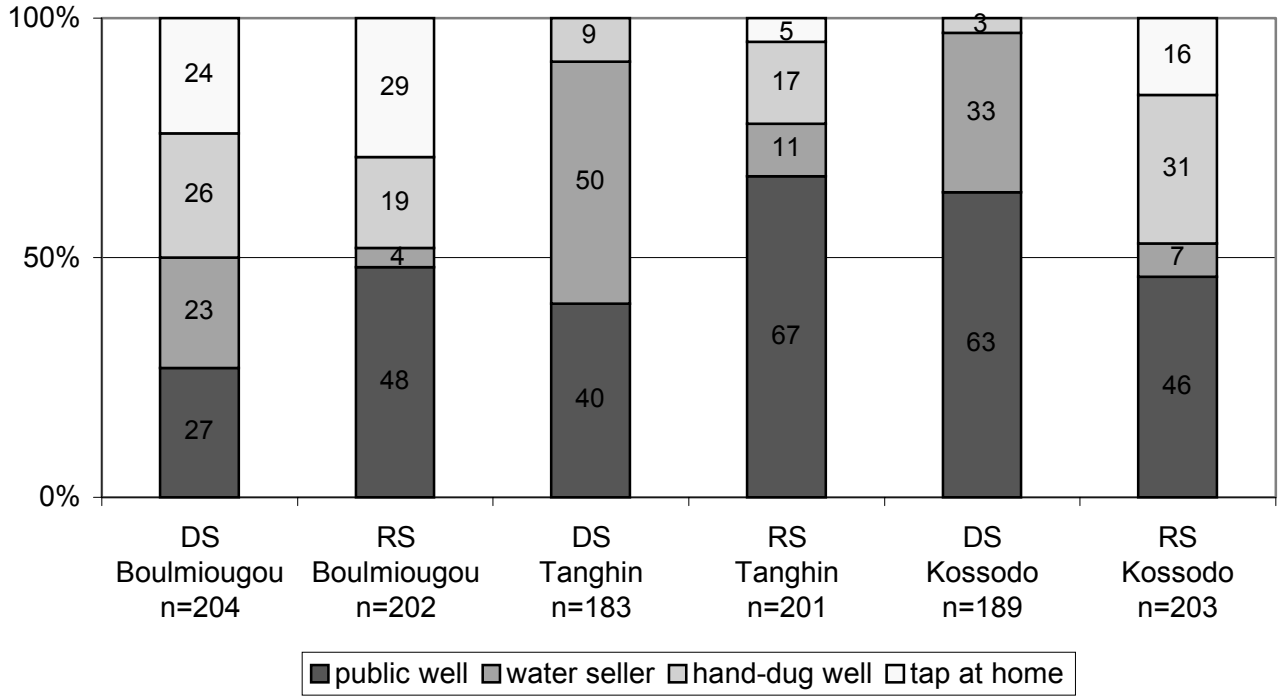
6.3.1.3. Drinking Water Sources

There are four possibilities of obtaining drinking water in Ouagadougou: at a tap at home, at a public well in the quarter, by a water seller and at a hand-dug well.

The use of different drinking water sources according to the two seasons is shown in Figure 6.5. The public well was the most common drinking water source for the whole study population both during the dry and the rainy season. However, in all sites it was used significantly more in the rainy season than in the dry season ($p<0.001$). This fact could be linked to the different percentages of people buying drinking water from a water seller during the dry and the rainy season. In Boulmiougou 23% (n=46/204) of the households bought water from a water seller in the dry season, in Tanghin 50% (n=91/183) and in Kossodo 33% (n=63/189). During the rainy season the proportion decreased significantly in each of the three sites ($p<0.001$). In Boulmiougou only 4% (n=8/202) bought water from a water seller, in Tanghin 11% (n=22/201) and in Kossodo 7% (n=14/203). It was very likely that this shift was the result of people taking water from a public well in the rainy season

instead of buying water from a water seller. Public wells are filled up with rainwater in the rainy season once a year, afterwards they are used as water sources till they run dry which normally happens at the end of the dry season in April/May. The dry season in 1998 was a particularly difficult season as rainwater was running short very early in this season (see Chapter 5, Section 5.3.3.).

Figure 6.5. Comparison of the different drinking water sources in all households in Boulmiougou, Tanghin and Kossodo both during the dry and the rainy season



One other fact has to be pointed out. The number of households with a tap at home increased between the dry season of 1998 and the rainy season of 1999. This growth was most remarkable in the NHGs households of all three sites. In Boulmiougou there was an increase from NHGs households with a tap at home from 34% (n=36/107) to 48% (n=49/102), in Kossodo from 0% to 31% (n=31/100, $p<0.001$) and in Tanghin at a lower level from 1% (n=1/92) to 8% (n=9/199, $p=0.011$). This increase was probably caused by a time difference rather than by a seasonal difference. The present study was carried out 18 months after the

complementary study of the dry season. During April 1998 and October 1999 an increase in the socio-economic status was noted, particularly, at least in households without home gardens.

The installation costs for obtaining a tap at home have to be fully paid by the owner of the house. The government-owned company ONEA (Office Nationale de l'Eau et de l'Assainissement) has four installation centers in Ouagadougou. For 2.000 CFAF households can obtain an estimate of the installation costs there. The final installation costs start at 150.000 CFAF, but depend on the location of the house in town (Interview with Laurent Traore, Chef de Service Gestion Clientèle du Département de Ouagadougou, Ouagadougou, 2000).

The expenditures for drinking water did not seem to depend on seasonal variations. In two of the three examined sites, Boulmiougou and Kossodo, there were no significant differences between the two seasons. People in Boulmiougou spent 1.700 CFAF per month (Q_{25}-Q_{75}: 320-3.000 CFAF) in the dry season and 1.800 CFAF (Q_{25}-Q_{75}: 290-2.600 CFAF) in the rainy season. In Kossodo they spent 1.500 CFAF (Q_{25}-Q_{75}: 600-3.100 CFAF) and 1.800 CFAF (Q_{25}-Q_{75}: 500-3.800 CFAF), respectively.

A significant decrease in the monthly expenditures for water in the rainy season could only be seen in the households in Tanghin ($p<0.001$). The costs decreased from 1.800 CFAF (Q_{25}-Q_{75}: 980-4.800 CFAF) to 730 CFAF (Q_{25}-Q_{75}: 240-1.700 CFAF). The switch of the most frequent drinking water source used in the two seasons could explain this decrease. The expenditures for obtaining these two drinking water sources -public well and water seller- were different (see below). In the rainy season only 11% of Tanghin's population bought water from a water seller and 67% got water from a public well, while in the dry season 39% more people bought water from a water seller and only 40% got water from a well (refer to Figure 6.5.).

ONEA has the right to rent out public wells in the quarters of the town. Private people can rent public wells. They pay 186 CFAF for one cubic meter and report to ONEA every two weeks. They must sell the water of the public wells at fixed prices. A bucket of 20 liters costs 5 CFAF, a canister of 40 liters costs 10 CFAF and a barrel of 220 liters costs 60 CFAF. The price to obtain water from a public well stays the same

for the entire year (Interview with Laurent Traore, Chef de Service Gestion Clientèle du Département de Ouagadougou, Ouagadougou, 2000).
The water sellers in town, however, do not depend on the fixed price system of ONEA. Their prices depend on the two seasons. In the rainy season they take already six to seven times more for their water than at a public well. A 220-liter-barrel costs between 450 and 500 CFAF. In the dry season the price can increase up to 800-1.000 CFAF for one barrel (Personal Observation, Ouagadougou, 1999/2000; Interview with Laurent Traore, Chef de Service Gestion Clientèle du Département de Ouagadougou, Ouagadougou, 2000).

With a share of 8% of the monthly predictable costs, in both the dry and the rainy season, the monthly expenditures for water were, together with the expenditures for energy, the smallest household expenditures (refer to Figure 6.4.). However, especially for the poorer households of the study population 8% was not a negligible part of their total monthly household expenditures. Moreover, they did not have the assurance of safe drinking water. A HG (male, aged 35) of Tanghin said:

> *"Is drinking water really contaminated? As we take the water out of a well, we have no idea."*

More information on this subject is given in Chapter 7, Section 7.3.3.

6.3.1.4. Types of Fuel for Cooking

The different types of fuel for cooking used in Ouagadougou are wood, gas, charcoal, kerosene and millet stalk. Making up 15% of the monthly predictable costs in the whole study population both in the dry and the rainy season, fuels for cooking were the second largest monthly costs. Moreover, the amount spent on fuel for cooking did not seem to depend on seasonal variation (see Table 6.2.).

There were no big differences in the amount spent per month on fuel for cooking between the sites or within the seasons (refer to Table 6.2.). The difference between the costs during the dry and the rainy season was 1.000 CFAF in Boulmiougou and 1.300 CFAF in Kossodo. Only in Tanghin there was a significant decrease of the

costs from 6.000 CFAF in the dry season to 2.500 CFAF in the rainy season ($p<0.001$).

Table 6.2. Monthly costs for fuel for cooking in all households in Boulmiougou, Tanghin and Kossodo both during the dry season (DS) and the rainy season (RS)

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*
Boulmiougou	DS	4.500	4.500	3.000- 5.500	0	16.800	2.600	190
	RS	4.800	3.500	1.700-6.800	0	15.000	4.300	37
Tanghin	DS	5.400	6.000	3.000-6.000	0	30.000	3.400	174
	RS	3.200	2.500	1.600-4.500	0	7.500	2.100	37
Kossodo	DS	4.600	4.500	3.000-6.000	0	22.500	3.400	175
	RS	3.300	3.200	2.000-4.500	200	7.500	1.600	38

* Number of interviewees.

Wood was the most common source for cooking in all households (refer to Table 6.3.) in all sites and in all seasons. The lowest percentage of wood as a fuel was registered in the dry season in Boulmiougou with 73%, the highest share was also in the dry season in Kossodo with 87%.

Gas, as another possibility for cooking, increased significantly in Tanghin ($p<0.001$) and Kossodo ($p=0.05$) between the dry season 1998 and the rainy season 1999. In Tanghin 11% of the households were using gas in the rainy season compared to 1% in the dry season. In Kossodo 4% of the households were using gas in the rainy season, but none of the households were using gas in the dry season (refer to Table 6.3.).

Considering HGs and NHGs households separately during the two seasons, the difference was even more remarkable. In NHGs households in Tanghin the use of gas increased from 3% (n=3/97) in the dry season of 1998 to 16% (n=16/100) in the rainy season of 1999. In Kossodo there was an increase of 1% (n=1/99) in the dry season of 1998 to 8% (n=8/100) the rainy season of 1999.

Table 6.3. Distribution of the different fuels used for cooking in all households in Boulmiougou, Tanghin and Kossodo during the dry season (DS) and the rainy season (RS)

			Wood		Gas		Char-coal		Kero-sene		Millet stalk		No cooking	
		n	[%]	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]	n
Boulmiougou	DS	203	73	148	14	29	6	12	7	14	0	0	0	0
	RS	202	81	164	10	20	4	8	1	1	0	0	4	9
Tanghin	DS	201	81	163	1	3	0	0	1	1	3	7	13	27
	RS	201	76	153	11	23	1	2	1	1	0	0	11	22
Kossodo	DS	190	87	164	0	0	1	2	1	2	5	10	6	12
	RS	203	82	167	4	8	0	0	0	0	0	0	14	28

Again, the reason for the increase was more likely the time difference than the seasonal difference. Ouagadougou underwent the normal infrastructure expansion of all towns, which could be noted, particularly, in households without home gardens. In addition to the infrastructure expansion there could be another explanation for the increase in gas as a cooking source. To reduce deforestation, a big government-supported campaign to promote the use of gas has been held in Burkina Faso for the last years, but it seems not to be very successful according to a study in 1998 (INSD, 1998). One reason was probably the high purchase costs for the bottle of gas. A bottle of gas costs between 7.000 and 9.000 CFAF (Personal Observation, Ouagadougou, 1999). A positive switch could, however, be registered among the study population.

The two other cooking sources, charcoal and kerosene, were not used commonly among the study population in all sites and in all seasons (refer to Table 6.3.). Kerosene reached the highest percentage of these two fuels with 7% (n=14/203) in Boulmiougou in the dry season.

Millet stalk as the last fuel, disappeared completely during the rainy season, but also in the dry season it was only used in Tanghin with 3% (n=7/201) and Kossodo with 5% (n=10/190). The reason could be the lack of dry millet stalk in the rainy season.

After the harvest of millet in October it takes some time to dry the stalk so that it can be used as a fuel for cooking.

In conclusion, wood played a major role as a fuel for cooking in both seasons, in all sites and in both activity groups. All other possibilities played only a modest part. A total of 80% of the total study population cooked with wood in the dry and in the rainy season. This percentage lay between the results of two studies carried out in 1996 and 1998, in which 70% and 90%, respectively, of the households used wood as the most common fuel for cooking (INSD, 1996; INSD, 1998). In poor countries with annual per capita incomes of US $300 or less (Burkina Faso: US $240) at least 90% of the population depends on wood for cooking (BARNES et al., 1997).
However, wood for cooking has numerous disadvantages. First, wood is far less efficient than other energy sources. Second, burning wood for cooking on open fires presents a major health hazard (see Section 6.3.2.3.3.3.). Third, many people, especially children, must spend several hours each day for gathering wood. This leaves less time for schooling. Fourth, and probably most important, the use of wood fuels causes serious problems on the environment, leading to deforestation, soil erosion and reduction of soil fertility. Because of the given deforestation and the Sub-Saharan climate, which complicates reforestation campaigns, there is a great need for other cooking sources (BARNES et al., 1997). Between 1990 and 1995 the annual deforestation increased at 0.7% each year in Burkina Faso (WORLD BANK, 2000/01). In many low-income countries a considerable proportion of the poor urban population uses wood or charcoal for cooking. Government-supported campaigns for using gas or alternative fuels for cooking are a first positive step. Nevertheless, alternative methods for cooking are still used in much too low a degree.
The different food availability during the dry and the rainy season and the almost exclusive use of wood to prepare food are some of the biggest risk factors that the populations of Saharan and Sub-Saharan countries are confronted with.

6.3.1.5. Energy

The expenditures for energy contain the monthly costs for either electricity or kerosene. The interviewees were asked for the use of these two sources and their

costs. These questions were asked in the context of lighting the house and not as fuels for cooking.

The contribution of energy costs to the total monthly predictable costs increased from 4% (1.200 CFAF) in the dry season 1998 to 8% (1.800 CFAF) in the rainy season 1999 (refer to Figure 6.4.). This was most likely linked with the significant increase in electrical connections in the examined households between the dry season of 1998 and the rainy season of 1999.

In the present study during the rainy season 1999 21% (n=126/606) of the total study population had electricity at home. In the complementary study during the dry season 1998 only 11% (n=69/613) of all examined households had electricity at home (refer to Table 6.4.). The increase was still more evident in NHGs households. With an increase between 33% in Kossodo, 21% in Boulmiougou and still 9% in Tanghin the difference of NHGs households having electricity at home in the dry season and in the rainy season was significant at all three sites.

Table 6.4. Proportion of households -all, home gardeners (HGs), non-home gardeners (NHGs)- having electricity at home in Boulmiougou, Tanghin and Kossodo during the dry season 1998 and the rainy season 1999

		Electricity at Home Dry Season 1998		Electricity at Home Rainy Season 1999		
		[%]	n	[%]	n	p
Study Population	All	11	69 / 313	21	126 / 606	p<0.001*
	HGs	6	17 / 303	5	14 / 304	P=0.353
	NHGs	17	52 / 310	37	112 / 302	p<0.001*
Boulmiougou	All	23	49 / 213	33	66 / 202	p=0.018*
	HGs	8	9 / 102	8	8 / 100	p=517
	NHGs	36	40 / 111	57	58 / 102	p=0.002*
Tanghin	All	9	19 / 209	13	26 / 201	p=0.139
	HGs	6	7 / 109	5	5 / 101	p=0.438
	NHGs	12	12 / 100	21	21 / 100	p<0.001*
Kossodo	All	0.5	1 / 191	17	34 / 203	p<0.001*
	HGs	1	1 / 92	1	1 / 103	p=0.722
	NHGs	0	0 / 99	33	33 / 100	p<0.001*

* significantly different

As with the increase in water taps and gas at home, the rise of electricity was probably mainly caused by the time difference rather than by the seasonal difference. Similar to the installation of a tap at home, the costs for the installation of electricity also have to be fully paid by the owner of the house. On average they have to pay 238.000 CFAF to the government-owned power station SONABEL (Société Nationale Burkinabé d'Electricité) for obtaining electricity (Interview with Mathieu Ouedraogo, Chef de Gestion R.A.F. de SONABEL, Ouagadougou, 2000).

Despite the high installation costs, 31% of the households in Ouagadougou have their own electricity connection, according to a study of the ministry of economy and finances carried out in 1998 (INSD, 1998). This percentage was higher than what was found in this study.

In developing countries the first costs associated with getting access to modern sources of energy are often enormously high. The fees for being connected can range between US $20-1.000 (BARNES et al., 1997). Taking the exchange rate from 1999 of 600 CFAF for US $1, the city-dwellers of Ouagadougou paid approximately US $400 to be connected to the electricity system of the town.

In developing countries the transition to modern fuels is usually complete by the time annual per capita incomes reach US $1.000-1.500 (BARNES et al., 1997). This was also true in this study, where households with electricity at home had an average annual income of US $1.350, while households without electricity had an annual average income of US $250 (the income estimation of the study of the rainy season was used).

For the whole study population the amount spent on electricity increased significantly from 3.500 CFAF per household per month in the dry season, to 7.000 CFAF per household per month in the rainy season. However, the costs for one kilowatt-hour have not changed since 1994 and contain 86 CFAF exclusive tax (Interview with Mathieu Ouedraogo, Chef de Gestion R.A.F. de SONABEL, Ouagadougou, 2000).

With the exception of Kossodo, the costs for kerosene decreased on average by 650 CFAF per household per month in the rainy season. In the dry season the households in all three sites spent 1.000 CFAF monthly and in the rainy season the households spent between 300 CFAF and 1.200 CFAF monthly.

To summarize, there was a significant increase in the number of households having electricity at home between the dry season of 1998 and the rainy season of 1999. However, the increase was higher in NHGs than in HGs households. Also the monthly costs for electricity increased significantly within these 18 months.

Most of the country's electricity is produced in thermal installations. Most of them burn refined petroleum, 100% of which has to be imported (BURKINA FASO, 2000). The price of one kilowatt-hour of electricity is very high in comparison to the price for kerosene. The majority of the population can not afford these costs. In addition, the pre-installation has to be paid by the households themselves. Until this system for obtaining electricity changes, this source remains a privilege for the richer classes, while most households will remain without electricity.

6.3.2. Unpredictable Costs

To obtain a relatively exact statement of all monthly expenditures in a household the unpredictable costs must be added to the predictable costs, which were discussed in the sections before. Unpredictable costs occur irregularly in a household and people can not count on them in advance. In general unpredictable expenditures can arise in the case of an illness in the household or for leisure. To describe the total monthly costs in a household these unpredictable costs are calculated per month (see Section 6.2.6.2.).

6.3.2.1. Unpredictable Costs in the Context of the Total Monthly Costs in the Rainy Season

The absolute amounts spent for leisure (for exact numbers refer to Section 6.3.2.2.) or medical care (for exact numbers refer to Section 6.3.2.3.) did not differ enormously between and within the sites in the rainy season.

However there were variations in the proportion of these costs to the total monthly costs. The proportion of the total costs spent on leisure varied from 4% to 12% between the different sites and groups. The costs for medical care were more equivalent and had a percentage between 2% to 7% with the exception of HGs households in Boulmiougou with 11%.

When analyzing the predictable and unpredictable monthly household expenditures together they were significantly higher in NHGs than in HGs households in each of the three sites ($p<0.001$). The NHGs households in Boulmiougou spent a total of 36.900 CFAF monthly whereas the HGs households spent only 21.100 CFAF. In Tanghin the NHGs households spent 22.900 CFAF per month and the HGs households 18.000 CFAF. In Kossodo the NHGs household spent a total of 28.300 CFAF monthly and the HGs households only 17.000 CFAF.

The total amount of expenditures differed also in the NHGs households in the three sites. The difference in total expenditures between Boulmiougou, the site with the highest expenditures, and Tanghin, which had the lowest expenditures, was 14.000 CFAF.

There were also differences in total monthly expenditures between HGs households in the three sites, but these differences were on a lower level than those of NHGs

households. The HGs of Boulmiougou had significantly higher expenditures than the HGs of Tanghin and Kossodo with differences of 3.100 CFAF and 4.100 CFAF, respectively ($p<0.001$).

According to the results of the predictable expenditures, the NHGs households had higher total monthly costs than the HGs households in each of the three sites. In addition, the total monthly costs also were not similar in HGs households across the examined sites.

6.3.2.2. Unpredictable Monthly Expenditures: Leisure

Leisure consists of going out, family celebrations and holidays. In general holidays are regular events that come once a year. The most important holidays are Christmas and Easter for Christians and Ramadan and Tabaski for Muslims. In Burkina Faso in urban regions 62% of the population is Muslim and 34% is Christian. The number of animists has decreased to 26% of the total population in the last years (LEREBOURS PIGEONNIERE & JOMNI, 1998).

All these holidays fall in the dry season of the year and were considered only in the complementary study after the dry season. In Sub-Saharan Africa also predictable family celebrations, such as weddings, are submitted to a strict annual rhythm. Weddings, which are the most expensive ceremonies in comparison to baptisms and funerals, are only celebrated after harvesting in the beginning of the dry season (see Photo 37). Weddings therefore also could not influence the costs for leisure in the rainy season.

A distinction was made in the analysis of leisure costs between the costs for leisure in the dry and the rainy season. In the analysis of the rainy season the expenditures for leisure consist of going out such as to the cinema or dancing. It was assumed that the few family celebrations occurring during the rainy season would be included in these unpredictable costs.

6.3.2.2.1. Leisure Costs in the Rainy Season 1999: Cinema, Dancing, Tobacco, Drinks

The total expenditures for leisure included the costs for going out dancing and to the cinema, and for alcohol, soft drinks and tobacco. There was no significant difference between the expenditures for leisure across the three sites. The different households spent 1.700 CFAF (Q_{25}-Q_{75}: 290-4.600 CFAF) in Boulmiougou, 1.600 CFAF (Q_{25}-Q_{75}: 250-3.800 CFAF) in Tanghin and 1.500 CFAF (Q_{25}-Q_{75}: 0-4.500 CFAF) in Kossodo. However, significant differences were seen between the HGs and NHGs households in each of the three sites (refer to Table 6.5.). In Boulmiougou NHGs households spent almost the double (3.000 CFAF) than HGs households (1.300 CFAF, p=0.003). In Tanghin NHGs households spent 4.000 CFAF while HGs households spent 1.800 CFAF (p=0.001). It should be noted that between 20% and 24% of the study population had no expenditures for leisure in these two sites, which increased the absolute costs (mean expenditures) for those going out (see Table 6.5.).

Table 6.5. Monthly costs for leisure*[1] in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo during the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	[%] of all costs*[2]	N*[3]	N*[4] no costs
Boulmiougou	HGs	2.200	1.300	250-3.000	0	15.000	2.700	7	100	23
	NHGs	4.500	3.000	500-6.000	0	29.000	5.700	4	102	20
Tanghin	HGs	1.800	1.500	100-2.400	0	9.000	2.100	8	101	24
	NHGs	4.000	2.500	460-5.000	0	30.000	5.600	12	100	20
Kossodo	HGs	2.300	2.300	0-4.500	0	10.500	2.100	10	103	26
	NHGs	3.400	50	0-4.400	0	27.000	5.600	7	100	50

*[1] Costs for leisure include: cinema, dancing, alcohol, soft drinks and tobacco.
*[2] Contribution to the total monthly costs in households.
*[3] Number of interviewees.
*[4] Number of interviewed people who estimated to have no costs for or in their leisure per month.

The expenditures for leisure in Kossodo could lead to the assumption that the HGs households spent, with 2.300 CFAF, more for leisure than the NHGs households,

which spent 50 CFAF. This is because 50% of the NHGs households had no expenditures for leisure compared to 25% of the HGs households. The 50% NHGs in Kossodo who were going out spent on average 3.400 CFAF, while the HGs spent only 2.300 CFAF (refer to Table 6.5.).

The different number of people going out in each of the three sites and between the sites is also worth mentioning. In Boulmiougou every second HG and NHG estimated to go out at least once a month. However, in Tanghin only 10% HGs compared to 40% NHGs were going out ($p<0.001$) and in Kossodo 10% HGs, but 30% NHGs were going out monthly. There was also a significant difference between the sites. More than fifty percent (53%, n=108/202) of the households in Boulmiougou went out at least once a month, but only 27% (n=54/201) of the households in Tanghin and 22% (n=45/203) of the households in Kossodo went out monthly.

At 7-12% of the total monthly expenditures, the amount spent on leisure is considerable with the exception of NHGs households in Kossodo with 4%.
This high percentage was surprising, but not completely unexpected, considering the culture and tradition in Africa. An attempt to describe the importance of social nets in comparison to expenditures for going out is given below. In addition, the expenditures for leisure in NHGs households obtained in this study were confirmed by another household study carried out in Ouagadougou in 1998 (INSD, 1998). In that study households with an average size of between four and six people, which was equivalent to this study, spent 4.100 CFAF a month for their leisure (INSD, 1998).

Although going out has a high priority in the African society, the results of this study confirmed again that there were differences in these expenditures in HGs and NHGs households. NHGs households spent in general more on leisure than HGs households and the frequency of going out per month was also higher for NHGs than for HGs. One HG (male, aged 35) of Tanghin explained:

> *"I educated my family not to celebrate ceremonies and parties, because there is not always money available. The day we earn something is our personal day of ceremony."*

Taking the expenditures and the frequency of going out as a base, one could assume that HGs belong to a lower socio-economic class than the NHGs. Differences were also seen between the sites. Boulmiougou was the site with the highest expenditures for leisure and the highest frequency of going out, while Kossodo was the site with the lowest expenditures and the lowest frequency of going out. For more information on the different socio-economic status in HGs and NHGs households refer to Chapter 8.

Each culture has its own social net and it is always very difficult to understand how it works. There are very complex behaviors to cultivate and maintain a social net. Attempts to explain certain behavior patterns in a culture are risky, always incomplete and must be seen as an estimate.

The importance of going out is not comparable in African and Western cultures. In Africa going out has a different importance than it has in Western cultures. In Western cultures today it is more and more common for everybody to pay his own expenditures for a meal in a restaurant or for the cinema. In Africa, however, there is no doubt that someone who is going out invites all people who are with him. At the end of an evening it is expected that one person will pay the bill for all the people who went along with him. Sometimes this custom can also result in never ending discussions (Personal Observation, Ouagadougou, 1999; Cissé, Personal Information, Ouagadougou, 2000).

Going out and inviting friends and the family is very important in maintaining the social net. Perhaps even more important than in Western countries, in Africa it is absolutely necessary to belong to a certain social net, which facilitates the organization of daily life, but which also helps in economic crises and financial bottlenecks (Ouedraogo, Personal Information, Ouagadougou, 2000). Cultural identity is maintained through rituals, celebrations, and festivals, and poor people frequently mention participation in these events (NARAYAN et al., 2000a). Social solidarity is often one of the most important assets available to poor people. Maintaining this solidarity or social net is of extreme value for poor people and the inability to reciprocate with gifts or participate in community events can have harmful consequences such as the exclusion from the social network.

Friends and family are part of the social net. The importance of family in Africa is emphasized by its inclusive definition. A ‘family’ in Africa includes the extended

family. As an example, a cousin is always called a brother all other names would express an exclusion of this family member. The African family includes therefore cousins as brothers or sisters, nephews and nieces as children, and aunts and uncles as mothers and fathers. All are parts of the personal social net (Kone, Personal Information, Ouagadougou, 1999; Cissé, Personal Information, Ouagadougou, 2000; SOME, 1999).

6.3.2.2.2. Leisure Costs in the Dry Season 1998: Family Ceremonies and Holidays

After the harvest is done, the dry season is reserved for many different socio-economic activities, such as trips for visiting friends, weddings and reconstructing the houses (OUEDRAOGO, 1990). Therefore in the complementary study carried out after the dry season the costs for leisure consist of the costs for family ceremonies and holidays (refer to Table 6.6.).

The costs for holidays in the dry season were slightly higher than the costs for leisure during the rainy season (refer to Table 6.5.). Two reasons are possible. First, different approaches were taken to calculate the unpredictable costs, which are fully discussed in the methods section (refer to Section 6.2.6.2.).
Second, seasonal variations could be responsible for the higher costs for leisure in the dry season. Approximately 100% of the study population was either Christian (n=292/613) or Muslim (n=312/613) and celebrated, according to their religion, Christmas at the end of December or Tabaski at the end of the Ramadan in February. Both Christmas and Tabaski are the most important holidays in Ouagadougou and every household spent a lot celebrating these holidays. These costs entered only in the unpredictable costs of the complementary study, because Christmas and Tabaski were both celebrated during the dry season. Worth mentioning in this context is also that Christians and Muslims had more or less the same expenditures for their last holidays. The average Muslim household spent 500 CFAF to celebrate Tabaski and the average Christian household spent 730 CFAF to celebrate Christmas (p=0.507).

Table 6.6. Monthly costs for family ceremonies*[1] and holidays*[2] in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo during the dry season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*[3]
Family Ceremonies								
Boulmiougou	HGs	24.800	29.500	10.000-35.000	10.000	35.000	13.100	3
	NHGs	12.800	15.000	2.900-20.400	500	20.500	9.400	4
Tanghin	HGs	3.600	500	100-1.600	25	75.000	11.300	62
	NHGs	4.100	880	100-2.800	100	39.000	7.900	64
Kossodo	HGs	1.000	150	100-500	25	20.000	3.500	50
	NHGs	1.200	250	100-500	25	10.000	2.700	79
Holidays								
Boulmiougou	HGs	8.100	6.700	3.800-11.700	330	23.300	5.200	86
	NHGs	6.500	5.300	3.300-8.300	330	25.000	5.500	82
Tanghin	HGs	5.500	5.000	2.300-8.300	330	16.700	3.800	88
	NHGs	5.900	5.000	1.700-8.300	330	28.300	4.900	85
Kossodo	HGs	4.400	4.200	2.500-6.700	670	10.000	2.500	39
	NHGs	4.800	4.200	2.500-6.700	400	16.700	3.300	67

*[1] To obtain the monthly costs for ceremonies only the costs for the family ceremony held in the last month of the complementary study (April 1998) were taken (MÜLLER, 1999).
*[2] To calculate the monthly costs for holidays which are Christmas and Ramadan/Tabaski in the dry season, the given costs for these holidays were divided by three because these holidays were celebrated three months before the complementary study was carried out (MÜLLER, 1999).
*[3] Number of interviewees.

The costs for family ceremonies, such as weddings, funerals, baptisms and traditional parties never surpassed 880 CFAF a month in the different households, with the exception of Boulmiougou. In this site only three HGs households and four NHGs households had a family celebration in the last month of the complementary study. The costs for these family ceremonies were estimated by the HGs households to be 29.500 CFAF and by the NHGs households to be 15.000 CFAF. The interviewees probably overestimated their expenditures.

However, it is difficult to define general expenditures limits for family ceremonies, which is shown by the following account of a HG (male, aged 54) in Kossodo:

> *"What about the ceremony expenditures? These depend on the money available. If you can, you kill a cow. I can only afford a sheep."*

The importance of belonging to a certain social net, which is achieved through a number of ceremonies and symbolical presentations, is for many urban Africans as important as the possibility of belonging to an economic status that allows one to acquire all the basic needs (SOUMARE & GERARD, 1999). The results of the study agree with this statement.

To summarize, the proportion of the total costs spent on leisure was relatively large in the dry season as well as in the rainy season. In addition, the HGs households, which could in the best case hardly cover their daily basic needs with their daily income (see Chapter 7, Section 7.3.8.) also had a high percentage of these expenditures.

6.3.2.3. Economic Impact of Ill-Health and Medical Care

6.3.2.3.1. Expenditures for Medical Care in the Rainy Season

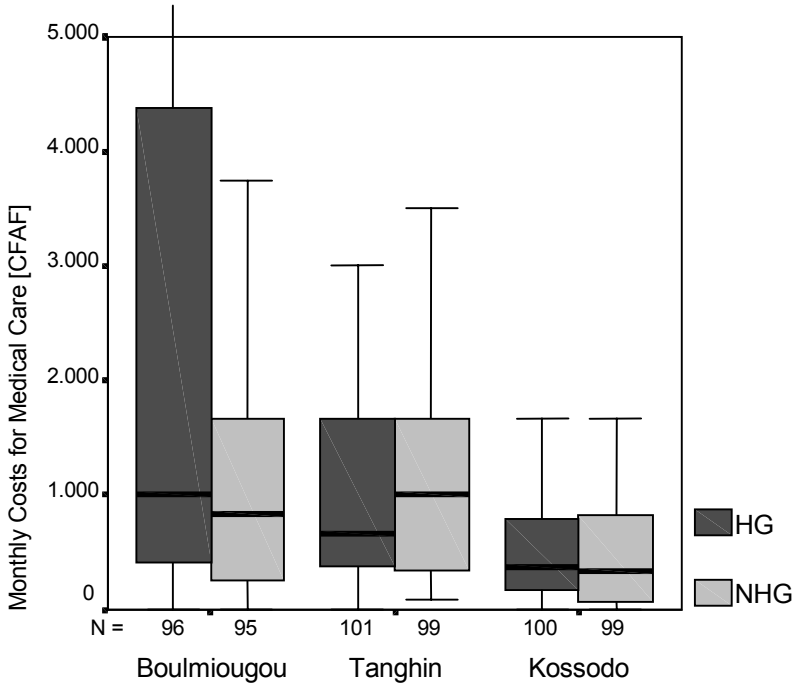
Well-being is a combination of sufficient material things and physical health:

> *“You are poor if you don’t have enough money to be sure to have sufficient food, to stay healthy and to achieve all the basic needs for your family.”*
> Cultivator (male, aged 25, socio-economic class 1/2) in Kossodo

The monthly costs for medical care were obtained by multiplying the costs for treatment of the last occurred illness in a household with the number of sick people in this household during the rainy season and dividing the amount by six (see Section 6.2.6.2.).

In the rainy season the whole study population did not spend much to treat illnesses, with 330 CFAF to 1.000 CFAF monthly (refer to Figure 6.6.). The costs for treatment did not differed significantly in HGs and NHGs households in the three different sites. In Boulmiougou HGs households spent for medical care 1.000 CFAF monthly (Q_{25}-Q_{75}: 420-4.200 CFAF) and NHGs households spent 830 CFAF (Q_{25}-Q_{75}: 250-1.700 CFAF). In Tanghin HGs households spent for medical care 650 CFAF monthly (Q_{25}-Q_{75}: 380-1.700 CFAF) and NHGs households spent 850 CFAF (Q_{25}-Q_{75}: 350-1.700 CFAF). The expenditures in HGs and NHGs households in Kossodo were significantly lower than in the two other sites. HGs households spent 360 CFAF (Q_{25}-Q_{75}: 170-830 CFAF) a month for medical care and the NHGs households spent 330 CFAF (Q_{25}-Q_{75}: 40-830 CFAF).

Figure 6.6. Monthly costs for medical care in home gardeners' (HG) and non-home gardeners' (NHG) households in Boulmiougou, Tanghin and Kossodo during the rainy season



Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

In Boulmiougou the contribution of health expenditures to the total monthly household expenditures in HGs households was, at 11%, extraordinary high. In all other sites the amount spent on medical care was one of the lowest of the total monthly household costs. In NHGs households it was in Boulmiougou 3%, in Tanghin 5% and in Kossodo 2%. In HGs households it was in Tanghin 7% and in Kossodo 3%.

In a study of all households in the country the cost for medicine amounted to 2.900 CFAF, which made up, on average, 4% of the total household costs (INSD, 1998). In a study of rural households in the northern area of Burkina Faso the costs for illness were 4.000 CFAF per month for the average households. This amounted to 6.2% of the monthly household expenditures (SAUERBORN et al., 1995). However it must be taken into consideration that in the cited study all costs of illness, not only for medical care, but also for the time costs of the sick person and the caretakers were involved in the figure (SAUERBORN et al., 1995). In the Central African Republic the monthly health care expenditures per episode of illness were 2.6% of the monthly household consumption (WEAVER et al., 1996).

In 1993 the World Bank Report 'Investing in Health' estimated that the annual cost per capita for health care was US $24 in Sub-Saharan Africa (WORLD BANK, 1993). However, 50% of the population in Sub-Saharan Africa does not have access to any form of public health (SKÖLD, 1998). In Sub-Saharan regions the public expenditures on health were 3.1% of the GNP (UNDP, 1993); in Burkina Faso the same expenditures were only 1.2%, which is under US $2 per capita per year (WORLD BANK, 2000/01). A national health system is not enforced effectively (VAN ADAMS & HARTNETT, 1998). In 2000 the WHO estimated the out-of-pocket health expenditures per capita of 26 international dollars[*] in Burkina Faso (WHO, 2000). No distinction was made between urban and rural settings or between higher and lower socio-economic classes. According to another study about health care expenditures, in Burkina Faso households spend US $8 per capita for health care and the government spent just US $1.9 (MAKINEN et al., 2000).

[*] Out-of-pocket health expenditures in international dollars are private spending for health in a country adjusted for purchasing power in this setting (Evans, Personal Information, Geneva, 2001).

When taking the monthly health expenditures of the rainy season, each of the interviewed households spent on average US $13 over one year for medical care. A household consists on average of five people, so the study population would have spent US $3 per capita for health care.

This study showed clearly that the expenditures for treatment were very low in comparison to other monthly household expenditures such as for food and fuel for cooking or leisure. The results were comparable in HGs and NHGs households in all three sites during the rainy season. Disease alleviation or reduction seemed to not be considered essential to economic growth for all households of the study population. Nevertheless investing in health should be an important part of the monthly household expenditures especially in agricultural-based developing countries where the physical contribution of labor to production is significant (NUR, 1993). In other words, the body is a poor person's main asset (NARAYAN et al., 2000b).

Family members of a household each have a different status in this household, and do not have equal command over resources (WRATTEN, 1995b). In the context of the expenditures for health care this could be expressed in intra-households differences in expenditures depending on the family member. It was assumed that the interviewed person, who was in most cases also the head of the household, would have the highest expenditures for health care. However, in all households and in all sites the highest expenditures were seen for the wife or the husband of the interviewed person and their parents. The interviewees themselves had the lowest or second lowest expenditures in comparison to the other family members in the rainy season.

6.3.2.3.2. Expenditures for Medical Care in the Dry Season

The questionnaire given in the dry season determined the amount spent on medical care. The answers could be given in four possible expenditure categories (≤1.000 CFAF, 1.001-5.000 CFAF, 5.001-10.000 CFAF, >10.000 CFAF).

More than one-third of the HGs (n=36/102) and NHGs (n=33/111) households in Boulmiougou and the HGs (n=36/109) and NHGs (n=43/100) households in Tanghin spent more than 10.000 CFAF a month for treatment during the dry season. Moreover, almost one-third of the HGs (n=26/102) and NHGs (n=37/111) households in Boulmiougou spent between 1.001-5.000 CFAF a month. Only in Kossodo could the same expenditure situation be seen in the dry season as well as in the rainy season. A total of 33% of the HGs (n=30/92) and NHGs households (n=33/99) spent less than 1.000 CFAF for treatment in the dry season. And 23% of the HGs (n=21/92) and 26% (n=26/99) of the NHGs households had no monthly expenditures for medical care in Kossodo.

Combining the data from all three sites, 69% of the HGs and 72% of the NHGs households spent more than 1.000 CFAF a month for treatment.

In summary, the amounts for treatment were two to ten times higher in the dry season than in the rainy season. These results were confirmed by one of the few studies done on health care expenditures in the context of seasonal variations. In that study the household treatment costs were up to six times higher in the dry season than in the rainy season (SAUERBORN et al., 1996a).

In the rainy season the health status of a population is threatened by the combination of two factors. First, the rainy season is a time of peak manual activity. Energy expended on cultivating and harvesting cereals is close to the physiological maximum (BLEIBERG et al., 1980). Second, the frequency of major diseases rises in the rainy season. The best-known example is malaria. An increase in the incidence of parasitemia was reported in a study in Gambia, which has a socio-ecological setting similar to Burkina Faso (GREENWOD & PICKERING, 1993).

It was therefore thought that a population would be ill more often in the rainy season than in the dry season and as a consequence, the costs for medical care would be higher in the rainy season. However, the contrary was seen in this study.

According to the study cited above, one main reason for the lower costs for treatment in the rainy season was that significantly fewer illness episodes were perceived in this season (SAUERBORN et al., 1996a). Similar results were seen in this study.

There was a significant difference in the number of people ill when the episodes of illnesses in the last month of this study (October 1999) were compared with the episodes of illnesses in the last month of the complementary study (April 1998).

Almost half of the study population estimated to have a sick person in the household in the last month of the dry season (48%, n=297/613), but only 35% (n=214/605) in the last month of the rainy season.
Further reasons are possible for the higher costs for medical care in the dry season than in the rainy season. The rainy season is the season of high manual activity, which restricts the time available for doing other things. A health care center or a doctor may be consulted only in very severe cases of illness. In addition, the HGs households had a significantly higher income in the dry than in the rainy season (see Chapter 5, Section 5.3.2.2.2.). This fact could also explain the higher expenditures in the dry season. Lastly, the study population could be more frequently and more severely ill in the dry than in the rainy season. However, as it will be explained in the next section, the frequency of the different disease categories was comparable in the dry and in the rainy season.

In conclusion, the recent study confirmed the results of Sauerborn et al. (1996a) and stressed the need to carry out research in all relevant seasons of the year when studying health-seeking behavior. In order to obtain the most realistic monthly household costs for health care over the year, seasonal variations of the monthly costs must be taken into account.

6.3.2.3.3. Frequency of Illnesses

In the studies after the dry and the rainy season the study population was asked about the most recent illness in the household. The study used, therefore, only a self-estimation of illness. No physical examinations were undertaken afterwards to confirm the perception.
As a modification of the international classifications of diseases (WHO, 2001 / see Section 6.2.7.) the diseases were divided into six categories: malaria, gastro-intestinal diseases, respiratory diseases, diarrhea, headache and other diseases (refer to Table 6.7.). ‘Gastro-intestinal diseases’ were defined as all of the diseases, which involve the digestive system. The interviewees often did not differentiate between gastro-intestinal diseases and diarrhea, which would explain the low occurrence of diarrhea in the study in the rainy season. The classification ‘respiratory

diseases' regarded diseases that involve the respiratory system, such as cough. The so-called 'others' class contained diseases, which did not match the given five categories.

Table 6.7. Distribution of six different disease categories in the whole study population and for home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo both during the rainy season and the dry season

	Study	Boulmiougou		Tanghin		Kossodo	
	Population	HGs	NHGs	HGs	NHGs	HGs	NHGs
Rainy Season	n=591	n=96	n=95	n=101	n=99	n=101	n=99
Malaria	51%	54%	42%	39%	22%	66%	78%
Gastro-intestinal Diseases	12%	9%	10%	16%	17%	14%	6%
Respiratory Diseases	8%	5%	11%	7%	18%	4%	4%
Diarrhea	3%	2%	3%	7%	7%	1%	0%
Headache	3%	1%	3%	6%	10%	0%	0%
Others	23%	29%	31%	25%	26%	15%	12%
Dry Season	n=538	n=88	n=95	n=100	n=89	n=75	n=91
Malaria	47%	44%	47%	23%	35%	75%	65%
Gastro-intestinal Diseases	6%	6%	4%	7%	8%	3%	5%
Respiratory Diseases	10%	7%	6%	23%	13%	1%	10%
Diarrhea	8%	6%	12%	8%	8%	8%	7%
Headache	3%	2%	6%	4%	4%	0%	0%
Others	26%	35%	25%	35%	32%	13%	13%

In 51% of the whole study population, malaria was the most recent illness in the rainy season. Next on the list were gastro-intestinal diseases and respiratory diseases. The perception of illnesses was almost equivalent in the dry and the rainy season. Malaria was also the most frequent illness in the dry season. A total of 47% of the study population estimated to have a malaria episode as the last illness in the household. Gastro-intestinal diseases and respiratory diseases were again next on the list, but in the opposite sequence.

When analyzing the whole study population together, 12% (n=75/613) of the households did not specify an illness in the household in the dry season. However,

the coded answer to this question was so that this 12% included also the non-respondents. Only 2% (n=15/606) of the study population did not have an illness in the household in the rainy season. This frequency was very low, but unfortunately reflect the data of health statistics of the Sub-Saharan region and Africa (i.e. DEP, 1996; INSD, 1996; UNDP, 2000; WHO, 2000). One HG (male, aged 40) in a focus group discussion held in Kossodo, Ouagadougou, 1994, said (CISSE, 1997):

> *"It is impossible to stay in healthy shape forever. It is normal that you get sick in intervals of about one to two months."*

The perceived illness of the interviewed person did not necessarily reflect the real health status. Nevertheless there was a high similarity between the frequency of illnesses obtained in this study and official data.

Official statistical data on the frequency of diseases in Ouagadougou on the local level were not available. But there is a data set of the most frequent diseases in the province of Kadiogo from the Ministry of Health and Social Affairs (DEP, 1996). Because the population of Ouagadougou represents 98% of the population of the province of Kadiogo, the official data can be compared with the data obtained in this study. In that statistic, malaria was also the most frequent disease. Among the top five diseases were skin diseases, gastro-intestinal diseases and respiratory diseases. Diarrhea was placed six (DEP, 1996).

It is important to note that this official statistic contains only diseases, which were treated and recorded in a health care center. Illnesses that were not treated or were treated by traditional healers did not enter the statistic. According to INSD only half of the population (46%) in urban regions, such as in Ouagadougou, visits a health care center in order to receive help (INSD, 1996). And only 13% of those being ill go to a doctor in Burkina Faso (MAKINEN et al., 2000).

On the national level, several studies were done in order to obtain the most frequent illnesses in the population of Burkina Faso. All of them had the above-mentioned three categories among the top five illnesses on their lists (DEVELAY, 1991; SAUERBORN et al., 1995; MEYER, 1998/99). Also, the official list of the morbidity rate in the population was headed by malaria with 31%, and followed by respiratory

diseases with 20%. Next on the list were gastro-intestinal diseases together with diarrhea, each with 17% (INSD, 1997a).

On the international level, the results of the dry and the rainy season were also confirmed regarding the global burden of disease by cause (WHO, 2000). The global burden of disease is defined as a combination of the loss of life from premature death with the loss of healthy life from disability. It is measured in units of disability-adjusted life years (DALYs). More information on the DALYs is given in Chapter 1, Section 1.1.1. In Sub-Saharan Africa the highest numbers of DALYs are related to malaria, diarrhea, and respiratory diseases (WORLD BANK, 1994).
In HGs households in Nouakchott, Mauritania, respiratory diseases, diarrhea, and gastro-intestinal diseases were among the five most frequent diseases. However, arthritis or articular rheumatism was at the top of the list (SCHNEIDER & GAGNEUX, 1997). In nomadic people (only men) in Chad the main health problems were fever-headache-malaria syndromes, respiratory problems and intestinal problems (WIESE & TANNER, 2000). The given illnesses represent the typical rank of illnesses in developing countries.

6.3.2.3.3.1. Malaria

The malaria situation in Sub-Saharan Africa is severe. The disease now constitutes a leading cause of poverty accounting for annual losses of up to US $12 billion (KILAMA, 2000).
Also in this study malaria was estimated as the most recent illness in each of the households in the three sites in the *RAINY SEASON* (refer to Table 6.7.). The exception was NHGs households in Tanghin, which had a slightly higher percentage for ‘other’ illnesses than for malaria. Furthermore, there was a slightly higher frequency of malaria in HGs than in NHGs households in two of the three sites. Only in Kossodo was the frequency of the perception of malaria higher in NHGs than in HGs households. But there also the frequency of malaria was, with 66% in HGs and 78% in NHGs households, the highest in comparison to all the households of Boulmiougou and Tanghin.

The results obtained at the end of the rainy season were expected for two main reasons. First, the immense quantity of stationary water offered optimal breeding places for the mosquito *Anopheles gambiae spec.,* the vector for malaria. This was confirmed by a study in Gambia, which has incidence rates for malaria three times higher in the rainy season than in the dry season (GREENWOD & PICKERING, 1993).
Moreover, there was no remarkable consciousness in the study population to protect themselves against malaria. Prophylaxes such as sleeping under a mosquito net or taking repellents against mosquito bites were seen as possibilities for higher socio-economic classes and were not considered affordable (KABORE, 2001; Personal Observation, Ouagadougou, 1999). HGs in particular, emphasized in focus group discussions that there were no financial resources at all to afford some prophylaxes against malaria (MEYER, 1998/99). This could also be a reason that in two sites the frequency of malaria was slightly higher in HGs than in NHGs households. Similar results were obtained in a study carried out after the rainy season in 1998 (MEYER, 1998/99).

Malaria was most often named as the most recent illness in each of the households in the three sites in the *DRY SEASON*, as well (refer to Table 6.7.). However, at this time there was a higher frequency of malaria in NHGs than in HGs households in Boulmiougou and Tanghin. As in the rainy season, in Kossodo the frequency of malaria was, with 75% in HGs and 65% in NHGs households, higher than in the households of Boulmiougou and Tanghin, but this time HGs households had a higher frequency in this site than NHGs households. In a sentence, the frequency of malaria was more or less equivalent in each of the three sites in the dry season. Moreover, no difference could be seen between the perception of malaria in the study population in the dry season and the rainy season.

These results were not expected for the dry season. One would expect that malaria episodes would be more frequent during and especially in the end of the rainy season due to optimal reproduction conditions for mosquitoes. And higher incidence rates in the rainy season were also confirmed in literature (GREENWOD & PICKERING, 1993). However, the peak of malaria episodes is reached at the end of the rainy season and at the beginning of the dry season. In addition it should again

be noted that the study population was only asked for their own perception of the last illness in their household. No physical examination was made to confirm the answers. It is very possible that simple fever attacks could be read as malaria episodes. People can barely distinguish between a malaria episode and a fever symptom caused by other illnesses. This assumption is confirmed by the quote of a HG in a focus group discussion held in Tanghin, Ouagadougou, 1998 (MEYER, 1998/99):

> *"You have to distinguish two kinds of malaria: the first one is caused by mosquitoes and the other is caused by low temperatures and dust. The more severe form is that of the mosquitoes, while the other is only a cough with headache."*

6.3.2.3.3.2. Gastro-Intestinal Illnesses and Diarrhea

Making up 12% of the most recent illnesses, gastro-intestinal illnesses were estimated as the second most frequent class of diseases in the whole study population in the *RAINY SEASON* (refer to Table 6.7.). The frequency of gastro-intestinal illnesses was comparable between HGs and NHGs households in Boulmiougou as well as in Tanghin. However, the frequency of gastro-intestinal illnesses was almost two times higher in Tanghin than in Boulmiougou. In Kossodo there was a difference in the percentage of gastro-intestinal illnesses between HGs and NHGs households. A total of 14% of the HGs estimated gastro-intestinal illnesses as the last illness in the household, but only 6% of the NHGs.

With a proportion of 3% in the study population diarrhea had a relatively low importance in the whole study population. Only in Tanghin was the frequency as high as 7% in HGs and NHGs households. One reason could be that the interviewees were not directly asked for the occurrence of diarrhea. Instead, they had to estimate the last illness in the household.
Nevertheless, corresponding to the results of the rainy season also in the studies of Develay (1991) and Meyer (1998/99) the frequency of gastro-intestinal illnesses was higher than the frequency of diarrhea. Also the official statistic of Kadiogo mentioned gastro-intestinal diseases before diarrhea (DED, 1996). It is worth mentioning in this

context that diarrhea was perceived by the population to be more important than gastro-intestinal illnesses (MEYER, 1998/99). These results could lead to the assumption that adults are generally more affected by gastro-intestinal illnesses, but emphasize the importance of diarrhea because their children suffer very often from this severe illness.

Making up 6% of the most recent illnesses, gastro-intestinal illnesses were estimated to be the third most frequent class of diseases in the whole study population in the *DRY SEASON* (refer to Table 6.7.). Gastro-intestinal illnesses occurred twice as often in the rainy season as in the dry season. However, when the frequencies of gastro-intestinal illnesses were added to those of diarrhea, the total was similar in the dry (15%) and rainy seasons (14%).
There was no difference in the frequency of gastro-intestinal illnesses and diarrhea between HGs and NHGs households in each of the three sites in the dry season. The exception was Boulmiougou, where in 12% of the NHGs households' diarrhea was stated as the most recent illnesses but only in 6% of the HGs households.

Gastro-Intestinal Diseases and Diarrhea in Children

Diarrhea is widely recognized as a major disease of morbidity and mortality in Sub-Saharan Africa (FEACHEM & JAMISON, 1991). In developing countries diarrhea is one of the three most frequent diseases, which causes mortality in children under five years (WORLD BANK, 1993; WHO, 2000). More than three million children are dying every year due to diarrhea (PRADELLES, 1995).
Also in Burkina Faso diarrhea is the first reason for children being hospitalized in one of the municipal clinics (OUEDRAOGO, 1994). In a household study carried out in an urban setting in Burkina Faso the prevalence rate of diarrhea in children under five years was between 20% and 30% according to the different socio-economic status of the family (INSD, 1997a). In Ouagadougou the prevalence rate was 19% (INSD, 1994b). Cissé confirmed in his study the high prevalence of diarrhea in children under five years in Ouagadougou (CISSE, 1997).
In this study the small sample size of children who were ill according to the questionnaire do not allow statistical analysis. However, of all children who were

reported to be ill, 15-16% of them were estimated to have gastro-intestinal illnesses and diarrhea in both the rainy season (n=42/274) and the dry season (n=32/217). For a discussion about the different frequencies of gastro-intestinal illnesses, including diarrhea, in children among different socio-economic classes refer to Chapter 8, Section 8.3.6. The high percentage of diarrhea in children could be linked with the lack of awareness in the population of the origin of this disease, as a male HG in a focus group discussion held in Kossodo, Ouagadougou, 1994, admitted (CISSE, 1997):

> *"We do not know the origin* [of diarrhea]. *Children love to eat sugar, perhaps this can cause diarrhea."*

Risk Factors Causing Gastro-Intestinal Diseases and Diarrhea in Ouagadougou

The link between environmental factors, hygiene practices and an incidence of diarrhea and parasitic infections has already been seen in several studies (HUTTLY, 1990; BUKENYA & NWOKOLO, 1991; TRAORE et al., 1994; CURTIS et al., 1995). Because of the environmental risk factors, which cause gastro-intestinal diseases and diarrhea, one might assume that working as a HG would increase the risk of getting one of these diseases. One of the greatest environmental risk factors is irrigation of the fields with wastewater which contaminates the vegetables with parasites and bacteria (FEACHEM et al., 1983). In arid and semi-arid regions the reutilization of wastewater for irrigation is widely practiced. In region where water is very scarce it is too valuable to be used only once.

In the eighties the WHO published guidelines for the use of wastewater in agriculture. Standards were set for microbiological indicators: faecal coliform bacteria and for nematode eggs. The first was intended to protect exposed persons from bacteria and viral infections and the latter, from helminth infections. According to the WHO guidelines, the limit for water used to irrigate uncooked vegetables was ≤1 nematode egg/liter and 1.000 faecal coliform bacteria out of 100 ml (WHO, 1989). Recently published studies recommend to change the WHO guidelines in reducing the quantity of nematodes eggs from ≤1 nematode eggs/l to ≤0.1 nematode eggs/l (BLUMENTHAL et al., 2000; BLUMENTHAL et al., 2001). Irrigation water in the dry

Sub-Saharan region generally fails to meet these requirements. The water for irrigation is never treated in any ways before use.

Further behavioral risk factors including eating the vegetables directly on the site without washing or/and cooking them (GAGNEUX et al., 1999) and walking barefooted on the contaminated fields (MARA & CAIRNCROSS, 1991). About three billion people have intestinal worms. The most widespread soil-transmitted nematodes are *Ascaris lumbricoides*, hookworms and *Trichuris trichiura* (LAGARDERE & DUMURGIER, 1994). In addition, the habit that children have of defecating directly on the home gardening fields contributes also to a higher risk (HUTTLY, 1990).

All of these risk factors were also reported in the different home gardening sites in Ouagadougou. A contamination of the vegetables, especially lettuces, with bacteria and a contamination of the HGs fields with parasites such as *Ascaris lumbricoides* and *Ancylostomes* were seen (CISSE, 1997), but not believed by HGs:

> *"It's the dirt provoking diarrhea and this dirt is coming with the wind. I will say it once again, our products* [vegetables] *have nothing at all to do with our illnesses."*
> HG (female, aged 40) in a focus group discussion held in Kossodo, Ouagadougou, 1994 (CISSE, 1997)

Moreover, all examined sites in Ouagadougou showed higher microbiological contamination than was recommended. The fields are irrigated with wastewater from nearby drains or open wastewater channels, which is polluted with virus, bacteria, parasites and chemicals (CISSE, 1997; BOSSHART, 1998). Nevertheless a consciousness of polluted water was not seen in HGs. This was proved by the following account of a HG (female, aged 24) in a focus group discussion held in Tanghin, Ouagadougou, 1994 (CISSE, 1997):

> *"Of course, our water is very good for the vegetables and for consumption, also without treatment. It is clear and very tasty to drink."*

The differences in the degree of pollution are worth mentioning in this context. First, there was a significant increase in the microbiological pollution of the water in the dry season. And second, water taken from reservoirs seemed to be less polluted than water taken from wells (CISSE, 1997). In addition in focus group discussions, HGs reported to walk on the fields without shoes most of the time and to eat the uncooked vegetables during working (OUEDRAOGO et al., submitted). That many HGs walked on the fields without shoes was also observed in this study (Personal Observation, Ouagadougou, 1999/2000).

The frequency of gastro-intestinal illnesses, including diarrhea, as most recent illness was lower in HGs households in Boulmiougou (11%) than in HGs households in Kossodo (15%) in the rainy season. This could be caused by the different water sources used in these two sites. The home garden fields in Boulmiougou are irrigated with water from a reservoir (TRAORE, 1999), in comparison to the fields in Kossodo, which are irrigated with a mix of wastewater from the tannery, the slaughterhouse and the brewery (DESCONNETS, 1998). This could also explain the difference in frequency of these illnesses between HGs (15%) and NHGs (6%) households in Kossodo.

Nevertheless, the HGs households in Tanghin had the highest frequency of gastro-intestinal illnesses, including diarrhea, in the rainy season (23%). The HGs in Tanghin irrigate their fields from a water reservoir, but also from a hand-dug well (OUEDRAOGO et al., 1998). The quality of water is better in Tanghin than in Kossodo. It should be noted that there was no difference in the frequency of gastro-intestinal illnesses, including diarrhea, between HGs and NHGs households in Boulmiougou and Tanghin in the rainy season.

Despite a significant increase in the microbiological pollution of the water in the dry season the study population had more or less the same frequency of gastro-intestinal diseases, including diarrhea, in the dry season and the rainy season. Moreover, in the dry season HGs and NHGs households had the same frequency of these illnesses both in Tanghin and Kossodo. The NHGs households in Boulmiougou had a higher frequency than the HGs households.

Similar results were seen in studies carried out between 1994 and 1998 (CISSE, 1997; MEYER, 1998/99). Considering the environmental risk factors for HGs households in Ouagadougou, these results were not expected.

One possible reason for the unexpected results is that the HGs are always in contact with wastewater and contaminated water, soils and vegetables and have therefore a higher tolerance for pathogenic agents. To support this hypothesis Cissé (1997) pointed out a significantly higher occurrence of gastro-intestinal illnesses in the less polluted sites of Ouagadougou. In addition, HGs could be more aware of the higher disease risk due to their activity and work more carefully on their fields. However, there was no consciousness seen in HGs of the contamination of the irrigation water.

The consciousness of the origin of diseases in the study population was very different from biomedical interpretations of causality. In contemporary Africa where traditional ideas and biomedicine have co-existed for so many years, it is evident that interpretations of an illness are based on different types of knowledge. A syncretism in the interpretation of the illnesses might be seen in this study as well. Similar results were obtained in a household study carried out in six different regions of Burkina Faso and in Tanzania (PODA et al., 2000; HAUSMANN MUELA, 2000). Two quotes of HGs are cited here as examples:

> *"Sometimes our children take vegetables and start eating them without washing. Moreover, we spray the vegetables with insecticides and if they eat them they will get diarrhea and malaria."*
> HG (male, aged 35) in Kossodo

> *"Normal individuals tend to have diarrhea once a month. It is very good that the stomach will be liberated from all things that were blocked in it."*
> HG (male, aged 27) a focus group discussion in Kossodo, Ouagadougou, 1994 (CISSE, 1997)

One further reason for the same frequency of gastro-intestinal illnesses in different severely contaminated sites could be the differences in food patterns across the sites. The HGs in Boulmiougou produce mainly European vegetables (see Chapter 4, Section 4.2.1.1.). European vegetables are often eaten uncooked such as in form of salads. And uncooked vegetables can cause gastro-intestinal problems. The HGs in Kossodo produce mainly traditional vegetables. They are only eaten

prepared, such as in the sauce for the maize or millet porridge. Although Kossodo has the most contaminated water for irrigation, their vegetables are eaten cooked, and this can reduce the risk of gastro-intestinal problems at that site. However, this study did not focused on the different food patterns at the different sites. Further research would be necessary to gain a better understanding of this subject.
Nevertheless, the assumption was supported by a study among HGs in Nouakchott, Mauritania. HGs there had a high incidence rate of diarrhea of between 6.9 to 8.5 episodes each year. In addition to a low socio-economic status, bad hygienic practices in preparation of the food and taking water from a unprotected hand-dug well, the frequent consumption of uncooked vegetables was one of the biggest risk factors for this incidence (GAGNEUX et al., 1999; OULD BABA et al., in press for 2001).

In conclusion, practicing home gardening did not raise the risk of gastro-intestinal illnesses, including diarrhea, in comparison to activities other than home gardening in Ouagadougou. However, this study reflects only the perception of illnesses of the interviewed people. This stresses the need for further research with a special emphasis on health. Information about this topic should be complemented by physical examinations of those who are interviewed.

6.3.2.3.3.3. Respiratory Illnesses

The second or third most frequent class of diseases was respiratory illnesses, making up 8% (*RAINY SEASON)* and 10% (*DRY SEASON)* of the most recent illnesses in the whole study population (refer to Table 6.7.). In the rainy season the frequency of these illnesses was lower in HGs than in NHGs households in Boulmiougou (HGs households 5%, NHGs households 11%) as well as in Tanghin (HGs households 7%, NHGs households 18%). In Tanghin the difference was significant (p=0.013). Only in Kossodo did HGs (4%) and NHGs (4%) households have the same perception of respiratory illnesses, and this was lower than in the two other sites.
In the dry season the only site, in which the frequency of respiratory illnesses was higher in HGs (23%) than in NHGs (13%) households, was Tanghin. In Boulmiougou

and Kossodo the frequency in HGs households was similar or lower than in NHGs households (Boulmiougou: HGs households 7%, NHGs households 6%; Kossodo: HGs households 1%, NHGs households 10%).

Contrary to what was expected, the frequency of respiratory illnesses was lower in HGs than in NHGs households in the dry season as well as in the rainy season. As for gastro-intestinal illnesses, it was assumed that HGs would have a higher risk of respiratory illnesses because of their home gardening activity. This was seen in a study carried out during the rainy season in 1998 (MEYER, 1998/99). Respiratory illnesses were the second most frequent illnesses in HGs households, but only the fifth most frequent in NHGs households (MEYER, 1998/99).

There are several reasons for this. The daily contact with contaminated water can damage not only the skin but also the respiratory tract. This is confirmed by studies showing a connection between poor hygienic conditions and a higher frequency of respiratory diseases (WORLD BANK, 1993; CAIRNCROSS & FEACHEM, 1993). HGs often have contact with pesticides and insecticides, which can also cause irritation of the respiratory tract (SMIT et al., 1996). Moreover, the activity of home gardening can only be practiced outdoors. The HGs are therefore exposed daily to different climatic conditions, such as cold and humidity, which predispose to coughs and colds.

For the contrary results seen in this study and the complementary study a possible explication is that respiratory diseases are also promoted by the permanent dust being brought into the town by the Saharan wind Harmatan. It is possible that the other professions of NHGs exposed the NHGs in this study more to this dust.

In addition, the typical fuel for cooking is wood, and food is almost always prepared on open fires (see Section 6.3.1.4.). Households cooking on an open fire have been described as the largest single occupational health problem in the world for women. Infants and young children are also exposed to smoke for long periods. The smoke from biomass fuels tends to cause acute respiratory disease in children and chronic lung diseases in adults (BARNES et al., 1997; BIRLEY & LOCK, 1998). HGs and NHGs households were affected in the same way by this problem.

6.3.2.3.3.4. Other Illnesses

In the rainy season approximately one-quarter of the study population had most recent illnesses, which did not fit into the five given categories (refer to Table 6.7.). A total of 27 other health problems and disorders were mentioned during the interviews, such as toothache, heart pain, problems with the eyes, ears, kidneys and legs, different fractures, accidents, pregnancy, birth and miscarriage. Four disorders (problems with the eyes, heart pain, fever and 'feeling tired') made up between 2% and 3% of the illnesses in the category 'other illnesses'. The other 23 illnesses each had a frequency of about 1%.

The same results were seen in the dry season, in which also approximately one-quarter of the study population had last illnesses, which did not fit into the given five categories (refer to Table 6.7.). A total of 31 health problems and disorders were mentioned during the interviews, which were more or less the same as for the rainy season. Fractures/accidents and feeling sick made up between 3% and 4% of the illnesses in the category 'other illnesses' in the dry season. The other 29 illnesses each had a frequency of about 1%.

As expected, malaria, gastro-intestinal and respiratory illnesses were at the top of the list of most frequent illnesses in the study population. HGs and NHGs households had approximately the same frequency of each of the illnesses in each of the three sites. One HG explained:

> *"There are no particular diseases made especially for HGs. We are human beings like you. All diseases come from God, there is no other origin of diseases."*
> HG (male) in a focus group discussion in Kossodo, Ouagadougou, 1994 (CISSE, 1997)

The assumption that HGs had a higher risk of becoming certain illnesses because of their activity was not confirmed by this study.

6.3.2.3.4. Latest Illness in Households: Costs of Separate Disease Categories

The study population spent between 1.000 CFAF and 5.800 CFAF to treat the last illness in the household during the rainy season. In the so-called 'other illnesses' category the costs for treatment were the highest, at 5.800 CFAF (n=136/591). This category had the most diversity of illnesses and contained diseases such as accidents and fractures, which generally caused higher costs because they involved hospital visits. Gastro-intestinal illnesses cost on average 5.000 CFAF (n=71/591) and respiratory illnesses cost 3.000 CFAF (n=48/591). Each of the households spent on average only 1.250 CFAF (n=295/591) for a malaria episode. These supports the observation that malaria episodes were seen as commonly recurring events and not much attention was paid to this illness. Only severe cases were treated.

In comparison to the difference in monthly costs between medical care during the dry season and the rainy season (refer to Section 6.3.2.3.1. and 6.3.2.3.2.), the amount spent to treat each of the different disease categories did not differ much between the two seasons. Respiratory illnesses (n=56/538) as well as gastro-intestinal illnesses, including diarrhea (n=73/538), cost between 1.001 CFAF and 5.000 CFAF in one-third of the households where this illness occurred. This is comparable to the amount spent in the rainy season. For an episode of malaria 31% of the concerned households spent less than 1.000 CFAF in the dry season. Again people did not spend a lot of money to treat this illness also in the dry season.

To summarize, although the single costs for the different illness categories did not differ by much over one year, the monthly household costs differed a lot between the dry and the rainy season. The monthly health expenditures in a household were two to ten times higher in the dry season than in the rainy season. One possible reason was that fewer illness episodes were perceived in the rainy than in the dry season both in HGs an in NHGs households. The fact that the costs of the different disease categories did not vary over the course of the year supports this hypothesis.

6.3.2.3.5. Duration of Illness and the Distribution of Ill Persons in Different Households Both During the Dry and the Rainy Season

Despite the variety of different illnesses the *DURATION OF AN ILLNESS* was similar between all sites and groups in the rainy season. The study population estimated to be ill for seven days on average (Q_{25}-Q_{75}: 4-10 days). This could be linked to the fact that people considered themselves healthy when they were back to work, which was not necessarily a sign that they were cured. In regions without governmental health insurance, people do not have the privilege of being sick longer than the minimum needed time.

The *DISTRIBUTION OF ILL PERSONS IN A HOUSEHOLD* was also similar between the different sites, different activity groups and seasons.
The probability of coming down with an illness showed no seasonal differences in the different households' members. In almost 50% of the households, the most recent illness affected a child, in the dry as well as in the rainy season (refer to Table 6.8.).

Table 6.8. Distribution of the last ill person among home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo during the dry season (DS) and the rainy season (RS)

	Boulmiougou				Tanghin				Kossodo			
	HGs		NHGs		HGs		NHGs		HGs		NHGs	
	n=73	n=96	n=80	n=95	n=92	n=101	n=78	n=99	n=66	n=101	n=91	n=99
	DS [%]	RS [%]	DS [%]	RS [%]	DS [%]	RS [%]	DS [%]	RS [%]	DS [%]	RS [%]	DS [%]	RS [%]
Child	28	40	33	53	46	37	39	30	64	56	64	63
Interviewed person	25	24	25	27	30	33	35	26	20	24	23	23
Husband / Wife	23	18	19	14	13	18	11	21	9	15	8	12
Brother / Sister	4	8	6	3	2	5	11	14	0	0	2	0
Parents	8	5	1	0	7	6	1	7	0	1	1	0
Other family members	12	5	16	3	2	1	3	2	7	4	2	2

Unfortunately this is a normal distribution in a country where 21% of the children do not live to be over five years old (UNDP, 2000; WORLD BANK, 2000/01). It is also

worth mentioning that in both the dry and the rainy season the children in Kossodo were affected more often by an illness (56-64%) than the children in Boulmiougou (28-53%) and the children in Tanghin (30-46%).

In almost 50% of the households the most recent illness affected the interviewed people and their husbands. If these two people were the main earners in a household, their illness could lower the monthly income of a household. All other household members were perceived to be ill less often.

The market value of forgone productivity resulting from a disease is linked to the value of people's contribution to the output of the margin. Often the lost productivity is approximated by the wages the person would have received (HARTUNIAN et al., 1981). This approximation is, however, at best a very rough approximation of the marginal productivity of labor and can only be used for developed countries with mainly industrial communities. In an agricultural community such as in the case of this study, perceived days of illness can not be equated with loss of work and loss of income. Although illness of the major supporter of the household may threaten the household income, neither the cultivation of cereals nor the production of vegetables is totally affected or stopped during the period of an illness. Other family members can compensate for the work of the ill person over a period of time. Further research would be necessary to estimate the probable loss of income due to illness in HGs households. However, it has been shown that illness-induced loss of employment is disproportionately borne by the poorest households and by those who lack health insurance (PRYER, 1993).

6.4. Summary and Conclusion

Seasonal rainfall determines the rhythm of life and work of the population in Saharan and Sub-Saharan countries, where almost everybody depends on agriculture. Seasonal rainfall and the lack of water at a certain time of the year also determine crucially urban agriculture and interrupt home gardening for several weeks each year. Particularly in HGs households this can cause financial problems (CHAMBERS et al., 1981).

The aim of the study was to evaluate the economic impact of home gardening on HGs households in comparison to NHGs households during the dry and the rainy season in Ouagadougou, Burkina Faso. In addition, the extent to which the economic situation of a household -the relation between income and expenditures- influences the health status of HGs in comparison to NHGs households was examined. The study emphasized seasonal variations in the monthly predictable and unpredictable household costs. Significant differences between the dry and the rainy season were pointed out.

The main finding of the study was the difference in the financial situations of HGs households between the dry and rainy season. HGs households had more or less the same monthly expenditures as NHGs households in the dry season. The NHGs households also spent the same amount in the rainy season as in the dry season. However, the HGs households had significantly lower monthly expenditures in the rainy season than in the dry season (refer to Table 6.9.).
Such as the monthly expenditures also the estimated average monthly income in HGs households was subjected to seasonal variations (refer to Table 6.9.). HGs income was in each of the three sites lower in the rainy season than in the dry season. Moreover, their estimated average monthly income was significantly lower than the average monthly income of NHGs households in the dry as well as in the rainy season.

Table 6.9. Monthly financial situation (average monthly income vs. monthly predictable expenditures) in home gardeners' (HGs) and non-home gardeners' (NHGs) households both during the dry and the rainy season

		HGs		NHGs
Dry Season	Income*[1] (direct *[2]/ indirect*[3])	12.500 / 17.300	<*[4]	36.800
	Expenditures*[1]	27.800	=	29.300
		>*[4]		=
Rainy Season	Expenditures*[1]	11.900	<*[4]	20.900
	Income*[1] (direct *[2]/ indirect*[3])	8.300 / 14.100	<*[4]	37.500

*[1] All numbers in CFAF.
*[2] Directly estimated average monthly income of HGs and NHGs households.
*[3] Indirectly estimated average monthly income from selling vegetables in HGs households.
*[4] $p<0.001$

The financial situations of NHGs households did not depend on seasonal variations. NHGs households had lower monthly expenditures than incomes over the entire year, which guarantee them a financial security over a long period (refer to Table 6.10.). Moreover, with this monthly surplus they were able to react to unpredictable upcoming events, such as hospital visits or funerals, without falling immediately below the poverty line.

In contrast, the HGs households did depend on seasonal differences. The lower monthly predictable expenditures in HGs households were due only to the differences in monthly expenditures for food between the two seasons. Reduced food expenditures lowered the predictable monthly expenditures during the rainy season. Nevertheless, HGs households could barely cover these expenditures with their monthly income. In the dry season, higher food expenditures raised the total monthly predictable expenditures. Although there was a higher monthly income, the HGs households had a negative expenditures coverage rate in this season (refer to Table 6.10.).

Focusing on the unpredictable upcoming costs, HGs households had no opportunity to save money both in the dry and in the rainy season. Unpredictable upcoming expenditures, or external catastrophes, would threaten the whole existence of the HGs household in that month.

According to these results the HGs in Ouagadougou belong to one of the lowest economic classes, with less income and fewer spending opportunities than any other working group. There are several possible reasons for these results. Occupation-specific differences between HGs and NHGs households are possible and are explained in detail in Chapter 7. Seasonal variations influence HGs expenditures and income. HGs monthly estimated incomes were slightly higher in the dry than in the rainy season, but always lower than those in NHGs households. More information on seasonal income differences can be found in Chapter 5.

The expenditures of HGs households almost doubled from the rainy season to the dry season because of higher food costs in the dry season. All of the other monthly predictable costs, such as for drinking water, fuel for cooking and energy showed no changes between the two seasons. The subsistence production of vegetables has to stop for several weeks at the end of the dry season because of lack of water to irrigate the fields. During this time the HGs households have to buy their food. On the daily market in town, however, the costs for food are higher in the dry season than in the rainy season. European vegetables cost one to four times more in the dry season and also the traditional vegetables are slightly higher in price then (average price estimation of 100 different households, Ouagadougou, 2000). In addition, cereals cost 10-25% more in the dry than in the rainy season (Personal Information, Ouagadougou, 1999).

One could conclude that the HGs households had to live the whole year with an economic risk because of the seasonal variations in their income and expenditures. Although subsistence production provides advantages for HGs households in the rainy season, over the entire year HGs households are more threatened by seasonal factors than other population groups with non-seasonal activities.

The rainy and the dry season dominate the whole Sub-Saharan region. HGs in all towns of this region are faced with these two seasons and with the related problems.

Therefore the results of this study carried out in Ouagadougou can be transferred with care to other urban agriculture systems in other towns and countries of the Sub-Saharan region.

As total monthly household expenditures include both predictable and unpredictable costs, the unpredictable costs for health care have to be discussed. When analyzing only the predictable costs, the NHGs households had a monthly financial surplus for unpredictable events, but the HGs households had no margin to cover unpredictable costs (refer to Table 6.10.). However, predictable and unpredictable costs are always interlinked within one household. In months with high unpredictable costs such as in the case of a hospital visit or an operation, this implies always a reduction in the predictable costs in this household. Although this adjustment within the household and the months could not be worked out in this study, it should be kept in mind.

The costs for medical care seem to be linked to seasonal variations. Each household spent less than 1.000 CFAF per month in the rainy season, whereas in the dry season 71% of the population spent more than 1.000 CFAF. Health care costs rose two to ten times from the rainy season to the dry (refer to Table 6.10.). Reasons could include higher incomes in HGs households in the dry season (refer to Table 6.9.), and the higher frequency of illness in two of the study sites during the last month of the dry season (refer to Table 6.10.).

HGs and NHGs households had the same expenditures for medical care both in the dry and in the rainy season. This result was unexpected, since HGs had a significantly lower average monthly income than their counterparts without gardens (refer to Table 6.9.). One reason, however, could be that HGs underestimated their income. As discussed in Chapter 5, the HGs in all three sites estimated their monthly income to be lower than it was with an indirectly estimated approach. Due to the difficulties in estimating incomes earned by engaging in activities which are not paid regularly, the indirectly estimated income could also still be an underestimation of the real income in HGs households. It could therefore be possible that HGs and NHGs households have a similar income than found in this study. However, because of the

large differences in socio-economic status between HGs and NHGs households (refer to Chapter 8, Section 8.3.f.), this assumption must be made very carefully.

The analysis of the health status of the study population showed that residents were ill for seven days, on average, and it was the children in almost 50% of the households who were ill. The frequency of the last illnesses did not differ between the seasons and sites. In each of the three sites malaria was perceived to be the most recent illness. Second and third on the list were gastro-intestinal diseases and respiratory diseases (refer to Table 6.10.). This data corresponds with all the data available on diseases, disease frequency, and disease classes in Sub-Saharan Africa. Malaria, gastro-intestinal diseases and respiratory diseases were always among the top five diseases in this region (WORLD BANK, 1994; DEP, 1996; INSD, 1996; WHO, 2000).

To summarize, HGs and NHGs households spent the same amount for medical care and they had more or less the same frequency of illness. A difference in health status related to the different economic situations of HGs and NHGs households could not inferred from the results of this study.

This result was not foreseen. In addition to the significantly lower incomes of HGs households, the water for irrigation, as well as the soil and the vegetables of the three home gardening fields were contaminated (CISSE, 1997; BOSSHART, 1998). Thus, a higher frequency of gastro-intestinal diseases, including diarrhea, in HGs households was expected. A link between polluted water and a high risk for diarrhea is widely shown in literature (i.e. FEACHEM et al., 1983; CURTIS et al., 1995). And HGs had no consciousness of the contaminated water for irrigation and the related health risk. In addition, HGs households in Nouakchott, Mauritania had higher frequencies for gastro-intestinal diseases than households engaged in an activity other than home gardening (GAGNEUX et al., 1999; OULD BABA et al., in press for 2001).

Table 6.10. Expenditures coverage rate, estimated food pattern, frequency of last illness, last ill person in a household and the monthly expenditures for medical care in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo during the dry season (DS) and the rainy season (RS)

			Boulmiougou		Tanghin		Kossodo	
			HGs	NHGs	HGs	NHGs	HGs	NHGs
Expenditures Coverage Rate								
RS	Expenditures Coverage Rate (directly / indirectly estimated income) in %		67 / 102	171	86 / 115	228	28 / 116	110
DS	Expenditures Coverage Rate (directly / indirectly estimated Income) in %		61 / 171	87	38 / 45	180	44 / 24	125
Estimated Food Pattern for Vegetables*[1]			E		T / E		T	
Frequency of Illness [%]								
RS	Malaria		54	42	39	22	66	78
	Gastro-Intestinal Diseases incl. Diarrhea		11	13	23	24	15	6
	Respiratory Diseases		5	11	7	18	4	4
DS	Malaria		44	47	23	35	75	65
	Gastro-Intestinal Diseases incl. Diarrhea		12	16	15	16	11	12
	Respiratory Diseases		7	6	23	13	1	10
Ill Person in Household in the last Month of the								
DS [%]			25	17	62	53	62	77
RS [%]			26	28	71	51	20	16
Monthly Expenditures for Illnesses								
RS	in Households [CFAF]		1.000	830	700	1.000	360	380
DS	in House-	0-1.000	5	5	21	13	55	60
	holds [%]*[2]	1.000-5.000	17	16	12	17	5	8
		>10.000	35	30	33	43	5	10

*[1] E=European vegetables, T/E= traditional and European vegetables, T=traditional vegetables (for more information refer to Section 6.2.6.1.).

*[2] Monthly expenditures for illness [CFAF] as a percentage of the total monthly predictable household expenditures.

An additional unexpected result was seen in the comparison of the three sites. In HGs households across the different sites the frequency of illnesses was the same (refer to Table 6.10.). The home garden fields, the water for irrigation and the vegetables were contaminated, but the degree of contamination varied from site to site. Kossodo was the most polluted site of the three. In addition, the HGs households there had the lowest estimated average monthly incomes of all three sites. This could lead to the assumption that the frequency of gastro-intestinal diseases among HGs households in Kossodo was higher than in the other two sites. One possible reason for the same frequency of gastro-intestinal illnesses in HGs households in different severely contaminated sites come from the differences in food patterns in the three sites (refer to Table 6.10.). The HGs in Boulmiougou produce mainly European vegetables. European vegetables are often eaten uncooked, which can cause gastro-intestinal problems. The HGs in Kossodo produce mainly traditional vegetables, which are the base for a cooked sauce eaten together with porridge. Although Kossodo has the most contaminated water for irrigation, the vegetables there are always eaten cooked and so the risk for gastro-intestinal problems at that site is reduced.

The climate of Sub-Saharan Africa is dominated by the rainy and the dry season. HGs in all towns of this region are faced with these two seasons and with the related problems. Using wastewater for both irrigation and drinking is not a unique practice in Ouagadougou, but widely used in other towns and countries of the Sub-Saharan region. Wastewater is used in Dakar, Senegal; Lomé, Togo; and Nouakchott, Mauritania's capital, among others (LACHANCE, 1993; GAGNEUX et al., 1999). Nevertheless differences were noted in the health status of the HGs households in different towns. It is highly recommended that the result of this study will be used as a base for further research on the ill-health subject.
Intervention strategies based on this data should be carefully tailored to other urban agriculture systems in other towns and countries of the Sub-Saharan region, each of which depends on the same external factors as the HGs households in Ouagadougou (refer to Figure 6.1.).

Further research is necessary to clarify the assumption that variations in the frequency of gastro-intestinal diseases are related to differences in food patterns.

Moreover, more knowledge should be obtained about the health risk related to practicing home gardening and the supposed association of a better economic situation and better health.

A cross-sectional study would be a useful approach. In Ouagadougou, the most polluted site (Kossodo) and the most unpolluted site (Boulmiougou) should be included in the study. Since sites in other towns of the Sub-Saharan region showed results other than those in this study, it is clearly necessary to involve different sites from various other Sub-Saharan countries in the study. To compare the activities of HGs with other activities in town, the neighbors of the HGs should be equally included in the study design.

The questionnaire should equally emphasize income, food patterns and care-seeking behavior. Questions about income should aim to find out who the income generator of the family is, whether there is more than one person earning money in the household, what activities earn the money, how much the income is, and whether there are any seasonal variations in income. Questions about food patterns should ask how many meals are eaten by the family, where the meals are eaten (at home / outside), which ingredients generally make up the meals, whether there are many uncooked vegetables eaten, where the food is purchased (location of the market), whether there is a subsistence production, which vegetables and cereals are grown at home, and whether there are any differences in the food expenditures and the food pattern between the dry and the rainy seasons.

To understand the health status and the care-seeking behavior in a household, the questionnaire should ask for the last perceived illness in the household in a given period of the year (i.e. rainy season and dry season), the duration of this illness, which family member was ill, and what the consequences were of having an ill person in the household (i.e. amount of spending for health care, which kind of treatment). To ensure the correctness of the perception of illness, a physical examination of the ill household member should be taken parallel to the interviews.

The above-suggested cross-sectional study should be carried out at least twice during the year: once after the rainy season in October and once after the dry season in May, because this study found clear seasonal changes in the economic situation of HGs households, but no seasonal changes in the health status, and care-seeking behavior.

Addressing the feasible interventions to strengthen urban agriculture for HGs, all determinants and interaction of the different factors of urban agriculture, the household economy and the possible health risks should be taken into consideration. This consideration will allow a careful risk assessment and will help to identify the greatest potential and the lowest health risk for HGs households.

As shown in this study, one big risk factor for HGs households are the seasonal variations in the monthly income and food expenditures. A micro-credit system, on the level of the individual home gardening sites, appears to be a feasible and highly demanded strategy, and should be mainly carried out in the dry season. A micro-credit system could increase the income of HGs and might reduce the seasonal variations by increasing productivity as well as identifying new income-generating activities. To guarantee a high probability of successful intervention, the 'participatory action research' approach (MAYER & QUELLET, 1991; TANNER et al., 1999) should always assist in the translation of the interventions in the different sites.

Water is one of the most important external factors that limits vegetable production in the dry season. Extend the presence of water for irrigation could prolong HGs activity at the end of the dry season. The wells for irrigation could be constructed and reconstructed in such a way that the rainwater does not trickle away and evaporate too quickly in the dry season. Moreover, certain water sources should be reserved for exclusive use by the HGs. More intervention possibilities to increase the production of vegetables on the HGs sites are discussed in Chapter 7, Section 7.4. Interventions based on micro-credits to start other income-generating activities than home gardening are discussed in Chapter 5, Section 5.4.

The aim of these interventions should be to increase HGs income in the dry season and/or to increase the subsistence production of food. The economic conditions in HGs households should be improved to an extent that they are at least comparable with the economic situations of NHGs households.

In addition, year-round urban agriculture would not only be an advantage for HGs households, but for all city-dwellers. Throughout the entire year they could buy vegetables that were planted in town. Local production would stabilize the purchase prices of vegetables at an acceptable level over the entire year. Prices would not change because of vegetable shortages. In many Sub-Saharan towns, as in Ouagadougou, vegetable prices increase over the year as a result of high import

taxes or transport and storage costs, particularly in the dry season, when local production breaks down. Lower food prices over an entire year would release expenditures, which could then be used for other non-food items.

As shown above, another big risk factor is the health risk related to contaminated water and HGs' unawareness of this risk. There was a consciousness of the origin of diseases in the whole study population, which was very different to a biomedical interpretation of causality. A syncretism in the interpretation of the illnesses might be seen in this study as well.

Approximately 50% of the study population estimated to have malaria as the last illness in the household both in the dry an in the rainy season. However, almost none of them undertook any prophylactic methods against this disease. Information-education-communication campaigns with the main emphasis on forcing the use of mosquito nets are highly recommended. About 15% of the study population estimated to have gastro-intestinal diseases, including diarrhea. Although there was no direct relation seen between contaminated water and an increased risk for diarrhea in this study, the whole study population had a very high frequency of gastro-intestinal diseases, including diarrhea. A high frequency of gastro-intestinal diseases is often linked with poor sanitation. There is evidence of an association between the location of a child's stool disposal and hospital admission with diarrhea or dysentery. Human stools were more frequently observed in the courtyards of ill children, than in those of children being healthy (TRAORE et al., 1994). Information-education-communication campaigns for household sanitation are therefore recommended as well. To avoid more cases of diarrhea, people should be educated to dispose of human feces in a hygienic way, to avoid allowing children to defecate on fields, and to protect drinking water by covering the water pots.

Results of a multi-country study showed that improvements in sanitation had a positive impact on the incidence of diarrhea at all levels of water supply, even when the only water available was unimproved. But improvements in water quality did not affect health if sanitation remained unimproved (ESREY, 1996).

7. Study of the Predictable Costs for Households With Home Gardens and Households Without Home Gardens in Ouagadougou, Burkina Faso's Capital, in the Rainy Season

7.1. Introduction

The world population is increasing by about 85 million every year. According to United Nations' projections, the current world population of about six billion will grow to more than nine billion by 2050 (LEISINGER, 2000; UNITED NATIONS POPULATION DIVISION, 1998). The projected growth rates are especially high in West Africa. Since 1960 the West African population has more than doubled: it rose from 85 million to 215 million people in 1993 (MOKWUNYE et al., 1996; THE ECONOMIST, 1998). These figures are closely related to the rapid growth of urban centers. Projected figures for 2020 indicate that two-thirds of the West African population (430 million people) will be found in urban centers (SNRECH, 1994). This process can also be seen in Burkina Faso, where the capital, Ouagadougou, had a growth rate of 6.8% in 1998 compared to 2.8% for the entire country (LEREBOURS PIGEONNIERE & JOMNI, 1998).

Urbanization is not a bad process in itself. However, urbanization in developing countries entails major demographic, social, cultural, and environmental changes that have a market impact on the health and well-being of the population concerned (HARDOY & SATTERTHWAITE, 1992; HARPHAM & TANNER, 1995 / see Chapter 1, Section 1.1.1.). A number of descriptive studies have documented that poorer people in urban areas suffer the worst of both worlds: malnutrition and infectious diseases, which result from underdevelopment and social as well as economic marginalization, and chronic diseases, which result from modernization and the urban setting (PRYER, 1993; SATTERTHWAITE, 1993; SONGSORE & MCGRANAHAN, 1993). While poverty and food shortages were predominantly a rural problem in former times, the proportion of undernourished people living in cities is on the rise (VON BRAUN, 1997).

In many Third World countries, new urban forms are developing that are very different from Western concepts of what is urban. Many African cities are becoming

more rural. As they continue to grow under conditions of economic stagnation, an increasing number of city-dwellers grows part of their own food in the city (refer to Chapter 1, Section 1.2.1.). In addition, the importance of urban agriculture is increasing. Urban agriculture is a necessary activity in the rapidly growing towns, especially in the Sub-Saharan region, which experiences high unemployment rates and insecure sources of food.

In most developing countries, urban agriculture is dominated by unskilled, small-scale producers in low-income sectors seeking food security and additional income (ILEIA, 1994). Especially in arid and semi arid urban areas like the city of Ouagadougou, urban agriculture is an important factor for the economy of home gardeners’ households. It generates cash to cover basic needs and essential commodities and contributes to better nutrition (see Chapter 1, Section 1.2.3.1.). Otherwise, the poorest households in urban centers tend to spend 50% to 90% of their income on food (VASEY, 1990; DRESCHER, 1996a; SMIT et al., 1996).
In spite of the benefits in most towns, especially in Africa and including Ouagadougou, urban agriculture is not seen as a part of the urban economy. Moreover, there is a tendency to designate more and more of the production fields in town for other resources in order to finance urban industrial development. It is thought that urban agriculture does not contribute to sustained development and that the key to modernization lies in attaining rapid industrialization (LOFCHIE, 1997 / see Chapter 1, Section 1.2.3.2.).

In this context it becomes more and more important to understand the economic impact of urban agriculture. At first glance, urban agriculture can be seen as an income generating activity in home gardeners’ households which helps to cover monthly expenditures (refer to Figure 7.1.). When looked at more closely, however, it is clear that the urban agriculture system consists of more than just the economic factor. In addition to the economic factor there are the different types of vegetables, different soils, different irrigation possibilities and trade patterns (refer to Figure 7.1.).
All of these factors depend on each other, they are not largely influenced from the outside, and may influence the economic factor as well. This can create risks, especially for people who are directly related to the urban agriculture system, such as home gardeners, but also for more distant people, who are involved in some way in

the urban food chain, such as wholesalers and market vendors, as well as clients who are buying the vegetables (refer to Figure 7.1.).

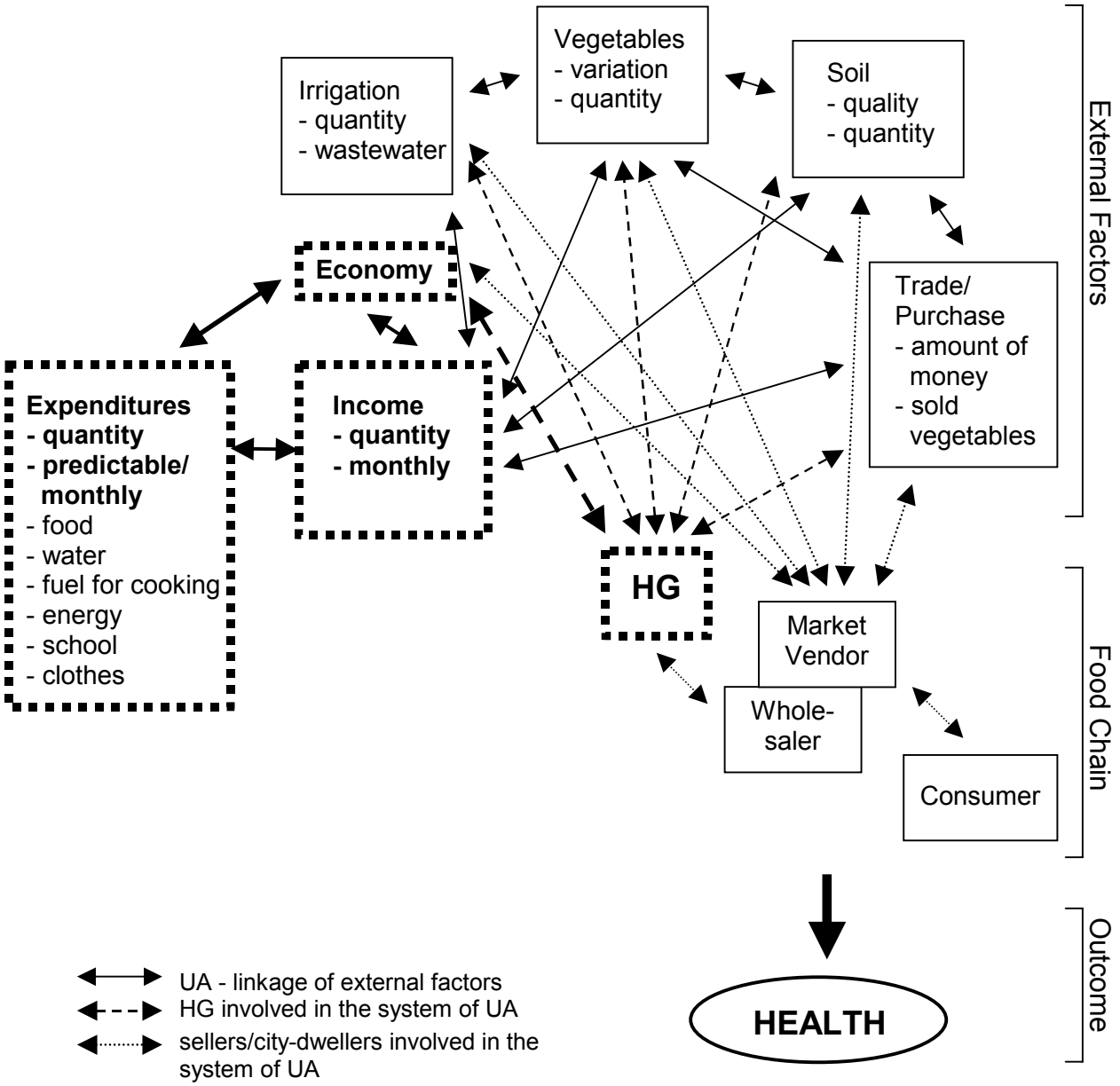
One additional risk of urban agriculture is its seasonality. In the Sub-Saharan region seasonal rainfall restricts the time of home gardening. Home gardening has its peak between December and February and stops on average at the end of April (see Chapter 1, Section 1.2.3.2.). Additionally, Chapter 6 deals with seasonal-specific differences in the home gardeners’ economic situation.

The home gardening fields are very often irrigated with wastewater from nearby drains or open wastewater channels, in particular in the dry Saharan zone, where water resources are extremely scarce. This situation may create even more additional health risks for the poor urban and peri-urban population (FEACHEM et al., 1983; PROST & BOUTIN, 1989). The water for irrigation in Ouagadougou is polluted with virus, bacteria, parasites and chemicals (CISSE, 1997; BOSSHART, 1998). The substantial survival capacity of pathogens in soil, on plants and on fruits increases the risks of illness (MARA & CAIRNCROSS, 1991). Chapter 1, Section 1.2.3.2. is related to the additional health risk due to practicing home gardening. Chapter 6, Section 6.3.2.3.f. analyzes health expenditures and frequencies of illnesses in home gardeners’ and non-home gardeners’ households. Practicing urban agriculture may influence the health status of the population engaged in this activity. It could increase the risk of being ill in home gardeners’ households in comparison to non-home gardeners’ households. Therefore it is of interest to work out a possible relation between home gardening and health.

The overall aim of the present study is to analyze a possible relationship between the economic situation and the health status of home gardeners’ households.

This chapter focuses on the occupational-specific spending behavior of home gardeners and people attending to an activity other than home gardening in the rainy season. Predictable monthly expenditures for food, fuel for cooking, water, energy, clothes and school will be discussed, because they represent a monthly burden for each household. Based on the data of the households’ monthly expenditures and average incomes, best-, base- and worst-case scenarios of the financial situation in home gardeners’ and non-home gardeners’ households will be drawn up for the rainy season of one year.

Figure 7.1. The system of urban agriculture (UA) and its outcome with a main emphasis on income and spending behaviors of home gardeners' (HG) households in the rainy season



7.2. Methods

7.2.1. Burkina Faso and its Capital Ouagadougou

Field work for this study was conducted in Ouagadougou, the capital of Burkina Faso in Sub-Saharan Africa, at the end of the rainy season. Additional information was recorded in a second, three-week field stay in November 2000.

Burkina Faso is situated at the southern part of the West African Sahel, has no coastal access, almost no natural resources and its land is used as for agriculture and for pasture. In 1999, the population was estimated at 11 million, with a population growth rate of 2.8% per year (WORLD BANK, 2000/01).

The basis of Burkina Faso’s economy is agriculture. About 92% of the population is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion. Since its independence in 1960, Burkina Faso has remained one of the poorest countries in the world and ranks only 172 of 174 countries in the Human Development Index (HDI) of the United Nations Development Program (UNDP, 2000). The main reasons for this low rank are its high population density, few exploitable natural resources and fragile soil. Social indicators are very low. Life expectancy at birth is 44 years, infant mortality (under five years) is 210 per 1.000 and the GNP per capita US $240 (WORLD BANK, 2000/01).

Ouagadougou with its 750.000 inhabitants (in 1996) and with an average annual growth rate of 6.8% lies in the center of the country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Being situated at the Sahelian border, its annual precipitation can vary from 850 to 900 mm per year and is restricted to the rainy season from June to October (LEREBOURS PIGEONNIERE & JOMNI, 1998). The average temperature is between 24° C in January and 28° C in July (see Figure 4.1.).

7.2.2. Home Gardening Sites

There are 48 different sites of home gardening in Ouagadougou (refer to Figure 4.2.). Home gardens vary in their sizes and from season to season (CISSE, 1997). Three sites (Boulmiougou, Tanghin and Kossodo) were selected for the study. Within these three areas there are clear differences in the local position of urban

agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies. All three sites are situated on the outskirts of the town. More detailed information on the three home gardening sites can be found in Chapter 4, Section 4.2.1.1. Refer to Appendix IV for the most common vegetables planted at the home gardening sites in Ouagadougou during the rainy season.

7.2.3. Study Population

The population covered in this study is represented by members of households involved in home gardening at one of the three sites and by members of households engaged in an activity other than home gardening but who live in the neighborhood of the home gardeners. A household was defined as a group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible. In this study the abbreviation ‘HGs households’ is used for the home gardeners’ households, while ‘NHGs households’ stands for households without home gardens, the so-called non-home gardeners’ households.
More information on the study population can be found in Chapter 4, Section 4.2.1.2.

7.2.4. Questionnaire

The purpose of the questionnaire was to collect information that can be used to study the economic impact and costs of home gardening. The study focused on the income, the expenditures, the health and socio-economic status of a certain population in Ouagadougou. Information collected included the composition of the households, the living conditions, the household income and the expenditures behavior.
The questionnaire was a structured questionnaire in French and most of the questions were closed and pre-coded. In total, the study contained 600 questionnaires for 100 HGs and 100 NHGs at each site.
For more information on the questionnaire refer to Chapter 4, Section 4.2.1.3. Refer to Appendix I for the full questionnaire of the rainy season.

7.2.5. Quality Control of the Data Collected and Implementation of the Study and Data Management

The data collection was based on a series of strict criteria: (1) the selection and the training of the interviewers, (2) a pilot study and (3) the permanent supervision of the study and the interviewers. All data of the questionnaire was entered using EpiInfo software (Version 6.02, CDC, United States). Data calculations were carried out using EpiInfo and SPSS (Version 9.0 for Windows 1995).

The Mann-Whitney- or Wilcoxon-non-parametric test was used to compare the income and expenditure numeric variables between and across the sites, because the variables were not normally distributed. Categorical variables between and across the sites were compared using chi-square-test or Fisher-exact-test. These statistical measures were applied both for the dry and for the rainy season, for each site, and for HGs and NHGs households. Because of a greater number of tests, the p-value should not be interpreted in a confirmatory sense. The results usually indicate the median of the variables; if other measures were used it is stated.

More detailed information on these topics can be found in Chapter 4, Sections 4.2.1.4.f.

7.2.6. Calculation of the Total Monthly Predictable Costs in a Household

It is always difficult to estimate the total monthly predictable costs of households. This is because of recall bias during the interview and, more likely, the unawareness of the interviewees of their exact household expenditures. Because of these difficulties, more than one approach was taken to obtain the most correct figure representing the total monthly predictable costs of HGs households and NHGs households in the rainy season.

The household unit was taken as the measuring unit. The household or family unit is typically viewed as the most appropriate unit of measure because families share income and expenditures (BLACKWOOD & LYNCH, 1994).

As *1ST APPROACHES*, HGs and NHGs were asked what they spent on each of the following consumer items: *FOOD, DRINKING WATER, FUEL FOR COOKING, ENERGY, CLOTHES* and *SCHOOL*. In order to obtain the total monthly predictable expenditures, the sum of all expenditures was calculated.
A detailed description of the calculation of the monthly expenditures for *FOOD, DRINKING WATER, FUEL FOR COOKING* and *ENERGY* and the average purchase prices for food are found in Chapter 6, Section 6.2.6.1.

Two steps were necessary to estimate the monthly costs for *CLOTHES*. First, interviewees were asked for the total number of clothing articles bought within the last three months. In the second step, people had to give the price for the last set of clothing bought. In order to calculate the total cost per month the given number of clothing articles was divided by three and multiplied with the amount for one set of clothing.

In Burkina Faso, *SCHOOL* costs consist of the expenditures for school uniforms, school books and exercise books and, depending on the school also school fees. Public primary and secondary schools do not charge school fees. Private primary and secondary schools and high schools, on the other hand, do charge fees. To estimate the monthly costs for school in a household, people were asked for the total school costs for all children in one household for a year, and these costs were divided by 12.
In order to gain a better understanding of the current *SCHOOL SYSTEM* in Burkina Faso three interviews were held with Flavie Konzié, a primary school teacher, Moussa Diessongo and Faustin Gervais, both evening school teachers in the second, short field stay in November 2000 (for the full question guide refer to Appendix VI).
There are three levels of school in Burkina Faso. The primary school (école primaire) lasts six years and children start at the age of seven. The secondary school (école secondaire) lasts seven years and children start at the age of 12. With a secondary school degree the pupils can go to a high school (école supérieure), which lasts three to four years. There are also Koran schools and classes in Morée, the local language of Mossi people in Ouagadougou. These two kinds of school have the

same level as primary schools. In addition, there are evening schools, which have both the primary and secondary school level.

As further *APPROACHES* to estimate the total monthly predictable costs in a household personal observations of the study populations were made, and the socio-economic status of HGs and NHGs households was classified. More information on the classification of socio-economic status is found in Chapter 6, Section 6.2.6.1.

After balancing between all of these approaches -estimation of each of the total monthly expenditures, personal observations, socio-economic status, final reports of the interviewers- a fairly exact statement was given about the total monthly predictable costs in HGs and NHGs households during the rainy season.

7.2.7. Income Estimation

All of the difficulties of measuring expenditures -recall bias, seasonality, long questionnaires- apply to a much greater extent to the measurement of income. Income is often a more sensitive topic than consumption, especially since the latter is more obvious to friends and neighbors than the former (DEATON, 1997).
Taking all of these difficulties into consideration it was decided that the triangulation strategy would obtain the most correct figures representing the income of the study populations. The following three approaches were used: (1) the directly estimated average monthly income approach, (2) the indirectly estimated average monthly income approach and (3) personal observations of the study populations and classification of the socio-economic status of HGs and NHGs households.
Detailed information on the income estimation is found in Chapter 5, Section 5.2.6.

7.2.8. Quality Control of the Results

Many different methods, which integrate qualitative and quantitative components, are widely used to obtain valid results in epidemiology research. This kind of investigation strategy is known as triangulation. Triangulation was used in this study

in the following ways: (1) questionnaires were administered to households to gather good quantitative data, (2) focus group discussions were held with individuals to gain valuable qualitative information and (3) personal observations were made to verify reported behavior. All data was compared to existing data of urban agriculture, and especially to data about the economic impact of urban agriculture. Several studies have already been completed and are discussed in Chapter 2 and in Chapter 4, Section 4.4.

7.3. Results and Discussion

The monthly predictable costs of HGs and NHGs households will be discussed. These costs represent a regular burden for all households. To calculate the monthly predictable expenditures per household the single expenditures for each item (food, drinking water, fuel for cooking, energy, school and clothes) were measured. The quality of household equipment, use of public utilities, food production and home consumption were also evaluated.

The total monthly predictable costs and their distribution will be described first, considering HGs and NHGs households separately for each site. The different costs will be specified. Lastly, best-case, base-case and worst-case scenarios of the financial situations in HGs and NHGs households will be worked out.

7.3.1. Monthly Predictable Expenditures and their Differences Between the Households and Sites

Significant differences were found between the monthly predictable costs of households with home gardens and households without in one site, but also between HGs and NHGs households in the different sites (refer to Figure 7.2.).

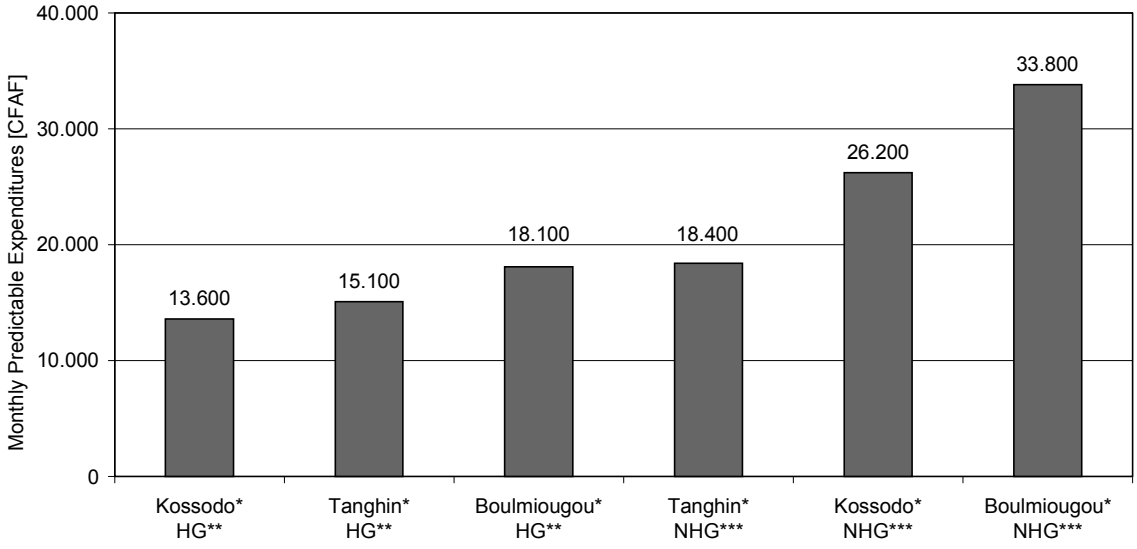
The NHGs households in Boulmiougou had the highest monthly predictable costs, with 33.800 CFAF (Q_{25}-Q_{75}: 19.900-49.900 CFAF), followed by the NHGs households in Kossodo, with 26.200 CFAF (Q_{25}-Q_{75}: 13.800-54.300 CFAF) and the NHGs households in Tanghin, with 18.400 CFAF (Q_{25}-Q_{75}: 14.500-25.300 CFAF). In HGs households the highest monthly predictable costs were found in Boulmiougou, with 18.100 CFAF (Q_{25}-Q_{75}: 13.000-25.200 CFAF), followed by Tanghin, with 15.100 CFAF (Q_{25}-Q_{75}: 10.300-21.300 CFAF) and Kossodo, with 13.600 CFAF (Q_{25}-Q_{75}: 11.600-19.800 CFAF).

The differences between HGs and NHGs households in the three sites were significant 3.300 CFAF in Tanghin, 12.600 CFAF in Kossodo and 15.700 CFAF in Boulmiougou ($p<0.001$ in all three sites).

The differences in the expenditures between the HGs households across the three sites were not as great as between HGs and NHGs households within the sites. They

were with 3.000 CFAF between Boulmiougou and Tanghin and 4.500 CFAF between Boulmiougou and Kossodo, nevertheless also significant (p<0.001). In comparison, the expenditures of NHGs households between the three sites varied widely. They differed significantly up to 15.400 CFAF (p<0.001) between Boulmiougou and Tanghin. The difference was 7.600 CFAF between Boulmiougou and Kossodo (p=0.134) and 7.800 CFAF between Kossodo and Tanghin (p=0.003).

Figure 7.2. Monthly predictable expenditures in home gardeners’ (HG) and non-home gardeners’ (NHG) households in Boulmiougou, Tanghin and Kossodo in the rainy season

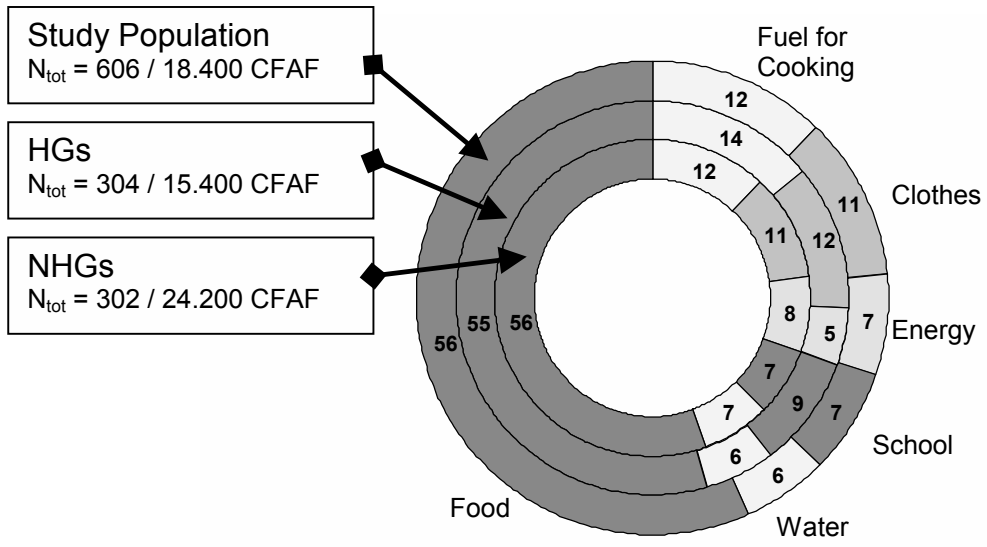


* The monthly predictable expenditures differed significantly between HGs and NHGs households in all three sites (p<0.001).
** The monthly predictable expenditures differed significantly between HGs households in Boulmiougou and Kossodo (p<0.001), and Boulmiougou and Tanghin (p<0.001).
***The monthly predictable expenditures differed significantly between NHGs households in Boulmiougou and Tanghin (p<0.001), and Tanghin and Kossodo (p=0.003).

The proportion of predictable costs devoted to each individual expenditure, however, was similar for all three sites in households with home gardens and households without home gardens. Therefore the whole study population showed an equivalent pattern, which is seen in Figure 7.3. The exact amounts of the different items are given in the following sections.

With 56% in the whole study population (12.500 CFAF, Q_{25}-Q_{75}: 9.000-20.200 CFAF) and 55% to 56% in the HGs and NHGs households, the expenditures for food were the highest and most predominant of all predictable costs. Twelve percent (3.000 CFAF, Q_{25}-Q_{75}: 1.700-4.900 CFAF) of the total expenditures were for fuels for cooking, making this the second largest expenditures. The smaller expenditures were for clothes (1.700 CFAF, Q_{25}-Q_{75}: 700-4.200) with 11%, energy (1.800 CFAF, Q_{25}-Q_{75}: 900-3.600 CFAF) and school (1.300 CFAF, Q_{25}-Q_{75}: 600-2.500 CFAF), each with 7%. The order of these three smaller expenditures varied between the sites and between the groups but they remained consistently lower than the expenditures for food and fuels for cooking. With the exception of Kossodo, the expenditures for drinking water were the lowest in all sites, with 6% or 1.500 CFAF (Q_{25}-Q_{75}: 300-2.500 CFAF).

Figure 7.3. Proportion of the monthly predictable expenditures for the whole study population and for home gardeners’ (HGs) and non-home gardeners’ (NHGs) households in the rainy season



It is difficult to define an international standard for poverty. International studies of poverty have both conceptual and practical problems. Different countries have different definitions of poverty, and comparisons between countries can be difficult.

Local poverty lines tend to have higher purchase power in rich countries, in which more generous standards are used than in poor countries. Furthermore the prices for goods and services are not traded internationally and can not be compared. One attempt to set an international poverty line is the commonly used US $1-a-day standard (WORLD BANK, 2000/01 / see Chapter 1, Section 1.1.2.). The average amount spent by each household in the whole study population was 25.600 CFAF, or US $42.60 per month, or US $1.40 per day. This amount was comparable with the US $1-a-day standard. On average, HGs spent US $1 per day, while NHGs spent US $1.80. The NHGs households showed a higher standard (also known as the US $2-a-day standard) than HGs (refer to Chapter 5).

Just as there are problems in comparing the poverty measurements of one country with that of another, there can also be problems in comparing poverty measurements within a country. The cost of living is typically higher in urban areas than in rural areas. Food, for example, tends to be more expensive in urban areas, as is the use of public utilities. The urban monetary poverty line should be higher than the rural poverty line (WORLD BANK, 2000).
Data about poverty lines are a good predictor of the financial situation of a certain population in a country. It is important, however, to be cautious when considering these data, and to understand the strengths and weaknesses of poverty line calculations.

7.3.2. Monthly Food Costs and their Differentiation

The lack of food is often related to poverty, as this quote shows:

> *“You are poor if you don’t have enough to eat.”*
> HG (male, aged 42, socio-economic class 1/2) with three wives and 11 children in Boulmiougou

In all three sites the expenditures for food were more than half (56%) of the total predictable costs. Separately seen the expenditures for food were 56% (17.000 CFAF, Q_{25}-Q_{75}: 10.500-27.000 CFAF) in Boulmiougou, 60% in Tanghin (13.100 CFAF, Q_{25}-Q_{75}: 9.000-17.800 CFAF) and 51% in Kossodo (9.300 CFAF, Q_{25}-Q_{75}:

7.100-19.100 CFAF). The big burden of these food costs was vividly described by a HG (male, aged 37) of Tanghin:

> *"Our greatest expense is buying food. For the treatment of illness you have to spend a lot also, but you are not ill daily, but you are hungry every day."*

Other studies of household expenditures were conducted in Burkina Faso and Ouagadougou between 1996 and 2000. The results were more or less the same as in this study (INSD, 1996; INSD, 1998; MINISTERE DE L’ECONOMIE ET DES FINANCES, 2000 / see Chapter 6, Section 6.3.1.2.). The argument that the urban poor spends more than 50% of their income on food was again confirmed in this study.

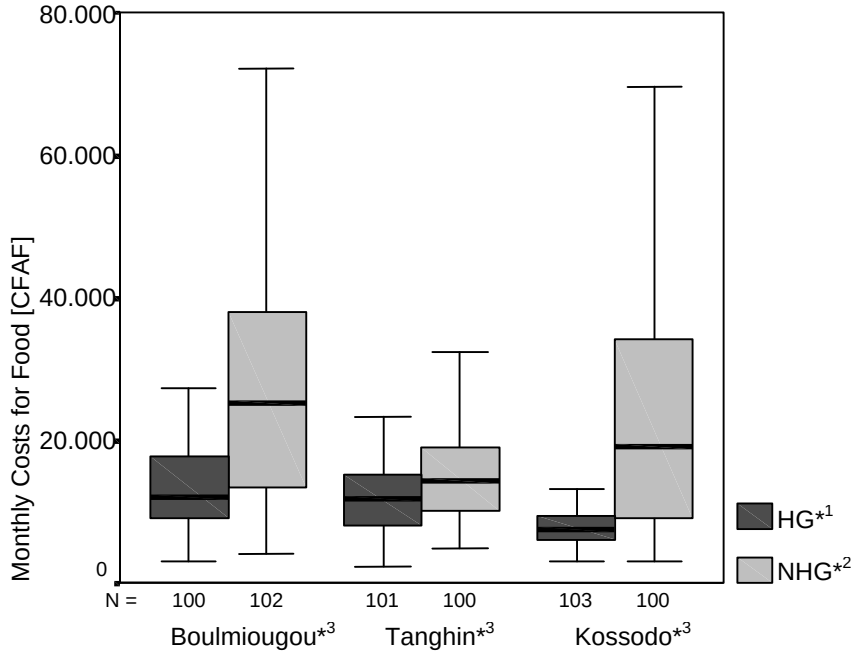
The total monthly costs for food differed both within and between the sites (see Figure 7.4.).

In all three sites NHGs households spent more per month for food than HGs households. There were also significant differences between the costs of NHGs households in the three sites ($p<0.001$ between Boulmiougou and Tanghin, $p=0.034$ between Boulmiougou and Kossodo and between Tanghin and Kossodo). With 25.200 CFAF (Q_{25}-Q_{75}: 13.500-38.400 CFAF) the NHGs households in Boulmiougou had the highest food expenditures, followed by the NHGs households in Kossodo with 19.000 CFAF (Q_{25}-Q_{75}: 9.000-34.100 CFAF) and the NHGs households in Tanghin with 14.400 CFAF (Q_{25}-Q_{75}: 10.100-19.100 CFAF).

There were also significant differences between the food costs of HGs households in the three sites ($p<0.001$ between Boulmiougou and Kossodo and between Tanghin and Kossodo). With 12.100 CFAF (Q_{25}-Q_{75}: 9.000-18.000 CFAF) the HGs households in Boulmiougou had the highest food expenditures, followed by the HGs households in Tanghin with 11.700 CFAF (Q_{25}-Q_{75}: 8.100-15.700 CFAF) and the HGs households in Kossodo with 7.500 CFAF (Q_{25}-Q_{75}: 6.000-9.500 CFAF).

In all three sites the differences in monthly food expenditures between HGs and NHGs households were significant ($p<0.001$ in Boulmiougou, $p=0.002$ in Tanghin and $p<0.001$ in Kossodo). In Boulmiougou they varied by 13.100 CFAF, in Kossodo by 11.500 CFAF and in Tanghin by 2.700 CFAF.

Figure 7.4. Monthly costs for food in home gardeners’ (HG) and non-home gardeners’ (NHG) households in Boulmiougou, Tanghin and Kossodo in the rainy season



*1 Costs differed significantly between HGs households in Boulmiougou and Kossodo, and Tanghin and Kossodo (p<0.001).
*2 Costs differed significantly between NHGs households in Boulmiougou and Tanghin (p<0.001), Boulmiougou and Kossodo (p=0.034) and Tanghin and Kossodo (p=0.034).
*3 Costs differed significantly between HGs and NHGs households in Boulmiougou (p<0.001), Tanghin (p=0.002) and Kossodo (p<0.001).
Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

The typical dish in Burkina Faso and therefore for the study population in Ouagadougou is Tô, a millet or maize porridge with sauce (see Chapter 6, Section 6.2.6.1.). In the rainy season HGs households can use their own cereals and their own vegetables for preparing their daily Tô.

A woman, aged 41, working on the home garden fields of Kossodo explained:

"Home garden products allow us to prepare our daily food."

This fact is most probably the reason for the differences in expenditures for food between HGs and NHGs households in the rainy season and will be discussed in the following sections.

Cereals

Extracting the costs for cereals from the total monthly costs for food, it was seen that these costs were between 3.000 and 4.000 CFAF for all three sites. There were no big differences within the sites, except for Kossodo. In that site the HGs households spent on average only 760 CFAF monthly for cereals.
Most of the HGs households in Ouagadougou during the rainy season cultivated their own cereals either on the home garden fields or more frequently in the villages they came from (see Photos 30 and 31). One home gardener (female, aged 32) of Kossodo explained that:

> *"In our village we have fields to cultivate our cereals. Here in town the home garden fields do not belong to us and we have to ask the owner to use the land for home gardening. In the rainy season they want their fields back for cultivating."*

The interviewees were also asked about the production of cereals and the consumption of their own cereals. Remarkably, in Kossodo up to 86% of the HGs cultivated their own cereals. Among these 86% cultivated millet, 25% maize and 54% rice. This could be a reason that in Kossodo the HGs households had surprisingly low expenditures for cereals and also their total monthly food costs were the lowest of all the sites. In Tanghin 75% of the HGs households cultivated millet, 52% maize and 27% rice. In Boulmiougou 60% of the HGs households were cultivating millet, 43% maize and 32% rice.
A new aspect of the study was that NHGs households also cultivated cereals during the rainy season. This was most frequent in Kossodo (29% millet, 17% maize and 2% rice), followed by Tanghin (16% millet, 17% maize and 2% rice) and Boulmiougou (20% millet, 14% maize and 3% rice).

Sauce

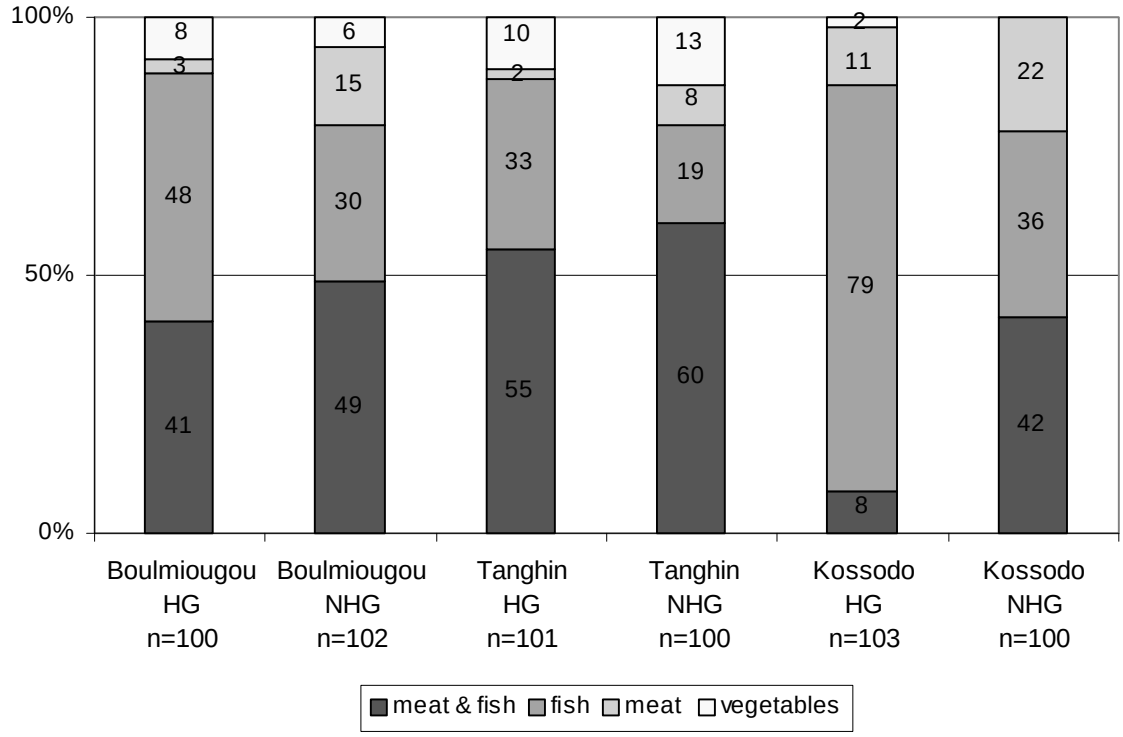
The sauce normally contains a selection of spices, vegetables, fish and meat (refer to Chapter 6, Section 6.2.6.1.). Of these ingredients meat and European vegetables were the most expensive ones and were often left out of the sauce to reduce costs.

European vegetables cost much more at the daily markets in Ouagadougou than traditional vegetables, especially during the dry season when they are often imported (Personal Information, Ouagadougou, 1999; average price estimation of 100 different households, Ouagadougou, 2000). Although European vegetables become more and more popular within the last years, they are still integrated in the local meal plan consisting of porridge with sauce (AG-BENDECH et al., 1996).

The monthly expenditures for food differed significantly between HGs and NHGs households at the three sites. This difference resulted most probably from the different costs for sauce. The biggest difference was in Kossodo with HGs households spending 7.500 CFAF (Q_{25}-Q_{75}: 6.000-9.000 CFAF) monthly for the sauce and NHGs households spending 15.000 CFAF (Q_{25}-Q_{75}: 7.900-24.000 CFAF). This amount was followed by Boulmiougou where HGs households spent 9.000 CFAF (Q_{25}-Q_{75}: 7.500-12.000 CFAF) and NHGs households 15.000 CFAF (Q_{25}-Q_{75}: 9.000-30.000 CFAF). Only in Tanghin HGs households (7.500 CFAF, Q_{25}-Q_{75}: 6.000-12.800 CFAF) and NHGs households (9.000 CFAF, Q_{25}-Q_{75}: 6.000-15.000 CFAF) spent approximately the same amount for sauce per month.

The main ingredients of sauce differed between HGs and NHGs households (refer to Figure 7.5.). Meat was the main ingredient in 8% (Tanghin) to 22% (Kossodo) of the NHGs households. Only 2% (Tanghin), 3% (Boulmiougou) and 11% (Kossodo) of the HGs households bought meat as the main ingredient of the sauce. In all three sites together the main ingredient in HGs households was fish (56%), instead of a combination of fish and meat (54%) in NHGs households ($p<0.001$).
Fresh water fish is less expensive than meat. One kilogram of fresh fish costs between 450 and 550 CFAF. In comparison, one kilogram of beef or mutton costs on average 1.800 CFAF (average price estimation of 100 different households, Ouagadougou, 2000). Chickens and guinea-fowls are, at 1.000 and 1.250 CFAF per piece, respectively, also more expensive than fish. In addition, the heads and tails are the cheapest parts of the fish and cost between 50 and 100 CFAF each. Often only these pieces are bought as ingredients for the sauce. The prices for meat and fish do not differ between the dry and rainy season (Personal Information, Ouagadougou, 1999; average price estimation of 100 different households, Ouagadougou, 2000).

Figure 7.5. Comparison of the ingredients of the sauce used in home gardeners’ (HG) and non-home gardeners’ (NHG) households in Boulmiougou, Tanghin and Kossodo in the rainy season



The lower costs and inferior quality of sauce in HGs households in all three sites can be a predictor of a lower socio-economic standard in this group, which was expressed with a lower quality of alimentation (THIOMBANO et al., 1992). In this study significantly more HGs than NHGs households belonged to the lowest socio-economic class (see Chapter 8).

These results were confirmed in another household study carried out in 1991 and 1992 in Harare, the capital of Zimbabwe. They recognized in poor households ‘some changes to their diet, eating meat less frequently and substituting that with home-grown green vegetables. In short, households eat food with a greater bulk and less protein.’ (KANJI, 1995).

To summarize, differences could be seen in the expenditures for food in HGs and NHGs households. In all three sites HGs households spent significantly less on food than NHGs households. Nevertheless, the food share in the total monthly

expenditures was 56% in the whole study population. Making up more than half of the total predictable costs, these expenditures were a major portion of the households’ expenditures. A very high food price index of 5.4% between 1990 and 1997 in Burkina Faso also contributed to this situation. The food price index is a subindex of the consumer price index. The consumer price index reflects changes in the costs to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specific intervals, such as yearly. Both indexes are useful indicators for measuring consumer price inflation within a country (WORLD BANK, 2000). A reduction of the high expenditures for food would help all households to release money for other needs.

7.3.3. Drinking Water Sources and the Monthly Costs of Obtaining Drinking Water

There are four possibilities of obtaining drinking water in Ouagadougou: at a tap at home, at a public well in the quarter, by a water seller and at a hand-dug well.
The monthly costs of drinking water were the highest, at 3.500 CFAF in Kossodo in NHGs households (refer to Table 7.1.). The cost of drinking water was 900 CFAF in NHGs households in Tanghin and 2.000 CFAF in Boulmiougou. In HGs households the cost of drinking water varied between 400 CFAF in Tanghin, 900 CFAF in Boulmiougou, and 1.800 CFAF in Kossodo.
In Tanghin, HGs and NHGs households spent nearly the same obtaining their monthly drinking water. In Boulmiougou and Kossodo NHGs households spent between 1.100 CFAF and 1.800 CFAF more than HGs households. One reason could be the different sources of drinking water used by the different groups, which will be discussed later.

The tap at home was the most expensive water source per month (4.000 CFAF, Q_{25}-Q_{75}: 2.000-6.000 CFAF). Water from a water seller cost 3.000 CFAF per month (Q_{25}-Q_{75}: 830-4.500 CFAF) and water from a public well cost 980 CFAF (Q_{25}-Q_{75}: 400-1.800 CFAF). At a hand-dug well more than 50% of the population got water for free, while those who had to pay for water paid 460 CFAF monthly (Q_{25}-Q_{75}: 0-425 CFAF) on average.

Table 7.1. Monthly costs of obtaining drinking water in home gardeners’ (HGs) and non-home gardeners’ (NHGs) households in Boulmiougou, Tanghin and Kossodo and their contribution to the monthly total predictable costs in households in the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*[1]	[%] of all costs*[2]
Boulmiougou	HGs	1.200	900	0-1.800	0	5.500	1.300	21	5
	NHGs	2.700	2.000	900-4.500	0	6.000	2.100	17	6
Tanghin	HGs	660	400	150-830	0	2.800	720	21	3
	NHGs	2.100	900	400-2.000	0	15.000	3.400	19	7
Kossodo	HGs	1.700	1.800	900-2.000	0	4.500	1.300	22	9
	NHGs	3.200	3.500	250-6.000	0	8.000	2.800	19	7

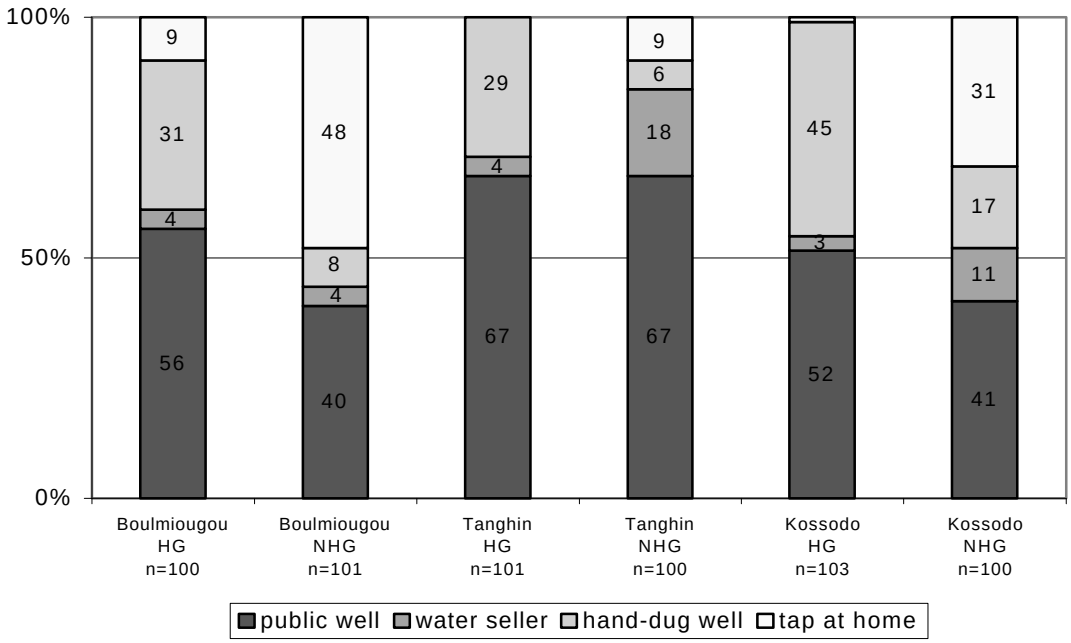
*[1] Number of interviewees.
*[2] Contribution to the total monthly predictable costs in households.

These costs reflected the real situation in Ouagadougou. Only upper classes could afford a tap at home. In the whole study population 16% (n=99/606) had a tap at home and from these 99 households, 57 belonged to the highest socio-economic class and 38 to the second highest class (for more information refer to Chapter 8).

The government-owned company ONEA (Office Nationale de l’Eau et de l’Assainissement) provides the town with drinking water via two different systems of distribution (Interview with Laurent Traore, Chef de Service Gestion Clientèle du Département de Ouagadougou, Ouagadougou, 2000). First, they provide all households which have a tap at home. In 1993, these were 38% of the inhabitants in Ouagadougou (GUENE et al., 1999). The price for the water depends on the consumed quantity per month. For up to ten cubic meters water one cubic meter costs 176 CFAF. For 11 to 25 cubic meters water one cubic meter costs 374 CFAF. If more than 25 cubic meters are consumed, from 26 cubic meters each cubic meter costs 993 CFAF. The prices are the same for all months of the year and the price system did not changed between 1998 and 2000. The second system of water distribution is via public wells in the quarters. A 220-liter-barrel of drinking water costs 60 CFAF. (Detailed information on this distribution system is given in Chapter 6,

Section 6.3.1.3.) Water sellers, however, sell a barrel of water for 450-500 CFAF in the rainy season. This could explain the different monthly expenditures for the different water sources in the study population.

Figure 7.6. Comparison of the different drinking water sources in home gardeners’ (HG) and non-home gardeners’ (NHG) households in Boulmiougou, Tanghin and Kossodo in the rainy season



In all three sites, the public well was the most common water source for HGs households and, with the exception of Boulmiougou, for NHGs households. In Boulmiougou 56% (n=56/100) HGs households and 40% (n=41/101) NHGs households obtained their water from these public wells. In Tanghin it was 67% (n=68/101) HGs households and also 67% (n=67/100) NHGs households, and in Kossodo it was 52% (n=53/103) HGs households and 41% (n=41/100) NHGs households (refer to Figure 7.6.).

A significant difference can be seen between HGs and NHGs households having a tap at home (see Figure 7.6.). In Boulmiougou 48% (n=49/102) of the NHGs had a tap at home, but only 9% of the HGs (n=9/100, $p<0.001$). In Tanghin the proportion

was 9% (n=9/100) to 0% (p=0.002) and in Kossodo 31% (n=31/100) to 1% (n=1/103, p<0.001). The higher proportion of taps at home and the resulting higher monthly costs for these taps might explain the higher expenditures for drinking water in NHGs households, especially in Boulmiougou and Kossodo (refer to Table 7.1.).

Many more HGs than NHGs households used water from a hand-dug well. In Boulmiougou 31% (n=31/100) of the HGs households used water from a hand-dug well, but only 8% (n=8/102) of NHGs households. In Tanghin the difference was 29% (n=29/101) to 6% (n=6/100) and in Kossodo 45% (n=46/103) to 17% (n=17/100), which was in all three sites significant (p<0.001).

Many more NHGs households than HGs households bought water from a water seller in Tanghin and Kossodo. In Tanghin the difference was 18% (n=18/100) to 4% (n=4/101, p<0.001) and in Kossodo 11% (n=11/100) to 3% (n=3/103). Drinking water at a hand-dug well was for half of the study population for free, while water bought from a water seller cost 450-500 CFAF for a barrel. This could be a further reason for the higher monthly costs for drinking water in NHGs households.

The irony of the water providing situation is that the price people pay to a water seller is more or less the same as what better-off families pay for the comfort of being connected to the town system, and even more important, for the security of save drinking water. This is a phenomenon, which arises frequently in developing towns and was also seen, among others, in Tegucigalpa, Honduras (CHOGUILL & CHOGUILL, 1996). For many urban households the payments made to water sellers represent major household expenditures, often taking up 10 to 20% of the household income. To make things worse, the poor often pay higher prices than the affluent for less convenient water (CAIRNCROSS & KINNEAR, 1992; HARDOY et al., 1992).

Many urban centers in Africa’s dryland areas face particularly serious problems because of a combination of rapid growth in demand for water and unusually low rainfall in recent years, with the consequent dwindling of local fresh water resources (MITLIN & SATTERTHWAITE, 1996). In Burkina Faso, freshwater resources (defined as cubic meters per capita) contained 1.671 m^3 in 1997. This number is also very low in comparison to its neighboring countries of the Sub-Saharan region, such as Mali (5.362 m^3) or Niger (3.204 m^3 / WORLD BANK, 2000/01).

Quantity of water and a good quality of water are not related and have to be regarded absolutely separately. In 1980, the United Nations proclaimed the eighties as the decade of ‘International Drinking Water Supply and Sanitation’ (PRADELLES, 1995; UN, 2001). Sustainable improvement in the standard and level of drinking water and sanitation, especially in developing countries, should have been reached. One goal was to obtain 20 liters of safe drinking water per person per day in the Sub-Saharan region (PRADELLES, 1995). In the least economically developed countries, however, progress has been significantly slower than elsewhere (ASHORN et al., 2000). Today only 69% of the world’s population (SKÖLD, 1998; WORLD BANK, 2000/01) and only 50% of the urban population have access to safe water (WORLD BANK, 2000).
There is a highly evidence for a higher diarrhea risk and the availability and quality of the drinking water (TRAORE et al., 1994; CURTIS et al., 1995). In Nicaragua children with water supplies away from their house had a significantly higher rate of diarrhea than children with their own water supply at home (GORTER et al., 1991). In a study in an urban setting of Brazil, children had a significantly lower risk of death from diarrhea when piped water in the household was available (VICTORA et al., 1988). In Malawi, children living in families who used good quality water supplies and latrines experienced 20% less diarrhea during the rainy season than children living in families without good quality water supply and without latrines (YOUNG & BRISCOE, 1988). Data collected in eight countries showed an association of water and sanitation with diarrhea in an urban setting. Children with the highest rate of diarrhea generally appeared among households without improved sanitation and children with the lowest rate of diarrhea lived in households with access to save water (ESREY, 1996). Access by households to sufficient and safe water, combined with adequate sanitation and hygiene could result in a substantial reduction in the five million deaths due to diarrhea diseases that occur each year (VAN DER HOECK et al., 1999).
In Burkina Faso 35% of the population is estimated to have access to improved water sources (WORLD BANK, 2000/01). Studies about the water quality in home gardening sites have shown that there was a contamination of the water with virus, bacteria, parasites and chemicals (CISSE, 1997; BOSSHART, 1998). However, the consciousness of the importance of obtaining safe drinking water was not seen in the study population. A HG (male, aged 35) pointed out:

“Water? That’s always and everywhere the same.”

More information on the frequency of illnesses and related environmental risk factors is given in Chapter 6, Section 6.3.2.3.3.f.

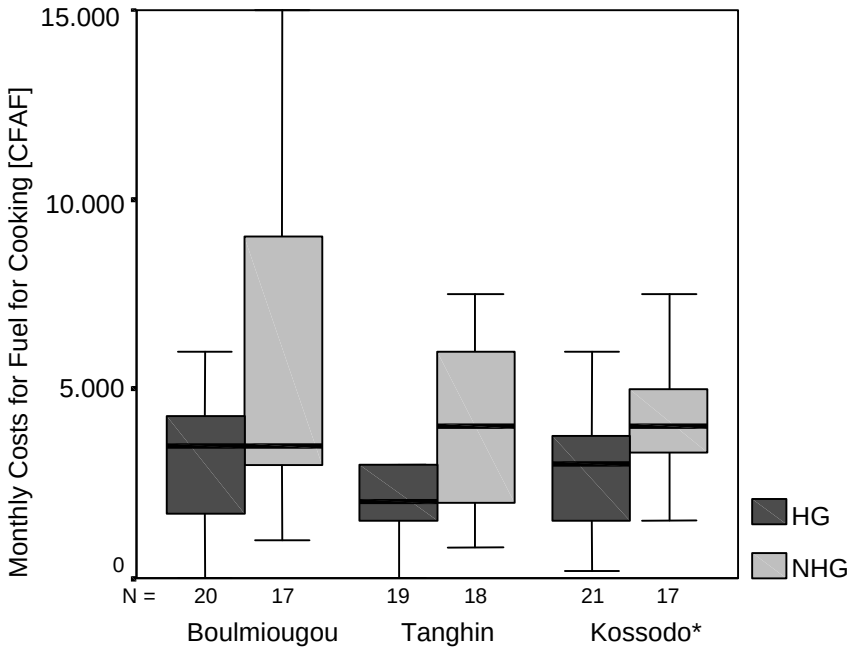
7.3.4. Types of Fuel for Cooking and their Monthly Costs

The different types of fuel for cooking in Ouagadougou are wood, gas, charcoal, millet stalk and kerosene. Interviewees were only asked about the fuel they used most often. Making up 12%[*] of the monthly predictable costs in the whole study population, fuel costs represented the second biggest monthly expenditures. Especially in poorer households, the expenditures on fuel occupy a prominent place in the monthly expenditures. In a survey in Burkina Faso in an urban setting households spent on average 20% of their total monthly expenditures on fuel for cooking and drinking water (MINISTERE DE L’ECONOMIE ET DES FINANCES, 2000). In Kenya, very low-income communities spent 30% of their income on fuel for cooking (BIRLEY & LOCK, 1998).

With a minimum of 2.000 CFAF and a maximum of 4.500 CFAF in the whole study population, the monthly costs of fuel for cooking only differed significantly between the HGs households and NHGs households in Kossodo (p=0.006, refer to Figure 7.7.). With 4.000 CFAF the NHGs households of Kossodo (Q_{25}-Q_{75}: 3.200-5.000 CFAF) and Tanghin (Q_{25}-Q_{75}: 2.000-6.000 CFAF) had the highest costs for their fuels for cooking, followed by the NHGs households of Boulmiougou (3.500 CFAF, Q_{25}-Q_{75}: 2.000-9.500 CFAF). In Boulmiougou the HGs households also spent 3.500 CFAF (Q_{25}-Q_{75}: 1.700-4.400 CFAF) per month, followed by the HGs households of Kossodo (3.000 CFAF, Q_{25}-Q_{75}: 1.500-4.100 CFAF) and Tanghin (2.000 CFAF, Q_{25}-Q_{75}: 1.500-3.000 CFAF).

[*] Boulmiougou: HGs households 14%, NHGs households 13%
Tanghin: HGs households 13%, NHGs households 14%
Kossodo: HGs households 14%, NHGs households 10%

Figure 7.7. Comparison of the monthly costs for fuel for cooking in home gardeners’ (HG) and non-home gardeners’ (NHG) households in Boulmiougou, Tanghin and Kossodo in the rainy season



* Costs differed significantly between HGs and NHGs households in Kossodo (p=0.006). Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

Regarding the different fuels for cooking separately, the average costs for wood were the highest at 3.000 CFAF monthly (Q_{25}-Q_{75}: 2.000-4.900 CFAF, n=100). Gas cost 1.900 CFAF (n=8) and charcoal 1.000 CFAF (n=1). The small sample size did not allow statistical analyses. A further study carried out in the urban setting in Burkina Faso confirms the high costs for wood. Poor households spent 15% of their total monthly expenditures only for wood (MINISTERE DE L’ECONOMIE ET DES FINANCES, 2000).

For all households in the study population, wood was the most common fuel for cooking (refer to Table 7.2.). Additionally, in all sites wood was more frequently used in HGs than in NHG households. In Boulmiougou 91% of the HGs households used wood, but only 72% of the NHGs households ($p<0.001$). In Tanghin 83% of the HGs households, but 69% of the NHGs households used wood. In Kossodo 86% of the HGs households, but 78% of the NHGs households used wood.

Table 7.2. Distribution of the different fuels used for cooking in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo in the rainy season

			Wood		Gas		Charcoal		Kerosene		No cooking	
		n	[%]	n	[%]	n	[%]	n	[%]	n	[%]	n
Boulmiougou	HGs	100	91	91	5	5	2	2	0	0	2	2
	NHGs	102	72	73	14	15	6	6	1	1	7	7
Tanghin	HGs	101	83	84	7	7	1	1	0	0	9	9
	NHGs	100	69	69	16	16	1	1	1	1	13	13
Kossodo	HGs	103	86	89	0	0	0	0	0	0	14	14
	NHGs	100	78	78	8	8	0	0	0	0	14	14

Gas was more frequently used in households without home gardens than in households with home gardens. In Boulmiougou 14% of the NHGs households used gas, but only 5% of the HGs households. In Tanghin 16% of the NHGs households, but 7% of the HGs households used gas. In Kossodo 8% of the NHGs households, but none of the HGs households used gas (see Table 7.2.).

The increase of gas as a cooking possibility can be seen in connection with a government-supported campaign started some years before to promote the use of gas (refer to Chapter 6, Section 6.3.1.4.) and with the different living conditions in the different households.

In the study three different types of housing were selected in Ouagadougou. A house constructed with adobes is the cheapest form of construction. As the adobes are water-soluble, the houses are often damaged after the rainy season (see Photo 15). The second form is a mix between adobes and cement. The joint between the adobes is filled up with cement, which makes the house more durable and water resistant. The best possibility in housing is a fully cemented house. Constructed with clay bricks it is totally roughcast with cement and can not be damaged by rain. This is also the most expensive form of constructing.

In all sites more NHGs than HGs households lived in cemented houses. In Boulmiougou only 9% (n=9/100) of HGs lived in cemented houses in comparison to 55% (n=55/102) of the NHGs households ($p<0.001$). In Tanghin 7% (n=7/101) of

HGs lived in cemented houses in comparison to 15% (n=15/101) of the NHGs households. In Kossodo 4% (n=4/103) of HGs lived in cemented houses in comparison to 36% (n=36/100) of the NHGs households ($p<0.001$). There was moreover a significant difference between HGs (n=0/304) and NHGs (n=26/302) living in a cemented house and cooking with gas ($p<0.001$).
The two other cooking sources, charcoal and kerosene, were not used commonly among the study population in all sites.

In conclusion, wood was the most commonly used fuel for cooking. Eighty percent (n=484/606) of the total study population cooked with wood. Deforestation and the Sub-Saharan climate are some of the biggest problems that the population of Saharan and Sub-Saharan countries is confronted with (refer to Chapter 6, Section 6.3.1.4.).

7.3.5. Energy Sources and the Monthly Expenditures for Electricity and Kerosene

People were asked about their source of energy and their expenditures either for electricity or kerosene. These questions were asked in the context of lighting the house and not as fuels for cooking.

Only 21% (n=126/606) of the whole study population had electricity at home and 19% (n=112/606) of this 21% were NHGs households. Therefore, the differences between HGs and NHGs households having electricity at home were big and in all three sites significant ($p<0.001$). In Boulmiougou only 8% (n=8/100) of the HGs households had electricity, but 58% (n=58/102) of the NHGs households. In Tanghin 5% (n=5/101) of the HGs households and 21% (n=21/100) of the NHGs households, and in Kossodo 1% (n=1/103) of the HGs households and 33% (n=33/100) of the NHGs households had electricity. These differences could be one reason that the costs for energy make up a larger percentage of the total monthly costs in NHGs households than in HGs households. NHGs households spent on average 9% (3.100 CFAF) of their total monthly costs for energy, and HGs households only 6% (1.100 CFAF).

In all three sites the costs for electricity were higher in NHGs households than in HGs households. In Kossodo NHGs households paid 9.000 CFAF monthly (Q_{25}-Q_{75}: 6.400-11.000 CFAF), in Tanghin 8.500 CFAF (Q_{25}-Q_{75}: 6.000-10.000 CFAF) and in Boulmiougou 6.300 CFAF (Q_{25}-Q_{75}: 4.100-8.000 CFAF). In all three sites, HGs households spent an average of only 4.000 CFAF monthly on electricity. The small sample size of HGs households using electricity did not allow statistical analyses between the costs of the two groups. Only eight HGs households in Boulmiougou, five in Tanghin and one HG household in Kossodo had electricity at home. In another household study carried out in 1998 the expenditures for electricity were lower with an average of 1.720 CFAF per household per month (INSD, 1998).

The monthly costs for kerosene were much lower than the monthly costs for electricity. With the exception of the HGs households in Kossodo (1.800 CFAF per month, Q_{25}-Q_{75}: 1.100-2.000 CFAF), the costs did not differ significantly for households with and without home gardens within the sites and between the sites. In Boulmiougou HGs households spent 550 CFAF monthly (Q_{25}-Q_{75}: 430-900 CFAF) and NHGs households 450 CFAF (Q_{25}-Q_{75}: 380-460 CFAF). In Tanghin both groups spent 300 CFAF monthly (Q_{25}-Q_{75}: 200-800 CFAF). In Kossodo NHGs households spent 900 CFAF monthly (Q_{25}-Q_{75}: 900-1.100 CFAF). These costs almost correspond to the household study of 1998. In this study the household expenditures for kerosene were 290 CFAF (INSD, 1998).

In conclusion, only 21% of the whole study population had electricity at home. In household’s interviews in Ouagadougou in 1998 31% of all households declared to have electricity (INSD, 1998). A reason for the lower percentage in the present study could be that HGs households represent a lower socio-economic class than the average of the households in Ouagadougou (for more information on the different socio-economic classes refer to Chapter 8).
Nevertheless, most of the quarters in Ouagadougou today still have no electricity and it is out of reach for the lower socio-economic classes. The reasons are the high cost for the kilowatt-hour and the high costs for the installation of electricity at home. (A detailed description of the electricity-providing system of the government-owned power station (SONABEL) is given in Chapter 6, Section 6.3.1.5.) Especially in Africa, where cities have been growing rapidly, the economic plight of the public

sector is severe. Financially-strapped central governments and local municipalities are not in a position to expand the public sector to individual households in disadvantaged areas (MCGRANAHAN et al., 1996). As in Burkina Faso, in many countries around the world the public sector is under pressure to retrench rather than expand (MCGRANAHAN & KAIJSER, 1993).

7.3.6. Expenditures for Clothes and Number of Clothes bought in Home Gardeners’ and Non-Home Gardeners’ Households

The lack of material well-being turns out to be closely related to poverty:

> *“Poverty is if you aren’t able to provide your family with enough food and clothes.”*
> HG (female, aged 38, socio-economic class 1/2) in Kossodo

In all three sites the HGs households spent significantly less for clothes than the NHGs households (refer to Table 7.3.). There were significant differences in clothing expenditures between the HGs households in the three sites ($p<0.001$ between HGs households in Boulmiougou and Tanghin, $p=0.001$ between HGs households between Tanghin and Kossodo). There were also significant differences in clothing expenditures between the NHGs households in the three sites ($p<0.001$ between NHGs households in Boulmiougou and Tanghin, $p=0.004$ between NHGs households in Tanghin and Kossodo).

In Kossodo the NHGs had the highest expenditures for clothes with 4.000 CFAF. The HGs at the same site spent only 1.700 CFAF monthly for clothes, which was significantly lower ($p=0.048$). In Boulmiougou the two groups were more similar, with monthly expenditures of 2.500 CFAF in NHGs and 2.100 CFAF in HGs households. In Tanghin the total amount for dressing was lower than in the two other sites. NHGs households spent 1.300 CFAF monthly and HGs households 840 CFAF.

The costs for clothes in this study were more or less identical with another study carried out in Burkina Faso in 1998, in which households spent on average 3.000 CFAF per month for clothes (INSD, 1998).

Table 7.3. Monthly costs for clothes in home gardeners’ (HGs) and non-home gardeners’ (NHGs) households in Boulmiougou, Tanghin and Kossodo and their contribution to the monthly total predictable costs in households in the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*[1]	[%] of all costs*[2]
Boulmiougou	HGs	3.300	2.100	1.300-3.400	200	35.000	4.300	89	12
	NHGs	3.400	2.500	1.500-4.200	420	20.000	3.100	100	7
Tanghin	HGs	1.400	840	500-2.000	100	10.000	1.600	101	7
	NHGs	2.600	1.300	600-2.700	130	33.000	4.300	100	9
Kossodo	HGs	3.500	1.700	650-6.700	90	13.300	3.600	102	18
	NHGs	6.500	4.000	500-10.000	40	30.000	7.100	97	15

*[1] Number of interviewed persons.
*[2] Contribution to the total monthly predictable costs in households.

Although there were differences in the spending behaviors of HGs and NHGs households, the number of clothes items bought during one year did not differ immensely between these two groups. The whole study population bought between one to four pieces of clothing per household each year.

Because of the constancy of both the cost and the number of clothes, the assumption could be made that clothing expenditures were not remarkably influenced by external factors. It was seen, however, that the monthly costs for clothes made up a large part of the total monthly expenditures in both NHGs households and HGs households in all three sites (refer to Table 7.3.). Regardless of socio-economic class, being dressed cleanly and neatly was relatively important to the study population.

7.3.7. Education and the Total Costs for School

Alongside the material things also physical and psychical ill-being features the characterization of poverty:

> *“Poverty means that you aren’t able to feed yourself and your whole family, to give them clothes, to look after them and to send your children to school.”*
> Teacher (female, aged 28, socio-economic class 3) in Boulmiougou
> Doctor (female, aged 32, socio-economic class 4) in Kossodo
>
> *“Poor is being illiterate and not healthy without having enough food.”*
> Night Guard (male, aged 47, socio-economic class 1/2) in Tanghin

In the study the monthly costs for school were asked for. These included school fees, school books, exercise books and the school uniforms for all children in one household (see Section 7.2.6.).
Public primary schools in Burkina Faso do not have school fees. Although attendance at primary schools is free and uniforms are not obligatory, parents have to pay a yearly contribution to the school. In addition, exercise books must be purchased. All together, a pupil at a public primary school costs between 5.000-8.000 CFAF per year. A pupil at a private primary school costs between 25.000-50.000 CFAF per year. In a public primary school, classes have an average of 60-130 pupils, and in a private primary school classes have an average of 50 pupils. There are six years of primary school (information obtained in three interviews held with school teachers, Ouagadougou, 2000 / see Photos 28 and 29).

Public secondary schools charge school fees. In addition school books and exercise books must be obtained. All costs taken together, a household has to spend an average of 50.000 CFAF per year to send a child to a public secondary school. Private secondary schools charge school fees of between 70.000 CFAF to 120.000 CFAF per year. School books are free at private secondary schools. After seven years the pupils obtain a secondary school degree, which allows them to go to a high school (information obtained in three interviews held with school teachers, Ouagadougou, 2000).

Average Monthly Expenditures for School in HGs and NHGs Households

The whole study population spent 1.300 CFAF monthly for school per household. This amount was nearly three times lower than what was found in a study conducted in Burkina Faso in 1997. In that study the costs for education amounted to 3.900 CFAF monthly per household in an urban setting (INSD, 1997b).
The expenditures for school differed across the sites and within the sites. For differences in the expenditures for school among the different socio-economic classes refer to Chapter 8, Section 8.3.3.

NHGs households in Boulmiougou had, with 2.500 CFAF, the highest expenditures for the education of their children of all the sites and groups (refer to Table 7.4.). At the same site, HGs households spent 2.100 CFAF, or nearly the same amount as the NHGs households and more than all HGs households on the other sites. At Tanghin and Kossodo differences between the groups were seen. In Tanghin HGs households spent only 830 CFAF for school, approximately half of the amount that NHGs households spent (1.700 CFAF). In Kossodo the difference between the two groups was still bigger, HGs households spent 630 CFAF, which was significantly lower than NHGs household expenditures of 1.700 CFAF ($p<0.001$, refer to Table 7.4.).

Table 7.4. Monthly costs for school in home gardeners’ (HGs) and non-home gardeners’ (NHGs) households in Boulmiougou, Tanghin and Kossodo and their contribution to the total monthly predictable costs in households in the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*[1]	[%] of all costs*[2]
Boulmiougou	HGs	3.300	2.100	870-4.200	380	16.700	3.800	53	12
	NHGs	4.000	2.500	1.300-5.000	630	25.000	4.000	68	9
Tanghin	HGs	1.500	830	400-1.700	250	12.500	2.000	66	8
	NHGs	1.900	1.700	830-2.100	330	8.300	1.700	54	7
Kossodo	HGs	1.000	630	340-1.700	0	3.800	900	67	5
	NHGs	1.900	1.700	420-3.300	170	6.700	1.700	71	5

*[1] Number of interviewed persons.
*[2] Contribution to the total monthly predictable costs in households.

Percentage of the Monthly Costs for School in regard to Other Household Expenditures

Differences in the proportion of total monthly predictable costs devoted to education were seen both within and between the sites. In comparison to other monthly predictable costs, the percentage of the expenditures for school was one of the lowest in all three sites (refer to Table 7.4.). In Boulmiougou, households spent between 12% (HGs) and 9% (NHGs) of the total monthly household costs for school. In Tanghin the percentage was lower with 8% for HGs and 7% for NHGs and in Kossodo it was only 5% in HGs and in NHGs households.

One would expect that expenditures for school would be considered an investment into the future, a chance for people to get higher paid work as a result of a better education. In urban Latin America education was by far the most powerful variable in explaining income differences (MUSGROVE, 1979). But this idea often exists only in people who themselves had the possibility to obtain a higher education. These people normally belong to a higher socio-economic class. In lower socio-economic classes the necessity for schooling often is not seen. For the education level among the different socio-economic classes in the study population and the different expenditures for school refer to Chapter 8, Section 8.3.3.
Payment of school was found to be required at the most difficult time of the year, coinciding with food shortage, heavy work in agriculture and high incidence of disease. Health was repeatedly and constantly given a higher priority than education. Thus, education is not regarded as a priority need in most communities (CHAMBERS, 1995). The same was seen in a household study carried out in Burkina Faso. There, with 6% the lowest priority within the total monthly household expenditures was given to the expenditures for education (MINISTERE DE L’ECONOMIE ET DES FINANCES, 2000).

Reasons for the Low Expenditures for School Especially in HGs Households

Several reasons could be seen for the low school expenditures and the assumption that especially in HGs households the need for a better education was not seen.

Illiteracy Rate

One reason was the high illiteracy rate in the study population, and especially among HGs (refer to Figure 7.8.), which is often linked with an ignorance to send one’s children to school. In this study the interviewees with a primary school education level spent 1.300 CFAF and the interviewees with a secondary school degree spent 2.100 CFAF for the education of their children. Interviewees with a high school degree spent already two to three times more for the education of their children (4.200 CFAF).
A significant link between a higher level of education of the head of the household and higher expenditures for the education of his children could also be seen in an earlier household study in Burkina Faso (INSD, 1997b).

The illiteracy rate of 63% (n=382/606) in the whole study population was lower than the average analphabetism rate of 80% (aged over 15) in the whole country (WORLD BANK, 2000). This is not surprising, since a country-wide illiteracy rate assumes equal gender and urban-rural distributions.
In this study, 73% (n=441/606) of the interviewed people were male and only 27% (n=165/606) female. The illiteracy rate in women, however, is generally higher than in the total population (VAN HOLST PELLEKAAN, 1996). In this study the illiteracy rate differed significantly with gender: 59% (n=261/441) of the men, but 73% (n=121/165) of the women were illiterate. The country’s female illiteracy rate is 87%, compared to 68% for men (INSD, 1997b; GALENSON, 2000; WORLD BANK, 2000/01). The illiteracy rate in men and women of the study population, which reflects the country’s illiteracy rate was very high in comparison to other countries of West Africa. In Côte d’Ivoire the illiteracy rate is for women 56%, and for men 40%. In Togo it is for women 48%, and for men 23%. In Cameroon it is for women 28%, and for men 15% (USAID, 2000). Today girls are still underrepresented in schools in Burkina Faso. In 1990, one of three boys attended school, but only one of five girls (NAGEL, 1996). As these words of a woman (HG, aged 47) in Tanghin clearly show:

"We never had the chance to go to school!”

A study of 41 countries showed that female disadvantage in attending school, defined as the gap between male and female enrollment rates, varies enormously. In Burkina Faso girls receive far less education than boys. In 1997, the expected years of schooling were three years for boys and two years for girls (WORLD BANK, 2000/01). The gender gap is often lower for the richest households and highest for the poorest households. (WORLD BANK, 2000/01 / refer to Chapter 8, Section 8.3.3.).

In interviews with school teachers the ignorance of the people was named as the main reason for the high illiteracy rate in the population of Burkina Faso. The heads of the households, who are mainly men, do not see the importance to send their children, and especially their daughters, to school (information obtained in three interviews held with school teachers, Ouagadougou, 2000). This was also the main reason for one-third of interviewed households in Burkina Faso not to send the girls to school (INSD, 1997b). A study in Côte d’Ivoire emphasized that female-headed households generally invest more in the education of their children (DE VREYER, 1993). However, especially fathers refuse to send their daughters to school. The common opinion is that education for girls is quite pointless because girls will not learn to care about their homes, and, thus, their attractiveness as potential wives will be diminished. Moreover, they will be married at the age of 15 to 17 and therefore the parents do not see the need to spend money for their education. It is felt that educated girls will become more independent and desire also educated husbands, a fact that reduces the quantity of possible candidates considerably (NARAYAN et al., 2000a; information obtained in three interviews held with school teachers, Ouagadougou, 2000).

Distribution of rural and urban regions is assumed to be equal when a country’s illiteracy rate is measured. However, the illiteracy rate is normally higher in rural regions than in urban regions. This was confirmed by a study carried out in an urban setting in Burkina Faso, where only 48% of the population was not able to read and write (INSD, 1997b). In comparison, the illiteracy rate of 63% (n=382/606) in the whole study population was very high. The NHGs had an illiteracy rate of 50% (n=150/302), which corresponded with the study mentioned above. The HGs, however, had a significantly higher illiteracy rate of 76% (n=232/304).

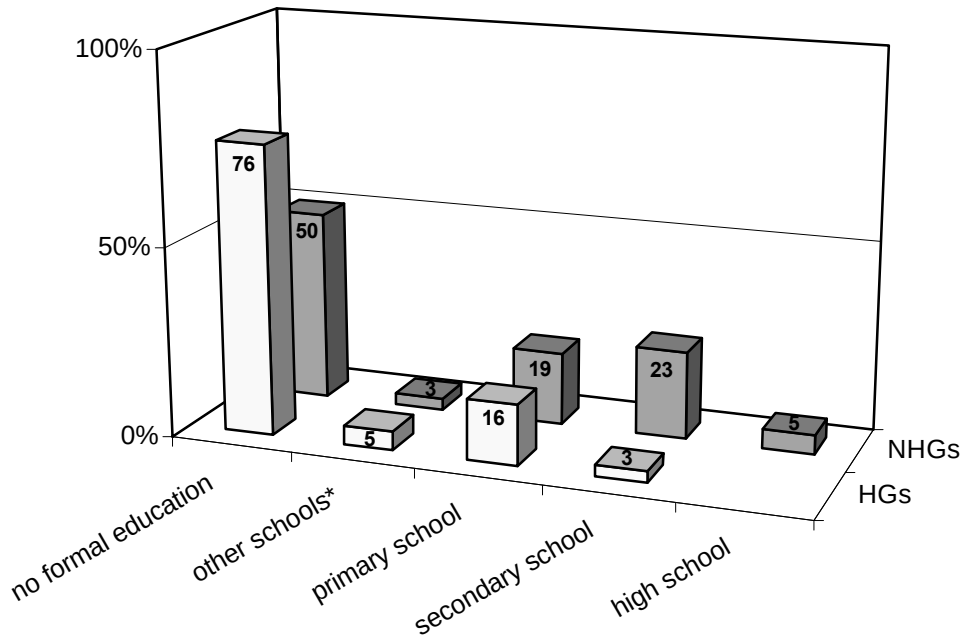
Level of Education

A further reason for the low school expenditures and the assumption that, especially in HGs households, the need for a better education was not seen could be the different level of education between HGs and NHGs.

On the primary school level, the percentage of HGs (16%, n=49/304) and NHGs (19%, n=58/302) was more or less comparable. There was a significant difference between HGs (3%, n=8/304) and NHGs (23%, n=71/302) who had attended secondary school (refer to Figure 7.8.). In addition only NHGs (5%, n=14/302) had attended high school.

Comparable to the different level of education in HGs and NHGs, the number of children attending school differed also between HGs and NHGs households. On the average, two out of two children in NHGs households attended school, compared to only one of three children in HGs households.

Figure 7.8. Comparison of the different education levels of home gardeners (HGs) and non-home gardeners (NHGs) in the rainy season



* People had attended class in Morée, the local language of the Mossi people in Ouagadougou, or a Koran school.

Income per Household

A last reason for the low school expenditures especially in HGs households could be the lower income in HGs than in NHGs households (refer to Chapter 5, Section 5.3.1.2.2.). According to school teachers in Ouagadougou, next to the ignorance of sending the children to school, the poverty of the people is the second main reason for the high illiteracy rate in the country. For one-third of the households in Burkina Faso the high expenditures for school were the reason not to send their children to school (INSD, 1997b). Richer households tend to demand more schooling for their children than less well-off households. Thus, the level of household income will play a key role in determining school attendance (BREDIE & BEEHARRY, 1998).

To summarize, there were different education levels between HGs and NHGs which could influence the different economic situation between these two groups. Furthermore, in comparison to other monthly predictable costs, the percentage of the expenditures for school was one of the lowest in the whole study population. Schooling has been found in many countries to promote management practices and productivity increase (LOCKHEED et al., 1989). However, still today the ignorance of the population to obtain a better education is one of the main factors for the high illiterate rate in Burkina Faso.

Therefore, education should be a key factor to ameliorate the economic situation in HGs households, but also in the whole country. Interventions such as alphabetizing programs for adults with an emphasis on women are important. In addition, information-education-communication campaigns would be an important tool to achieve more consciousness about the significance of education, especially for girls.

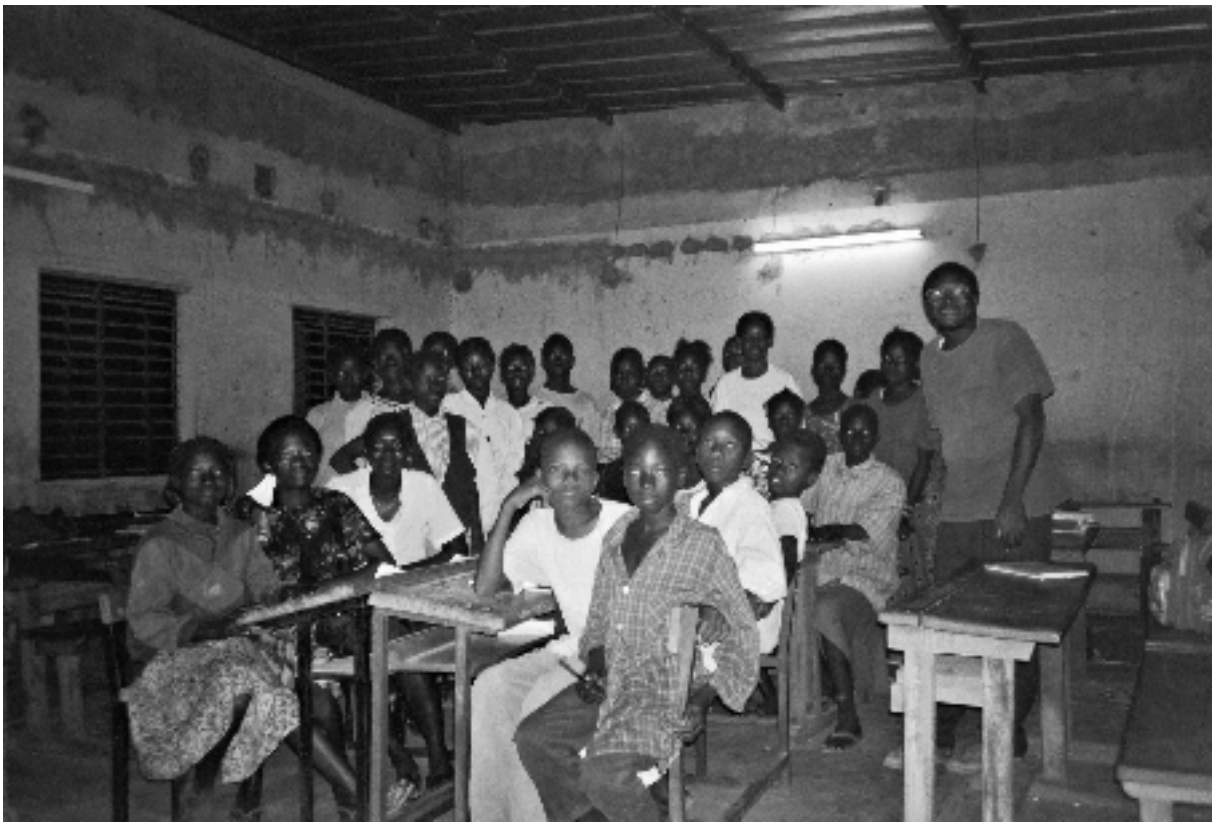


Photo 28: Evening school in Ouagadougou, 2000

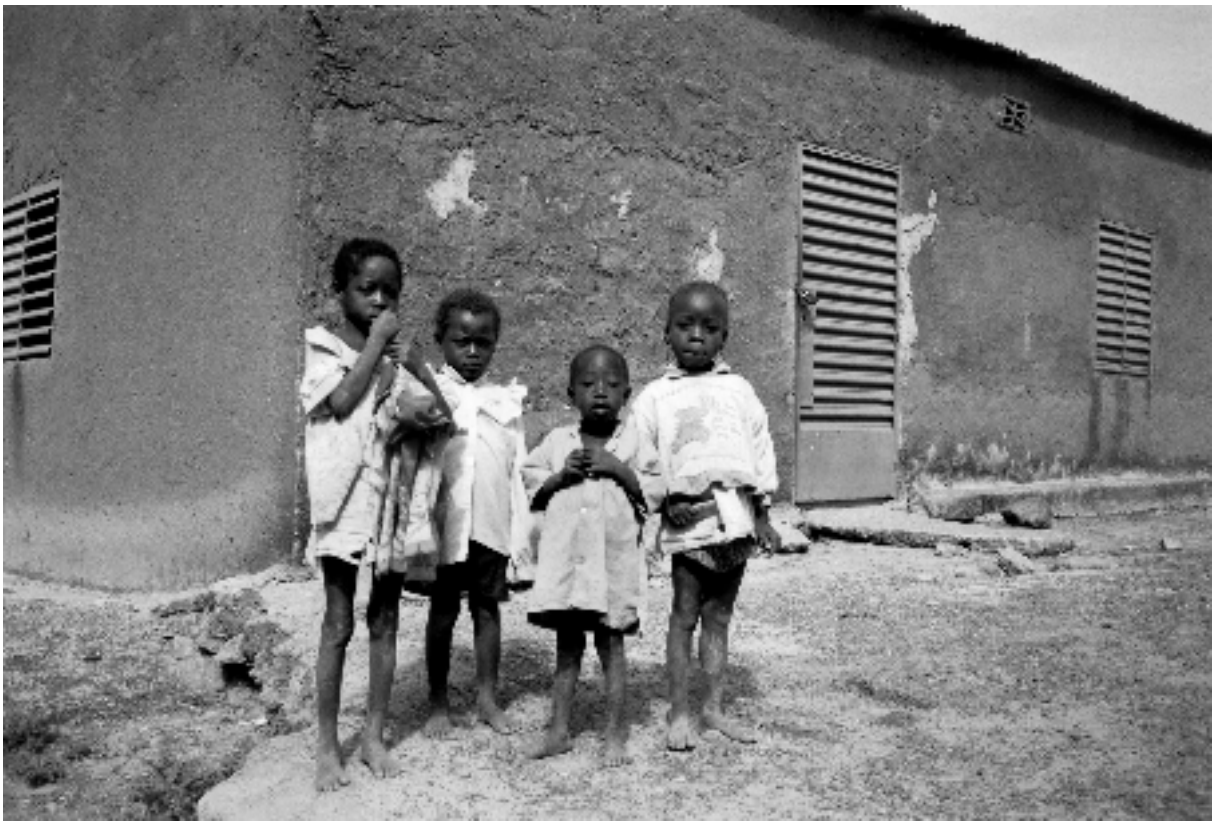


Photo 29: Home gardener’s children, Kossodo, Ouagadougou, 2000

Photo 30: Cultivation of millet on the home gardening site in Kossodo during the rainy season, October 1999

Photo 31: Two weeks later, the millet is cut and home gardening production is starting, Kossodo, October 1999

7.3.8. Best-, Base- and Worst-Case Scenarios of the Monthly Financial Situation in Home Gardeners’ and Non-Home Gardeners’ Households in the Rainy Season

In the previous sections the differences in the spending behavior between HGs and NHGs households were shown. It was clearly seen that the two groups took advantage of different options to cover their essential basic needs. In this context it is interesting to know to what extend HGs and NHGs households can cover their needs with their monthly income of the rainy season. As it was seen in Figure 7.1. the economic variable consists of two components -income and expenditures-, which always have to be regarded together. In the words of a HG (male, aged 23) of Boulmiougou:

> *"The total income comes from home gardening. Because we do nothing other than this activity, our daily living depends exclusively on home gardening. Exclusively means: new clothes, food, leisure, ceremonies, health..."*

To predict the coverage of the expenditures with the available income, the common three scenarios for economic estimations were taken: the base-case, the best-case and the worst-case scenarios (refer to Table 7.5.).
In all three scenarios all monthly predictable expenditures were directly compared with the monthly total income. As a base-case scenario the average incomes of HGs or NHGs households were taken. As a best-case scenario the 25% highest incomes in the two groups were taken and as a worst-case scenario the 25% lowest incomes were taken.

In the base-case scenario HGs households were not able to cover their monthly basic needs with either the directly nor with the indirectly estimated average monthly income (refer to Figure 7.9. / right graph). The directly estimated average monthly income covered 54% of the monthly expenditures, while the indirectly estimated income covered 92%.

Table 7.5. Base-case, best-case and worst-case scenarios of the coverage of the monthly total expenditures with the monthly income in the rainy season in home gardeners’ (HGs) and non-home gardeners’ (NHGs) households in Boulmiougou, Tanghin and Kossodo

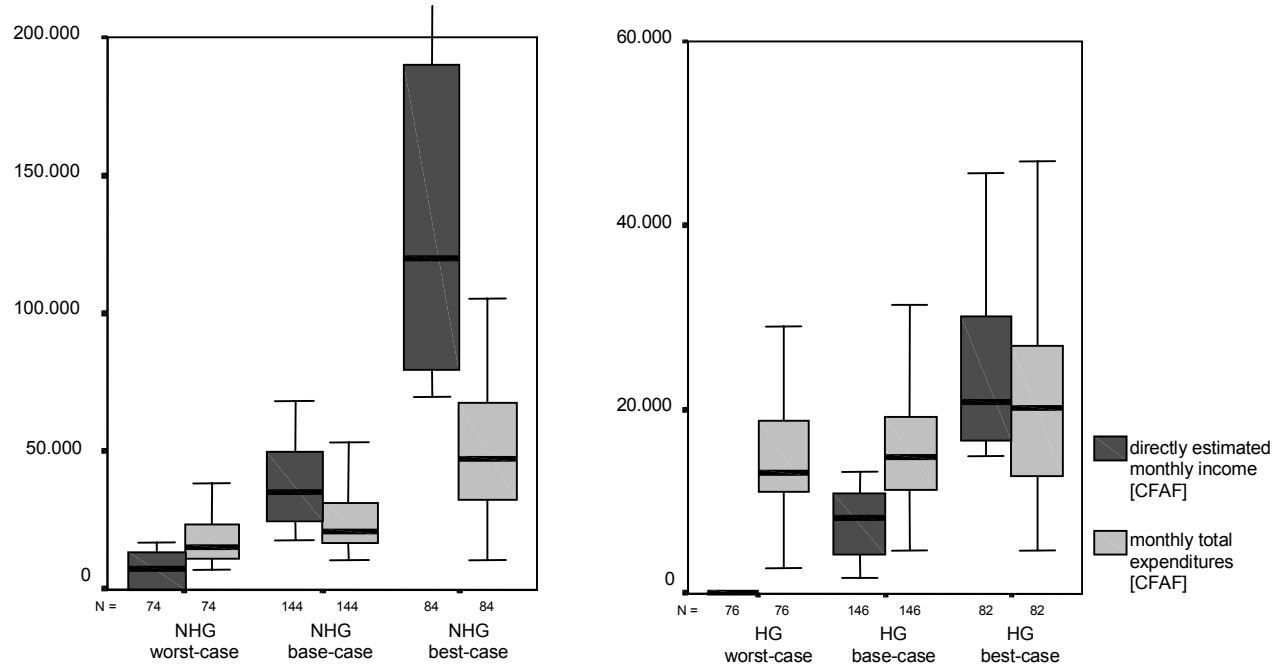
		Directly Income*[1]	Indirect. Income*[2]	Monthly Expen-ditures	Differ-ence to Directly Income	[%] Cover-age of Expendi-tures	Differ-ence to Indirect. Income	[%] Cover-age of Expendi-tures
Base-Case (median of all incomes)								
HGs		8.300	14.100	15.400	-7.100	54%	-1.300	92%
NHGs		37.500		24.200	13.300	155%		
Boulmiougo	HGs	9.600	14.600	18.100	-8.500	53%	-3.500	81%
	NHGs	50.000		33.800	16.200	148%		
Tanghin	HGs	10.800	14.500	15.100	-4.300	72%	-600	96%
	NHGs	38.800		18.400	20.400	211%		
Kossodo	HGs	3.000	12.600	13.600	-10.600	22%	-1.000	93%
	NHGs	25.000		26.200	-1.200	95%		
Best-Case (median of the highest 25% of HGs or NHGs income)								
HG		20.800	41.000	15.400	5.400	135%	25.600	266%
NHG		120.000		24.200	95.800	496%		
Boulmiougo	HGs	20.800	28.800	18.100	2.700	115%	10.700	159%
	NHGs	125.000		33.800	91.200	370%		
Tanghin	HGs	25.000	17.900	15.100	9.900	166%	2.800	119%
	NHGs	100.000		18.400	81.600	543%		
Kossodo	HGs	20.000	18.700	13.600	6.400	147%	5.100	138%
	NHGs	125.000		26.200	98.800	477%		
Worst-Case (median of the lowest 25% of HGs or NHGs income)								
HG		0	5.700	15.400	-15.400	0%	-9.700	37%
NHG		7.500		24.200	-16.700	31%		
Boulmiougo	HGs	0	6.700	18.100	-18.100	0%	-11.400	37%
	NHGs	15.000		33.800	-18.800	44%		
Tanghin	HGs	0	6.900	15.100	-15.100	0%	-8.200	46%
	NHGs	17.000		18.400	-1.400	92%		
Kossodo	HGs	0	4.050	13.600	-13.600	0%	-9.550	30%
	NHGs	0		26.200	-26.200	0%		

*[1] Directly estimated average monthly income of HGs and NHGs households.
*[2] Indirectly estimated average monthly income from selling vegetables in HGs households.

Assuming that the real monthly coverage rate was somewhere in between, HGs households could afford the costs for food, which were 55% (refer to Figure 7.3.) of the monthly total costs. For other basic needs the income was rarely sufficient. Moreover, according to the base-case scenario it was not possible for HGs households to save money for unpredictable future costs such as in the case of an illness.

On the other hand, in the base-case scenario NHGs households were able to cover their basic needs with their monthly income (refer to Figure 7.9. / left graph). The expenditures coverage rate was 155%, which showed that NHGs households had the possibility to save money each month for unpredictable future events.

Figure 7.9. Worst-case*[1], base-case and best-case*[2] scenarios of the directly estimated average monthly income and the monthly total expenditures in non-home gardeners’ (NHG / left graph) and home gardeners’ (HG / right graph) households in the rainy season*[3]



*[1] Calculated with the lowest 25% of either home gardeners’ or non-home gardeners’ directly estimated income.

*[2] Calculated with the highest 25% of either home gardeners’ or non-home gardeners’ directly estimated income.

*[3] The different scales on the two graphs should be noted.

Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

In the best-case scenario, which was based on the 25% highest incomes of the study populations, differences between HGs and NHGs households can again be seen. Although both groups had higher average monthly incomes than monthly expenditures, the expenditures coverage rate was much lower in HGs than in NHGs households (refer to Figure 7.9. / both graphs).
The NHGs households earned four to five times more than they spent for their essential needs. With that income they could start to satisfy some further needs to improve their quality of live. In HGs households, however, there was just enough money to cover their basic expenditures and even in a best-case income scenario they had rarely the possibility to save money.

In the worst-case scenario, which was calculated using the lowest 25% of the directly estimated incomes of the study populations, both in NHGs and in HGs households the earned money did not cover the essential needs. The expenditures coverage rate was still better in NHGs than in HGs households (refer to Figure 7.9. / both graphs). Nevertheless, HGs and NHGs households in each of the three sites lived under their subsistence level. In the worst-case scenario it was not possible for the study population to achieve sufficient food, because the food costs made up 56% of the total costs in the whole study population.

In conclusion, in both the base-case and the best-case scenarios, HGs households were rarely able to cover their essential monthly needs. They could not prepare themselves for economic crisis, but rather move in and out of poverty depending on their monthly income and unpredictable costs. On the other hand, NHGs households had, even in the base-case scenario, an expenditures coverage rate of over 100%. They had therefore the possibility to save money and prepare for future unpredictable costs.

7.4. Summary and Conclusion

Urbanization is increasing especially in developing countries. Because of this, urban agriculture is becoming more and more important and is frequently practiced in large Saharan and Sub-Saharan towns, such as in Ouagadougou, Burkina Faso. The urban agriculture system is very complex and consists of many factors, which influence each other on different levels (refer to Figure 7.1.). In addition, urban agriculture may influence the health status of the population engaged in this activity.

In the last year there was an enlargement of the definition of poverty from a resource-based definition towards participatory social development definitions (see Chapter 1, Section 1.1.4.). Poverty is multifaceted and the causes for poverty are interlinked. The primacy of the income/expenditures definition of poverty has changed to a definition of poverty based on the capacity of the poor to improve their living condition and to consider health and education as important as income (SEN, 1998).

Within this context, the aim of the study was to look at the ways, in which home gardeners’ economic situations may influence their health status. The main focus was on the occupational-specific spending behavior of HGs and NHGs households, with a main emphasis on the predictable monthly costs. The total monthly predictable expenditures of HGs and NHGs households were compared to the monthly estimated income in the rainy season.

The main finding of the study was that the monthly predictable expenditures in HGs households were significantly lower than in NHGs households. Also both their directly and indirectly estimated average monthly incomes were lower than those of NHGs households. Taking the income of the whole study population as a base-case scenario, the estimated expenditures coverage rate in HGs households laid between 54% (directly estimated income) and 92% (indirectly estimated income). In contrast, in NHGs households the estimated expenditures coverage rate was at 155%. Also in the best-case scenario, which dealt with the highest 25% of the monthly incomes,

HGs households could barely cover their daily needs, whereas the NHGs households earned four to five times more than they spent monthly.

According to these results the HGs households in Ouagadougou belong to one of the lowest economic classes with less income and therefore fewer spending options than any other working group. They also belong to those urban households without savings or saleable capital assets. Thus, they are very vulnerable to changes in their income and the demand for basic goods. To make it worse, in an urban setting the basic needs such as food, water, fuel for cooking or energy are only available in exchange for money. In contrast to a rural area, where some of these goods might be available for free, urban-dwellers and among them the HGs need cash to cover their basic needs.

One of the longest existing approaches to define urban poverty is the above-mentioned resource-based definition (WRATTEN, 1995b; SATTERTHWAITE, 2000). In that approach a poverty line is defined as the minimum income level required to purchase the socially determined essentials for living (BLACKWOOD & LYNCH, 1994). With this approach as a base the HGs households of this study all live below the poverty line, as opposed to all the other income groups examined, who live above the poverty line. Moreover the study confirms the view that in most developing countries urban agriculture is dominated by small-scale producers from less advantaged sectors of the population (ILEIA, 1994).

With an emphasis in this study on the monthly predictable expenditures, the second major result was the high proportion of food costs within the total monthly costs. In all three sites HGs and NHGs households spent approximately 55% of their monthly expenditures on food. In absolute costs, NHGs households spent significantly more for food than HGs households.

The present data confirm two opinions common in literature. First, the urban poor tend to spend more than 50% of their total expenditures for food (i.e. DRESCHER, 1996a; SMIT et al., 1996). Dependable year-round access to a well-balanced diet is seen as the primary concern of at least half of urban residents in Asia, Africa and Latin-America who live at or below the poverty line (SMIT et al., 1996).

Second, in HGs households, subsistence production improves food security during the rainy season. In the rainy season HGs cultivated their own cereals and vegetables and their food intake did not absolutely depend on their income, which

was very low. In this time of the year HGs households gained more control over the quantity, quality and stability of their diet. However, the obvious benefit of food security disappeared at latest in the end of the dry season (see Chapter 6).
As seen in the literature, an improved nutritional balance reduces protein and energy malnutrition as well as deficiencies of essential micronutrients and vitamins (SMIT et al., 1996). Moreover, the nutritional impact of home gardening was clearly seen in research studies. In Kampala, Uganda, children of low-income farming families were as healthy as children of high-income families and healthier than children of non-farming poor families (MAXWELL, 1993). In Harare, Zimbabwe, children under five from farming households had higher rates of growth in weight and height than those of non-farmers (BRICKHILL, 1998).

With 12% in the whole study population, fuels for cooking were the second largest expenditures both in HGs households and in NHGs households. Wood was, with 80%, the most commonly used source in all households. Since 1998 a government-supported campaign has existed to promote the use of gas for cooking. According to statistical data (INSD, 1998) and to this study, however this campaign was not very successful until now.
Wood is the most frequently used fuel for cooking in all countries of the Saharan and Sub-Saharan region. In poor countries with annual per capita incomes of US $300 or less (i.e. Burkina Faso: US $240 (WORLD BANK, 2000/01) at least 90% of the population depends on wood for cooking (BARNES et al., 1997). And in many developing countries the costs for the fuel for cooking are a main burden in the monthly households’ costs. However, wood for cooking has numerous disadvantages. It is far less efficient than other energy sources, it causes respiratory diseases (refer to Chapter 6, Section 6.3.2.3.3.3.), and probably most important, it has serious harmful effects on the environment. Burkina Faso, as well as its neighboring countries in this region, is known for its arid climate, poor rainfall, fragile soil, erosion and deforestation. All of these factors work against wood production and reforestation campaigns. Today the Sub-Saharan region is already starting to run short of wood, and the facility to cook with wood will be even more limited in the future. Nevertheless, still today the governments of these affected countries and therefore also the populations do not really deal with this problem and deforestation has increased immense. Between 1990 and 1995 the annual deforestation increased

at 0.7% each year in Burkina Faso (WORLD BANK, 2000/01). In addition to the variability in food security in a year, the use of wood as a fuel for cooking is a big risk factor for the population of Saharan and Sub-Saharan countries.

One of the last findings was that in the whole study population the costs for school were one of the lowest of all the monthly predictable costs. NHGs households spent 1.700 CFAF monthly for the education of all children, while HGs households spent 1.000 CFAF. With these numbers it is fair to assume that education does not have a high priority in NHGs and, especially in HGs households.
The assumption that the poorest households tend to spend more on other things than on education, was confirmed through a study done in Zambia (NORTON et al., 1994). In a so-called participatory poverty assessment poor people had to estimate their own priorities for spending money. It was clear that education was not a priority need in most communities and payment of school fees was found to be required at the most difficult time of the year, coinciding with food shortage, heavy work in agriculture, indebtedness, expenditures for Christmas and high incidence of disease (NORTON et al., 1994).
The illiteracy rate was, with 76%, higher for the HGs than for the NHGs, whose rate was 50%. At least the NHGs rate was equal to the urban illiteracy rate in a study done in Ouagadougou in 1998 (INSD, 1998). Similar results were found in a previous study in Ouagadougou, where almost 80% of the HGs did not attend school, but 70% of the city-dwellers went to school (MEYER, 1998/99).
However, urban agriculture is not always just an activity for the unschooled or illiterate, which was seen in a study in Dar es Salaam, Tanzania. Surprisingly, 40% of the people engaged in urban farming there were secondary school graduates (LEE, 1993). This is a very positive result, as schooling has been found in many countries to promote improved farming management practices and productivity increase (LOCKHEED et al., 1989).

The results of this study complement the results of the urban agriculture project (see Chapter 2). The main aim of this study was to look at how home gardeners’ economic situations influence the status of their households’ health. There was no difference between the health status in HGs households and NHGs households.

First, the frequency of malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases as the most recent illnesses did not differ between HGs and NHGs households. Second, in the whole study population children were most frequently ill in the household. And third, the number of days being ill was equivalent in HGs and NHGs households (for more information refer to Chapter 6, Section 6.3.2.3.f.). These results could lead to the assumption that lower monthly predictable expenditures and a lower expenditures coverage rate in HGs households is not directly related to a lower health status in a population practicing home gardening.
One reason could be seen in the given subsistence production in HGs households. At least in the rainy season HGs were almost independent of their low income to afford sufficient and nutritious food. As already seen in other studies this could be a factor for the comparable health status in the HGs and NHGs population (MAXWELL, 1993; SMIT et al., 1996).

Home gardening is not a phenomenon existing only in Ouagadougou, but rather it is part of an existing worldwide system of urban agriculture. And especially in countries of the Sub-Saharan region it has grown rapidly in the last years. In addition to Burkina Faso, a lot of West African countries have home gardening sites in their towns (see Chapter 1, Section 1.2.2.).
Urban agriculture depends on many external factors, such as the quantity and quality of water for irrigation, different soils, variation of vegetables and trade possibilities (refer to Figure 7.1.). All of these factors are difficult to influence and have a different importance for different countries. Nevertheless they show similar patterns in countries which have similar climatic conditions.

This is the case in all Saharan and Sub-Saharan countries, where a dry and a rainy season influence the urban agriculture system in the same way. Thus, the data obtained in this study can also be used as a base for research and intervention possibilities in further countries of the Sub-Saharan region.

Further research is necessary to clarify the assumption that a lower expenditures coverage rate does not influence the health status of a population and that the subsistence production could be one factor for the same health status in HGs and NHGs households.

A useful approach would be a prospective cohort study. In a cohort study the groups are selected on the basis of whether they have the exposure of interest or not. In the following the two groups are observed for a certain time (BURING, 2000). In this case the two groups should be HGs households and NHGs households both having low expenditures coverage rates. In addition, HGs households should have the possibility of subsistence production, which is not given in the NHG households. The questions should emphasize the monthly expenditures on food and the different origins of the food. A second emphasis of the questionnaire should be on the perceived illnesses in the different households. Moreover, the frequency and duration of these illnesses in all household members should be asked for. The perceived illnesses could be accompanied by a physical examination of the ill household members. As the outcome of the study, the different behavior in attending food and the different illnesses in HGs and NHGs households will be assessed.

In this study data were obtained, which reflect the situation in a household during one rainy season. The data show a snapshot in time, where exposure and outcome of an individual were assessed simultaneously and no temporal sequence could be seen. The proposed prospective cohort study would be interesting because it would follow the same two groups of HGs and NHGs households over a certain length of time. The aim would be to gain knowledge about exposure and outcome within a time sequence.

In the prospective cohort study at least two successive seasons, two dry and two rainy seasons, should be regarded for countries of the Sub-Saharan region. In addition, the influence of the expenditures coverage rate and the subsistence production on the health status of HGs households in countries with other climatic conditions than the dry climate of the Sub-Saharan region should be taken into account. Thus, urban agriculture systems in dry and temperate climatic zones ,i.e., Mexico City, and in hot and humid climatic zones ,i.e., Bangkok, should be involved in the proposed prospective cohort study.

For a high probability of successful translation of the above-mentioned research results into action and therefore a high chance that activities and interventions become sustainable, the ‘participatory action research’ approach should be taken into account, which is discussed in Chapter 5, Section 5.4. In Ouagadougou, as in any other Sub-Saharan town, the home gardening sites are not homogenous and the

given results can not be totally generalized and transferred from one site to another. However, all HGs households could barely cover their daily needs with their daily expenditures. All possible interventions should thus be aimed at improving the economic conditions in HGs households so that they are at least comparable with the economic situation in NHGs households.
All interventions should be carried out at both the micro and the macro levels. Interventions at the micro level look at the HGs themselves and require their commitment. Interventions at the macro level look at the municipality level and try to reach a base for improved home gardening in town. Proper macro-economic policies and programs are clearly essential, but stronger links are required to the micro level where poor people live and work (NARAYAN et al., 2000b).

On the micro level, HGs themselves should increase their productivity. It is estimated that HGs can sell European vegetables to five times higher prices than traditional vegetables (ADAMA et al., 1997). Moreover, there are vegetables which grow faster than others. According to these results, HGs should change the production pattern on their fields. The HGs of Boulmiougou especially should switch from slower growing European vegetables to faster growing European vegetables or at least change the priority of the vegetables grown. There are vegetables with slow growing cycles and therefore only one to two harvests during the home gardening season and vegetables with fast growing cycles and three to five harvests during the home gardening season (NDERO, 1996). Advantages can be seen in reducing the production risk due to external factors such as drought by reducing the production time. In addition, harvesting a vegetable more than one or two times at the same field and selling them will increase HGs income.
For the same advantages also the HGs in Tanghin should emphasize the production of European vegetables. However, to ensure the sale of their vegetables in town they should maintain diversity by continuing to produce traditional vegetables as well. Leafy vegetables are the main crops on urban open spaces for several reasons. First, the demand is high because leafy vegetables are a component of the traditional meal of sauce with porridge. Second, these leafy vegetables are very perishable and do not tolerate long transports. The closeness to the urban markets offers the HGs a market niche, as farmers working outside the city can not sell the products in the cities because of the long transport distance (DONGUS, 2000).

In Kossodo the external factors unfortunately are very bad for vegetable production (refer to Chapter 4, Section 4.2.1.1. and Chapter 6, Section 6.3.2.3.3.2.). It seems, thus, difficult to increase the income of the HGs households in strengthening the vegetable production in Kossodo. The HGs households should continue to grow vegetables for their own use. However, to earn money they should try to switch to horticultural production. Growing plants and trees would release them from the burden of their highly contaminated water for irrigation. Moreover, there are few sites which do horticulture in town, so the competition in this market niche is low. One of the best known sites, which is practicing horticulture, is the site of ‘canal central’ (Personal Observation, Ouagadougou, 2000).

In addition to the change of the production pattern, the level of education in HGs should be improved by establishing alphabetizing programs. HGs would become more independent from external help. Interventions such as the management of micro-credits could be realized and carried out more easily. Possible interventions with the help of micro-credits are discussed in Chapter 5, Section 5.4.
In addition, people with higher education tend to place more value on their children’s education (AINSWORTH, 1994). This would, consequently, improve the future of the children in HGs households.

On the macro level, home gardening should become a regular part of the primary sector. Still today urban agriculture belongs to the informal sector and is merely tolerated in Ouagadougou. Data on the economic impact of home gardening should finally influence official statistical reports. Home gardening must be recognized as part of the urban economy and home garden fields should not be taken to finance and realize other often less profitable urban industrial projects.

Next to the lack of the official acceptance, the second problem of home gardening on the macro level is the lack of legislation. The land used is often borrowed or rented and can be reclaimed at any time and on short notice. A HG (female, aged 48) in Tanghin explained:

> *“We will always carry out our activity, however, when the government will take us once the home garden fields, we have to stop immediately.”*

The authorities in Ouagadougou should officially assign home garden fields in town. Urban agriculture should be integrated in urban planning and the access to land and water should be facilitated during the entire year.

As mentioned above, there was an enlargement of the definition of poverty from a resource-based definition to participatory social development definitions.
One poverty reduction strategy, which is more related to the social development definition, is the sustainable livelihood strategy. The two main interventions on the micro level for people involved in home gardening could be viewed as this strategy. As seen in this study, within a set of basic questions the poor and their special needs were identified. For resulting interventions the participation of the poor, the empowerment is then a must. The results of this study can therefore be taken as a base to start interventions in all towns where home gardening exists, but they indicate also clearly that the demands and needs of the involved population should be always considered.

The market based pro-poor strategy is closely related to the resource-based definition of poverty. The interventions proposed on the macro level can be seen as this strategy. In comparison to the sustainable livelihoods strategy, which works on the micro level, the market based pro-poor strategy works on the macro level in supporting targeted pro-poor interventions. The aim is to increase the economic benefit of the poor by creating a base for economic growth in towns and countries. The most important driving forces both for the sustainable livelihood strategy and for the market based pro-poor strategy are the poor people and the poor countries themselves. As proposed for Ouagadougou, urban agriculture should be supported in other towns of the Sub-Saharan region as well. This would create labor intensive growth in towns, especially for few skilled and limited educated city-dwellers.

8. Socio-Economic Status in Home Gardeners' and Non-Home Gardeners' Households Both in the Dry and in the Rainy Season

8.1. Introduction

Over the past years various attempts have been made to assess the level of well-being or the socio-economic status of a population or within population groups (DASGUPTA & WEALE, 1992).

One of the longest existing definitions of poverty is the conventional economic definition, or resource-based definition (WRATTEN, 1995b). Commonly used indicators of poverty, according to this definition, are income and expenditures as derived from official statistical data on the national level or from economic surveys of households. Poverty can be expressed as a percentage of the population whose level of income or expenditures is below a certain poverty line (RAVALLION, 1992; WRATTEN, 1995b) or with the Gini-Coefficient, which measures the extent to which the distribution of income among households deviates from a perfectly equal distribution (BLACKWOOD & LYNCH, 1994). More information on the resource-based definition and its indicators is given in Chapter 1, Section 1.1.4.

While there is no doubt that income and expenditures are important indicators of overall development, they also have their limitations (HOUSE, 1991; RAVALLION, 1996). During the last few years, thus, the definition of poverty has been widened, shifting from the resource-based definition towards participatory social development definitions. The one-dimensional approach of income and expenditures in measuring poverty in a certain population has begun to turn into a multi-dimensional approach including income and expenditures variables as well as non-income/expenditures variables in the same way. One example of a multi-dimensional approach is the Human Development Index (HDI), which is an aggregate indicator based on three components: life expectancy at birth, schooling and the real national income per capita on the country's level (UNDP, 1990).

In a socio-economic study the majority of the questions is devoted to income and expenditures of a population. However, calculating consumption and particularly income from the raw data is not easy, and the difficulties are discussed extensively in literature (SWAMINATHA, 1995; HENTSCHEL & LANJOUW, 1996; RAVALLION,

1996; DEATON, 1997). It has become customary to use a range of socio-economic indicators for assessing the level of well-being in a population (SATTERTHWAITE, 2000). The interviewer's own observations and additional questions to identify the socio-economic status of a household should complement questions about the financial situation of a household. Adding a set of easily measured objective indicators to the income and expenditures approach improves the explanatory power.

In general, objective indicators of socio-economic status in a population are measures of the access people have to the determinants of well-being. Indicators of socio-economic status include information on health-related variables such as life expectancy and access to save drinking water. Variables include the number of people living together in a household, the level of education of the head of the household, and the gender distribution in the population or in a population group. Other common variables are the quality of the dwelling, expressed as a housing score on the basis of the main building material of the house, and the ownership of various consumer variables such as refrigerators, ventilators, TVs or radios and cars, motorcycles or bicycles. A study to stratify the Mexican population in socio-economic terms showed clearly that there is no single variable or particular set of variables, which is always appropriate (INFANTE & SCHLAEPFER, 1994). This means that it is necessary to select indicators appropriate to the specific study question. The specific meaning of the indicators, with regard to the study problem and the objective and conceptual framework of the research must always be taken into consideration. Moreover, it must be understood that all the indicators taken in a study indicate the current status of the study population, but say nothing about the fixed status in that study population (Buring, Personal Information, Berlin, 2000).

To summarize, income and expenditures are still important indicators of poverty and well-being in a population. However, there are no golden standards and each approach has its own advantages and disadvantages. According to the multi-dimensional approach to estimate the well-being and the vulnerability degree of a population, additional indicators should be taken into account (see Chapter 1, Section 1.1.4.).

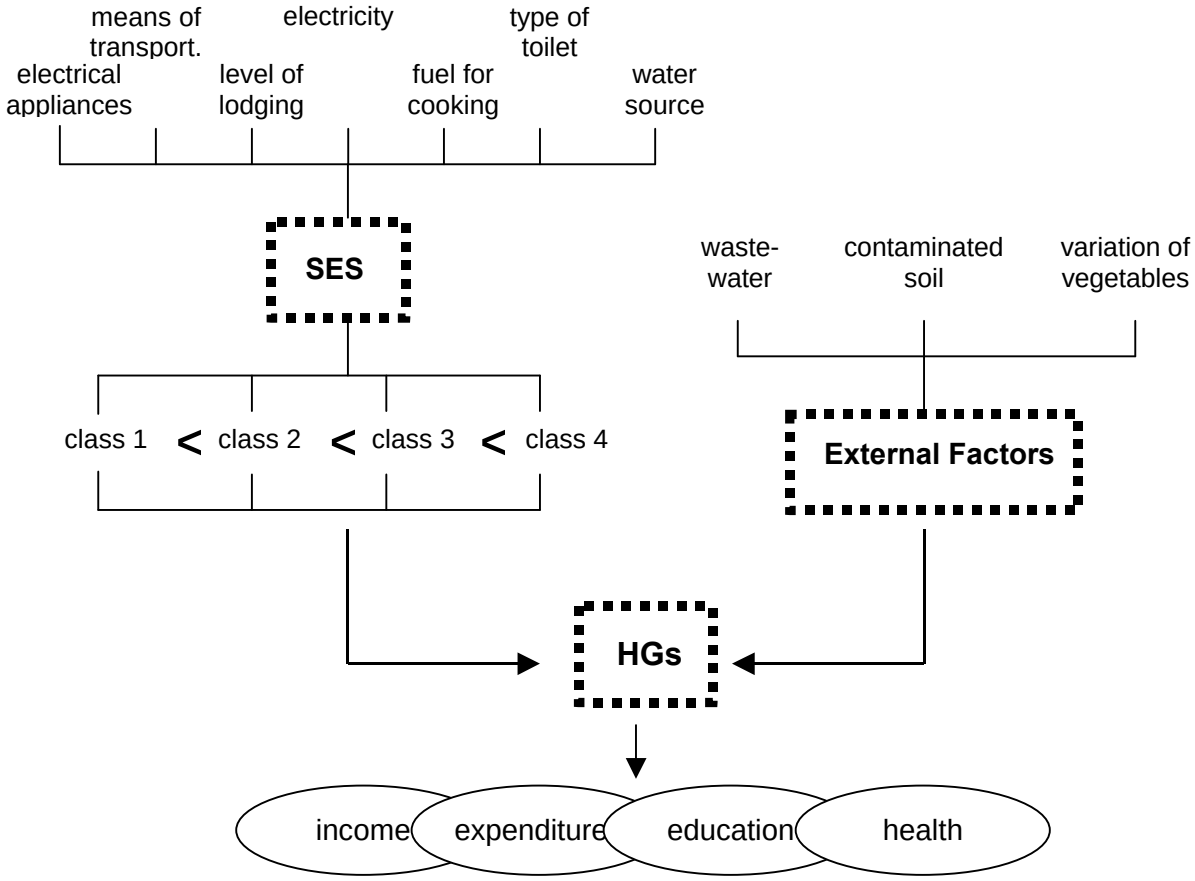
Burkina Faso is one of the poorest countries in the world. When the HDI is taken as one of the indicators to measure poverty, Burkina Faso ranks as 172nd among 174

countries (UNDP, 2000). According to the international poverty lines, 61% of Burkina Faso's population lives below US $1 and 86% of its population lives below US $2 a day (WORLD BANK, 2000/01). In addition, poverty is becoming more and more an urban problem, because of the intense rural-urban migration (i.e. AMIS, 1995). Burkina Faso has an urban growth rate three times higher than the rural growth rate (LEREBOURS PIGEONNIERE & JOMNI, 1998). In the context of dynamic urbanization, the informal sector, particularly home gardening, has become one of the most important forms of economic production in a town (SMIT et al., 1996 / see Chapter 1, Section 1.2.f.). It is an income-generating activity mainly for few-skilled and limited-educated city-dwellers. In addition to the benefits, home gardening may also create risks, particularly health risks for persons who are engaged in this activity (refer to Chapter 1, Section 1.2.3., Figures 1.1. and 1.3.).

The aim of this study was to estimate the economic dimension of home gardening and the related health status of home gardeners in comparison to any other income-generating activity in Ouagadougou. Seasonal-specific and occupational-specific income, expenditures and health data are fully described in the previous chapters five to seven. However, according to the multi-dimensional approach income and expenditures data should be amplified in analyzing additional indicators to obtain the socio-economic status of households that are engaged in home gardening in comparison to households with other activities.

The aim of this chapter is to compare the socio-economic status of households engaged in home gardening with those without home gardens. The chapter focuses on a possible correlation between socio-economic status and health status. There might be such a correlation among the home gardeners (see Figure 8.1.). However, the external factors of home gardening, such as the quality of the soil and the water for irrigation could have an influence on the health status of home gardeners as well. An additional focus of the chapter is the possible correlation between socio-economic status, the level of education and income and expenditure behaviors in households.

Figure 8.1. Influence of socio-economic status (SES) and/or external factors on income and expenditure behaviors, education level and health status of home gardeners' (HG) households



8.2. Methods

8.2.1. Burkina Faso and its Capital Ouagadougou

Field work for this study was conducted in Ouagadougou, the capital of Burkina Faso in Sub-Saharan Africa, at the end of the rainy season. To establish seasonal differences a complementary study was undertaken at the end of the dry season. The data was collected in April 1998 and in October 1999. Additional information was recorded in a second, three-week field stay in November 2000.

Burkina Faso is situated at the southern part of the West African Sahel, has no coastal access, almost no natural resources and its land is used as for agriculture and for pasture. In 1999, the population was estimated at 11 million, with a population growth rate of 2.8% per year (WORLD BANK, 2000/01).

The basis of Burkina Faso's economy is agriculture. About 92% of the population is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion. Since its independence in 1960, Burkina Faso has remained one of the poorest countries in the world and ranks only 172 of 174 countries in the Human Development Index (HDI) of the United Nations Development Program (UNDP, 2000). The main reasons for this low rank are its high population density, few exploitable natural resources and fragile soil. Social indicators are very low. Life expectancy at birth is 44 years, infant mortality (under five years) is 210 per 1.000 and the GNP per capita is US $240 (WORLD BANK, 2000/01).

Ouagadougou with its 750.000 inhabitants (in 1996) and with an average annual growth rate of 6.8% lies in the center of the country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Being situated at the Sahelian border, its annual precipitation can vary from 850 to 900 mm per year and is restricted to the rainy season from June to October (LEREBOURS PIGEONNIERE & JOMNI, 1998). The average temperature is between 24° C in January and 28° C in July (see Figure 4.1.).

8.2.2. Home Gardening Sites

There are 48 different sites of home gardening in Ouagadougou (see Figure 4.2.). Home gardens vary in their sizes and from season to season (CISSE, 1997). Three sites (Boulmiougou, Tanghin and Kossodo) were selected for the study. Within these three areas there are clear differences in the local position of urban agriculture, the social organization, the pattern of vegetable production and the planting and irrigation strategies. All three sites are situated on the outskirts of the town. More detailed information on the three home gardening sites can be found in Chapter 4, Section 4.2.1.1. Refer to Appendix IV for the most common vegetables planted at the home gardening sites in Ouagadougou during the rainy season.

8.2.3. Study Population

The population covered in this study is represented by members of households involved in home gardening at one of the three sites and by members of households engaged in an activity other than home gardening but who live in the neighborhood of the home gardeners. A household was defined as a group of people, who live in a dwelling unit, eat from the same pot and share common housekeeping arrangements under the authority of one person who is responsible. It is highly probable that the same people were interviewed in both studies, especially in the HGs group, although there was no attempt to find the respondents of the study carried out after the dry season again for the post-rainy season study. In this study the abbreviation ‘HGs households’ is used for the home gardeners’ households, while ‘NHGs households’ stands for households without home gardens, the so-called non-home gardeners’ households.

More information on the study population can be found in Chapter 4, Section 4.2.1.2.

8.2.4. Questionnaire

The purpose of the questionnaire was to collect information that can be used to study the economic impact and costs of home gardening within the seasonal variations. The study focused on the income, the expenditures, the health and socio-economic status of a certain population in Ouagadougou in the dry season and in the rainy season. Information collected included the composition of the households, the living conditions, the household income and the expenditures behavior.

The questionnaire was a structured questionnaire in French and most of the questions were closed and pre-coded. In total, both studies contained 600 questionnaires for 100 HGs and 100 NHGs at each site.

For more information on the questionnaire refer to Chapter 4, Section 4.2.1.3. Refer to Appendix I for the full questionnaire of the rainy season and to Appendix II for the full questionnaire of the dry season.

8.2.5. Calculation of the Socio-Economic Status

To estimate the socio-economic status (SES) of each household, the total score of each household on the base of the available socio-economic indicators was calculated (SEN & BEGUM, 1998).

The *FIRST STEP* in categorizing a household was to look at the following indicator groups: the equipment of the house (drinking water source, electricity, type of toilet and fuel for cooking), and the level of lodging (electrical appliances and means of transportation). Each of these indicator groups had a number of different indicator-objects. Each indicator-object was given a special score (refer to Table 8.1.). In each of the indicator groups the indicator-object, with the highest value in comparison to the other objects in the same group, was given the highest score. The indicator-object with the lowest relative value was given the lowest score[*].

[*] For example, ‘means of transportation’ represents an indicator group, and cars, motorcycles and bicycles are the three indicator-objects in this group. Cars have the highest value in this group. Cars, therefore, have the highest possible score in this group, which is a score of 3. Bicycles have the lowest value among these three indicator-objects and have, thus, a score of 1.

Table 8.1. Socio-economic indicators and their different scores

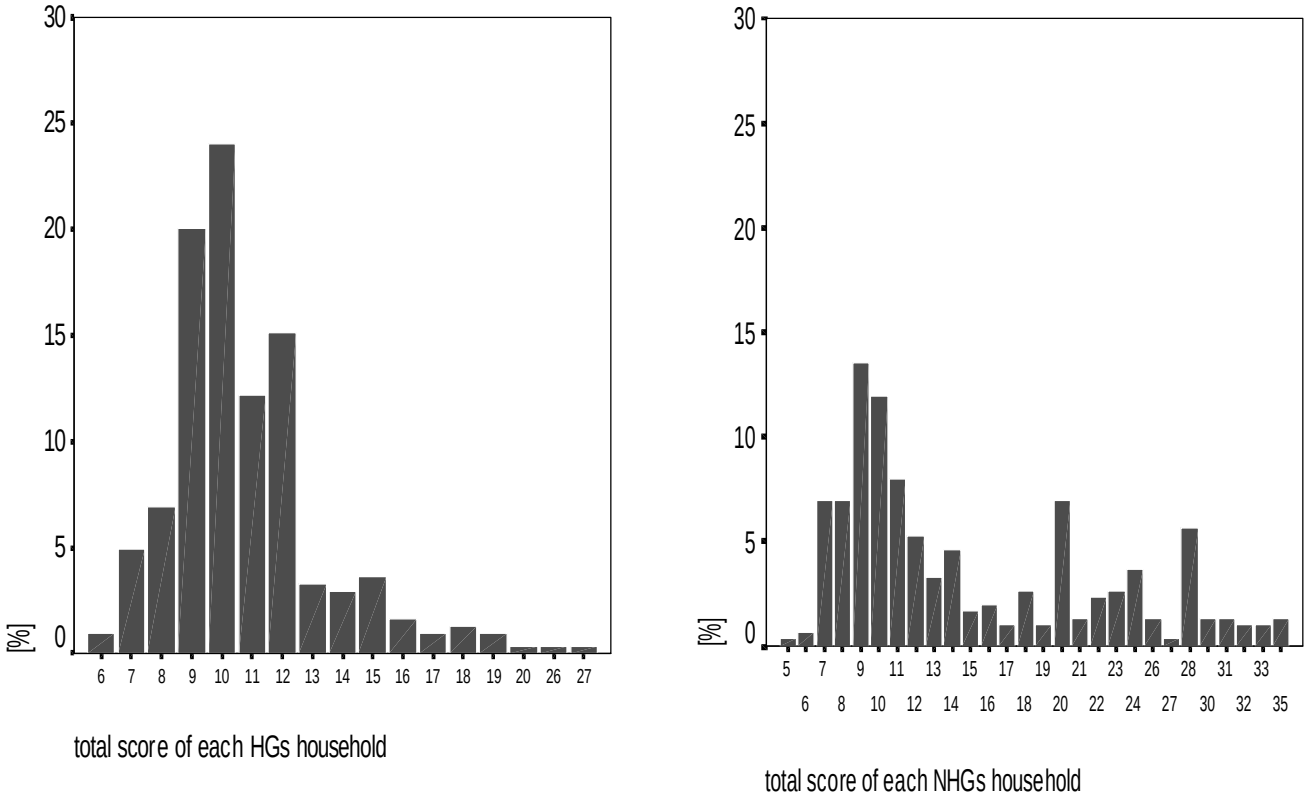
Socio-Economic Indicators	Score	Socio-Economic Indicators	Score
Equipment of the House		**Level of Lodging**	
Drinking Water Sources		Cemented House	4
Tap at Home	4	Mix Form of Adobes and Cement	3
Hand-dug Well	3	House constructed with Adobes	1
Water Seller	2		
Public Well in the Quarter	2		
Electricity at Home		**Electrical Appliances**	
Yes	1	Fan	4
No	0	Refrigerator	4
		TV	3
Type of Toilet		Radio	2
Water Toilet	4		
Cemented Latrine	3		
Simple Latrine	2	**Means of Transportation**	
No Toilet	0	Car	4
		Motorcycle	2
Fuel for Cooking		Bicycle	1
Gas	4		
Kerosene	3		
Charcoal	3		
Wood	2		
Millet Stalk	1		

In the *SECOND STEP* the percentage and distribution of each indicator (the so-called score of the indicator) in the study population, in each site, and for HGs and NHGs households were calculated (refer to Appendix VIII).). For each household all scores of the different indicators were added up. The maximum total score, which could be reached by a single household was 37, and the minimum total score was four.

When the sums of the scores of each household were analyzed separately, the HGs households were a more homogenous group than the NHGs households in the dry season as well as in the rainy season. In the rainy season 70% of the HGs

households had a total score between nine and twelve (refer to Figure 8.2. / left graph). In comparison to HG households the total score of the NHGs households was more distributed across the whole possible range: 14% of the NHGs households had a total score of nine and 12% had a score of ten. All of the other possible scores were represented in less than 8% in the NHGs households (refer to Figure 8.2. / right graph).

Figure 8.2. Total score and its distribution in home gardeners' (HGs) and non-home gardeners' (NHGs) households during the rainy season



In the *THIRD STEP* each household was placed in one of the four given possible socio-economic classes based on its total score. With a total score below seven people belonged to the socio-economic class 1, which represented the most underprivileged group of the whole study population. Households with a score between seven to twelve belonged to the higher socio-economic class 2. To belong

to class 3 households had to have a total score between 13 and 22. And households of the socio-economic class 4 had a score over 22 and could be seen as the most privileged group of the study population (refer to Table 8.2.).

Table 8.2. Distribution of the study population among the four different socio-economic classes according to their total score calculated from their socio-economic indicators

Socio-Economic Class	Score
Class 1	< 7
Class 2	7 – 12
Class 3	13 – 22
Class 4	> 22

The relative value of each indicator and the classification of each household were estimated as an adaptation of two other studies of home gardening carried out in Ouagadougou both during the dry and the rainy season of 1998 (MEYER, 1998/99; MÜLLER, 1999).

8.2.6. Family Structure in Households Among Different Socio-Economic Classes

During the second field stay in Ouagadougou in November 2000, HGs and NHGs households in each of the socio-economic classes were revisited. The same person who was interviewed during the first field stay after the rainy season in 1999 was interviewed again in order to gain a better understanding of the exact family structure in his/her household.

The questionnaire contained questions about the names, ages and levels of education of all people living in the household of the interviewed person. Interviewees were asked about their status within the family and the status of each of the mentioned family members (i.e. wife, son, brother, father) and the relation between the different members of the household. For the full questionnaire about the family structure refer to Appendix VII.

8.2.7. Quality Control of the Data Collected, Implementation of the Study, Data Management, and Quality Control of the Results

The data collection was based on a series of strict criteria: (1) the selection and the training of the interviewers, (2) a pilot study and (3) the permanent supervision of the study and the interviewers.

The method of Sen & Begum (1998) to estimate the SES in a study population was chosen, because it is a valid method to estimate the SES in a study population, which lives in the same environment. In this method each indicator is given a special score, which is chosen according its relative validity in an urban setting of a Sub-Saharan region. The score is adapted to this special surrounding and tries to reflect, thus, the real situation there. This method allows comparing population groups, which live in the same surrounding. This situation was given in this study, as the SES of HGs and NHGs households which lived in the neighborhood of each other was compared.

The scores were given taken into consideration the relative value of each indicator in its indicator group and not the absolute value of this indicator. Therefore, this method does not allow a comparison of a population group between different surroundings (i.e. HGs households in different climatic regions). In each of the population groups the relative value of an indicator could be defined differently.

All data of the questionnaire was entered using EpiInfo software (Version 6.02, CDC, United States). Data calculations were carried out using EpiInfo and SPSS (Version 9.0 for Windows 1995). The Mann-Whitney- or Wilcoxon-non-parametric test was used to compare the income and expenditure numeric variables between and across the sites, because the variables were not normal distributed. Categorical variables between and across the sites were compared using chi-square-test or Fisher-exact-test. These statistical measures were applied both for the dry and for the rainy season, for each site, and for HGs and NHGs households. Because of a greater number of tests, the p-value should not be interpreted in a confirmatory sense. The results usually indicate the median of the variables, when other measures were used it is stated.

More detailed information on these topics can be found in Chapter 4, Sections 4.2.1.4.f.

The investigation strategy was that of triangulation. All data was compared to existing data of urban agriculture, and especially to data about the economic impact of urban agriculture. Several studies have already been completed and are discussed in Chapter 2 and in Chapter 4, Section 4.4.

8.3. Results and Discussion

The multi-dimensional approach estimating the well-being or the poverty of a population or a population group includes income and expenditure variables as well as variables that are not related to the households' financial situation. Examples of non-income/expenditures variables include household equipment, the level of lodging, electrical appliances and means of transportation. These variables reflect the socio-economic status (SES) of a household.

When analyzing the financial situation, education level and health status of HGs and NHGs households, it is important to have some understanding of their living conditions and their SES. The SES helps to validate and to evaluate the data obtained from the different households. Data on the income and expenditures of HGs and NHGs households in relation to their health status are discussed in the previous chapters five to seven.

The following section analyzes the SES of households engaged in home gardening and households engaged in any activity other than home gardening. The SES will be compared with the education level, the income, the expenditures and the health status of the interviewed households. To reveal possible seasonal variations in the SES, particularly of HGs households, the data of the present study will be compared with the data of a complementary study carried out after the dry season in 1998.

8.3.1. Socio-Economic Status Among the Study Population

Description of the Socio-Economic Classes

The study population was divided into four classes according to socio-economic indicators (see Section 8.2.5.). People in 'class 1' were among the most underprivileged people in the whole study population. People in 'class 4' were the most privileged in the study population.

The households of the four different socio-economic classes were described as following (refer to Table 8.3. and Appendix VIII):

Class 1: All houses were constructed with adobes. They had no electricity and only simple latrines. The two main drinking water sources were hand-dug wells and public wells in the quarter. All households used wood as fuel for cooking. People of this class had no electrical appliances. Few households had radios and bicycles.

Class 2: More than 80% of the houses of class 2 were constructed with adobes and had simple latrines. The other houses of this class were a mix of adobes and cement and had cemented latrines. Almost none of the households had electricity at home. The most frequent drinking water source was the public well in the quarter. The households also took water from a hand-dug well in the rainy season and bought it from a water seller in the dry season. Wood was used as the fuel for cooking. None of the households had a ventilator or a refrigerator. More than two-thirds of the households had a radio. For transportation two-thirds of the households had a bicycle and one-third a motorcycle. None of the households had a car.

Class 3: 50% of these households lived in fully cemented houses with electricity. More than two-thirds had a cemented latrine. One-third obtained their drinking water from a tap at home. The other dominant water sources were a public well in the quarter in the rainy season and a water seller in the dry season. Wood was the most common fuel for cooking. However, a few households cooked with gas. Almost 100% of the households in this class had a radio and 50% had a TV. Almost none of the households had a refrigerator and only very few had a ventilator. The means of transportation for two-thirds of the households was a motorcycle and for the remaining third a bicycle.

Class 4: Almost 100% of the households in this class lived in cemented houses with electricity, a tap for drinking water and a cemented latrine. Twenty percent (20%) also had a water toilet at home. Two-thirds of the households still cooked with wood and one-third cooked with gas. Almost every household had a radio, a TV and a ventilator. Two-thirds also had a refrigerator. A motorcycle was the most common means of transportation in this class. One-third of the households in this class also had a car.

Table 8.3. Distribution of home gardeners' (HGs) and non-home gardeners' (NHGs) households between the socio-economic classes 1 to 4 showing the most dominant item for each of the different socio-economic indicators both during the dry season (DS) and the rainy season (RS)

Socio-Economic Indicators	Socio-Economic Status			
	Class 1*[1]	Class 2*[1]	Class 3*[1]	Class 4*[1]
Level of Lodging	House constructed with adobes	House constructed with adobes	Cemented house / mixed form	Cemented house
Drinking Water Sources	Hand-dug well / public well	Public well + RS: hand-dug well or DS: water seller	Tap at home + RS: public well or DS: water seller	Tap at home
Cooking Facilities	No cooking / Wood	Wood	Wood	Wood / Gas
Type of Toilet	Simple latrine (DS: also no toilet)	Simple latrine	Cemented latrine	Cemented latrine/ Water toilet
Electricity at Home	No	No	No / Yes	Yes
Electrical Appliances	None / Radio	Radio	Radio +/*[2] TV	Radio +/ TV +/ Refrigerator +/ Ventilator
Means of Transportation	None (DS: also Bicycle)	Bicycle	Motorcycle / Bicycle	Motorcycle / Car
Total Score	<7	7-12	13-22	>22
Rainy Season HGs Households (n=304)	1% (n=3)	83% (n=253)	15% (n=46)	1% (n=2)
NHGs House-holds (n=302)	1% (n=3)	53% (n=159)	27% (n=81)	20% (n=59)
Dry Season HGs Households (n=303)	10% (n=31)	83% (n=250)	6% (n=19)	1% (n=3)
NHGs House-holds (n=310)	9% (n=28)	68% (n=212)	16% (n=49)	7% (n=21)

*[1] The socio-economic class 1 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.
*[2] '+' = and, '/' = or

Because there were only six households in class 1 in the rainy season -three HGs (one in Boulmiougou and two in Kossodo) and three NHGs households (one in Boulmiougou and two in Kossodo)- class 1 and class 2 will be combined in the following sections to obtain a valid sample size for statistical analysis.
The same wealth indicators as described above to determinate the four socio-economic classes were also used in other household studies, for example in Burkina Faso and Vietnam (DEVELAY et al., 1996; INSD, 1997b; NARAYAN et al., 2000).

SES in the Study Population

Most of the study population, i.e., 69% in the rainy season and 85% in the dry season belonged to class 1/2. Therefore, the majority of the population was very poor in the sense that many basic needs were scarce. These results reflect the average distribution of people in developing countries, where the poorer socio-economic classes are the most common (WORLD BANK, 2000/01).
Similar results were seen in a study carried out in the southern Sudan. Most of the population lacked basic needs, and income and food security was precarious. Nevertheless, socio-economic differences within the classes could be seen (HOUSE, 1991).

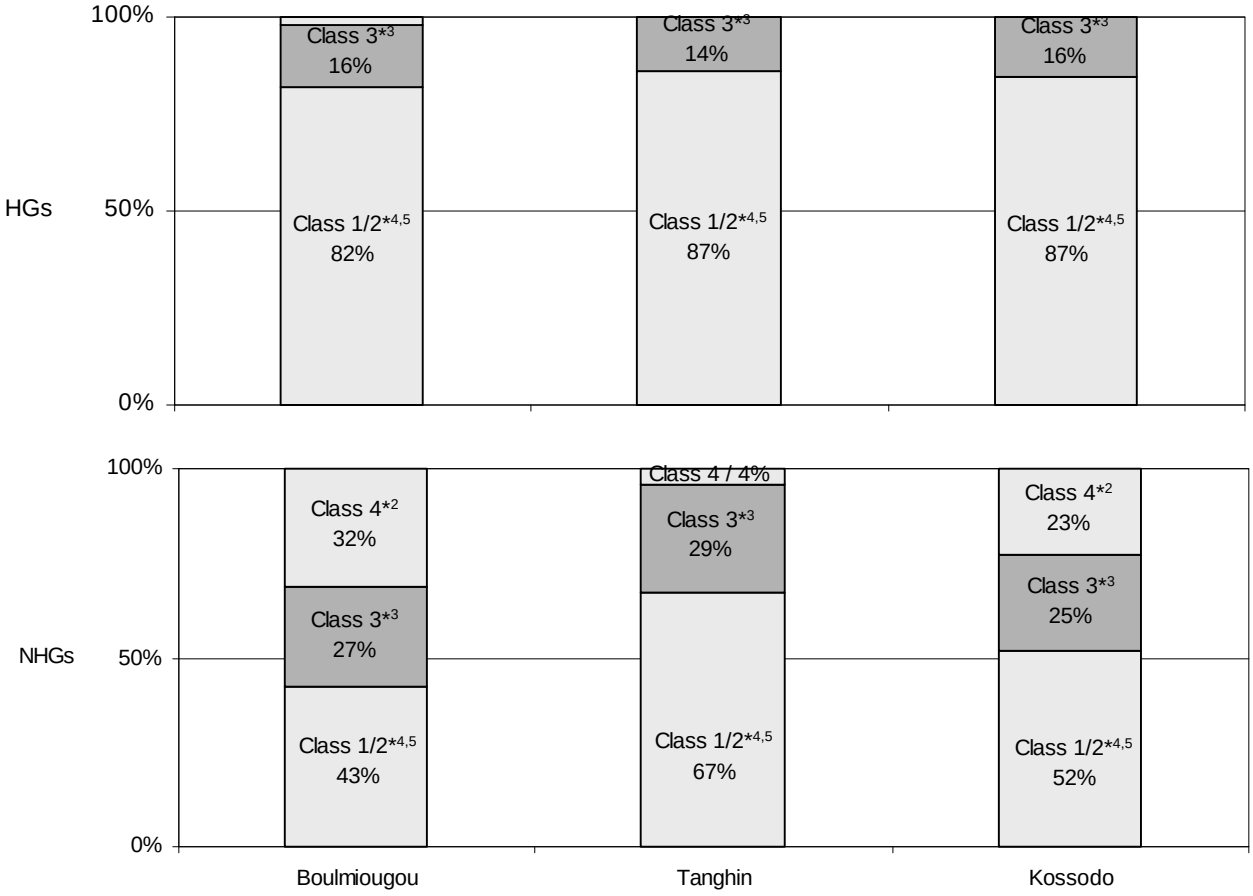
SES in HGs and NHGs Households in Boulmiougou, Tanghin and Kossodo

When viewing the whole study population together one might assume that the entire population belonged to a low socio-economic class, without any variations between the different groups and between the different sites.
However, the HGs households in Ouagadougou were not a homogenous group with respect to their economic situations. Chapters five to seven discuss the different incomes and expenditures of HGs households across the three sites. Although all HGs had the same activity, the variation of external factors from site to site made them a heterogeneous group (see Table 4.1.).

It was therefore also of interest to see if the SES of HGs households differed between the three home gardening sites Boulmiougou, Tanghin and Kossodo.
In Boulmiougou significantly more HGs households (81%, n=82/100) than NHGs households (43%, n=43/102) belonged to class 1/2 during the rainy season ($p<0.001$). A total of 16% (n=16/100) of the HGs and 27% (n=27/102) of the NHGs households belonged to class 3 and significantly more NHGs households (32%, n=32/102) than HGs households (2%, n=2/100) belonged to class 4 ($p<0.001$ / refer to Figure 8.3.).
In Tanghin significantly more HGs households (86%, n=87/101) than NHGs households (67%, n=67/100) belonged to class 1/2 ($p=0.001$) and 14% (n=14/101) of the HGs and 29% (n=29/100) of the NHGs households belonged to class 3. None of the HGs and 4% (n=4/100) of the NHGs households belonged to class 4. As in Boulmiougou and Tanghin, in Kossodo significantly more HGs households (85%, n=87/103) than NHGs households (52%, n=52/100) belonged to class 1/2 ($p<0.001$) and 15% (n=16/103) of the HGs and 25% (n=25/100) of the NHGs households belonged to class 3. None of the HGs households and 23% (n=25/100) of the NHGs households belonged to class 4 ($p<0.001$ / refer to Figure 8.3.).
There was an equal distribution of the number of HGs households in each of the socio-economic classes. Boulmiougou, Tanghin and Kossodo had in class 1/2 as well as in class 3 the same number of HGs households (refer to Figure 8.3. / upper graph).

The given SES reflect the current status of a population but not the fixed status in that population. Therefore it was of interest to compare the SES of HGs households in the dry season with their SES in the rainy season.
The results of the dry season were similar to those of the rainy season. More than 80% of the HGs households in Boulmiougou (84%, n=86/102) and 97% of the HGs households in Tanghin (n=106/109) and Kossodo (n=89/92) belonged to class 1/2. Only two HGs households in Boulmiougou and one HGs household in Tanghin reached the status of class 4 in the dry season.

Figure 8.3. The comparison of the socio-economic classes*[1] in home gardeners' (HGs) and non-home gardeners' (NHGs) households in Boulmiougou, Tanghin and Kossodo during the rainy season



*[1] The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.
*[2] In the socio-economic class 4 the absolute number of HGs households was significantly lower than that of NHGs households in Boulmiougou and Kossodo ($p<0.001$).
*[3] In the socio-economic class 3 the absolute number of HGs households was comparable in Boulmiougou, Tanghin and Kossodo.
*[4] In the socio-economic class 1/2 the absolute number of HGs households was comparable in Boulmiougou, Tanghin and Kossodo.
*[5] In the socio-economic class 1/2 the absolute number of HGs households was significantly higher than that of NHGs households in Boulmiougou ($p<0.001$), Tanghin ($p<0.001$), and Kossodo ($p=0.001$).

In conclusion, the SES of the HGs households in Ouagadougou did not differ between the sites. With respect to the SES, HGs were a very homogenous group in Ouagadougou. In addition, significantly more HGs households than NHGs households belonged to the lowest socio-economic class. This could lead to the

assumption that HGs households belonged to a lower socio-economic class than NHGs households only because of the difference in their activities.
Similar results were seen in a study carried out in October 1998, where HGs households in Boulmiougou, Tanghin and Kossodo and NHGs households in all 30 sectors of the town were interviewed (MEYER, 1998/99). Of 510 interviewed NHGs households, 39% belonged to the two highest socio-economic classes. In contrast, 85% of the interviewed HGs households belonged to the lowest socio-economic class.

Ethnic Groups and Age Distribution in HGs and NHGs Households and Among the Different Socio-Economic Classes

More than 90% of the study population belongs to the ethnic group of the Mossi. The distribution was equal between HGs and NHGs and between the different SES. Mossi people represent the biggest ethnic group in Burkina Faso and are mainly living on the central plateau, where Ouagadougou is situated (CAVIN, 1998).
The age distribution in HGs and NHGs households was similar in both studies and did not vary from site to site and from SES to SES. On average the interviewed HGs were 37 years old and the interviewed NHGs were 35 years old. Approximately half of the interviewees were aged between 31-45, while one-third were under 30. This age distribution is not surprising and reflects the common distribution in developing countries, where life expectancy at birth is low and younger people represent the majority of the population (WORLD BANK, 2000/01).

Gender Distribution in HGs and NHGs Households and Among the Different Socio-Economic Classes

A total of 73% of the interviewees were male (n=441/606) and 27% were female (n=165/606). The gender distribution was very similar to that found in the complementary study (72% men, n=444/613 / 28% women, n=169/613).
Among the NHGs, there were more male interviewees in Boulmiougou (98% in the dry season and 82% in the rainy season), and Tanghin (90% in the dry season and

83% in the rainy season). In Kossodo the number of women interviewed was higher in the dry season (42%) than in the rainy season (35%).

Only small differences were seen between the SES of NHGs men and NHGs women. The SES in NHGs men and women in each of the three sites reflect more or less the SES of all NHGs households of the study population. NHGs households had higher SES than their HGs counterparts both in the dry and rainy season. However, in the dry season 91% of the interviewed NHGs women (n=49/54) belonged to the socio-economic class 1/2, whereas only 37% (n=26/70) belonged to this class in the rainy season. It is very unlikely that the same NHGs women were interviewed both studies. Nevertheless, the results of the dry season reflect the common situation in developing countries, where women tend to belong more frequently to a lower socio-economic class than men (AINSWORTH, 1994; KANJI, 1995). Similar results were found in a poverty study carried out in Burkina Faso in 1996 (INSD, 1996).

Each of the sites must be considered in the gender analysis of HGs. In Boulmiougou the interviewees were exclusively male. At this site home gardening has existed for more than 40 years (TRAORE, 1999), and it is traditionally practiced only by men. In Boulmiougou they cultivate European vegetables rather than traditional vegetables. Home gardening here is well advanced and is used more as an income-generating activity than as a subsistence production.

In Tanghin and Kossodo half of the interviewed HGs were men and half were women, with a higher percentage of women in Kossodo in the dry season than in the rainy season. This reflects the real situation in these sites, as home gardening there is practiced equally by men and women. Especially in Kossodo home gardening is a subsistence production rather than an income-generating activity. Subsistence production in African countries is traditionally done by women (SMIT, 1996). This could explain why more women practice home gardening in Kossodo than at the other two sites. This explanation was also confirmed by the animator of the site in Kossodo (Kone, Personal Information, Ouagadougou, 2000).

No difference was seen between the SES of HGs men and HGs women. More than 80% of the HGs men and women belonged to the lowest two socio-economic classes in the rainy season as well as in the dry season. Distributed also by gender HGs households had lower SES than NHGs households in each of the three sites.

In conclusion, in the dry season there was a difference between the SES of NHGs women and those of NHGs men. NHGs women tended to belong to a lower socio-economic class than their male counterparts. Most HGs households (80%) belonged to the lowest socio-economic class. Possible differences between the SES of HGs men and those of HGs women were not seen.

8.3.2. Household Size and Average Number of Children Among the Different Socio-Economic Classes

The household size and the number of children in a household are often taken as indicators of SES (i.e. DASGUPTA & WEALE, 1992). Households with a lower SES tend to have a larger number of people in the household and a larger number of children. Parents with a higher level of education, which is strongly correlated to a higher SES (refer to Section 8.3.3.), reconsider the number of children that they can afford to raise and educate (AINSWORTH, 1994).

However, the results of this study did not support the two assumptions mentioned above. The households of the study population had an average of six people. This did not vary with socio-economic class, nor were there differences between NHGs and HGs households. The results were confirmed by an official statistic of Burkina Faso, which stated that the average household size in urban regions was 6.5 members (INSD, 1996). Another household study in Burkina Faso found that, on average, each household had six to seven people (USAID, 2000).
In this study the average number of children (aged 15 years and younger) was three per household. One study conducted in Burkina Faso in 1996 showed that the number of childbirths per women in general was eight (NAGEL, 1996). However, 21% of the newborn children do not reach five years of age (INSD, 1994b), which could explain the lower number of children in this study. Household size and number of children did not vary with SES, and did not differ between HGs and NHGs households.

Because these results were not expected and in order to gain a better understanding of the exact family structure among the different socio-economic classes, HGs and NHGs households were revisited.

Family structure did not change with SES. The family structure in HGs and NHGs households was comparable in each of the socio-economic classes. However, the answers of the interviewees in respect to the number of household members and the number of children often differed between the first questionnaire (of the socio-economic impact of home gardening, see Appendix I) carried out after the rainy season and the second questionnaire (of the family structure, see Appendix VII) carried out in an additional field stay in November 2000. The results can be explained as following: The brothers and sisters of the interviewees were often not recognized as part of the household and therefore not included in the list of household members in the questionnaire to socio-economic impact (see example 1 in Appendix VII/I). Additionally, in most households only family members (brothers, sisters, mother, father) of the male head of the household lived in this household. When members of the wives' family lived in the household, they were in most cases younger sisters. Thus, the household profits from an additional working power. In Moslem households the interviewees often counted only their male children (see example 1 in Appendix VII/I). In addition, in many households a nephew or a younger cousin of the interviewee was added to the number of the interviewee's own children (see example 2 in Appendix VII/I). Furthermore, in households with a large number of household members and children, the interviewees often were not sure of the exact number (see example 3 in Appendix VII/I). They often had difficulties remembering the names of their children, and their ages and the level of education were totally unknown.

To summarize, the assumption that households with a lower SES tend to have more household members and more children than households with a higher SES was not supported by these results. Because the study population had a very low average level of education (refer to Section 8.3.3.) and lived in the Sub-Saharan region, where it is still common to have many children, household size and the average number of children do not seem appropriate indicators of SES in that population.

However, in a household survey carried out in Burkina Faso in 1996 a relationship between family size and SES was seen (INSD, 1996). In the 'poorest class' 30% of the interviewed households had 13 or more family members and only 10% of the

households had between one to four persons. The contrary was seen in the ‘richest class’. There, 5% of the households had 13 or more family members and almost half of the households (48%) had only one to four people (INSD, 1996).

8.3.3. Expenditures for Education and Level of Education Among the Different Socio-Economic Classes

Expenditures for Education in the Whole Study Population and Among the Different Socio-Economic Classes

In the socio-economic class 1/2 each household in the study population spent 900 CFAF a month (Q_{25}-Q_{75}: 420-1.700 CFAF) on average for the education of their children. In class 3 they spent 1.700 CFAF a month (Q_{25}-Q_{75}: 1.000-3.300 CFAF) and in class 4 they spent 4.200 CFAF monthly (Q_{25}-Q_{75}: 2.100-5.800 CFAF). The expenditures for school were significantly lower in class 1/2 than in classes 3 and 4 ($p<0.001$ between all classes).

The results support the literature sources in so far as households with a higher SES tend to spend more for the education of their children. In another study carried out in an urban setting in Burkina Faso households of a low SES spent 880 CFAF monthly for the education of their children. Households of a high SES spent 5.500 CFAF monthly (INSD, 1997b). There are two reasons for these differences in expenditures. First, people with a higher SES are more likely to see the importance of a better education (BREDIE & BEEHARRY, 1998 / see below). Women, in particular, with a higher level of education tend to place more value on their children’s education (AINSWORTH, 1994). Second, a higher SES is normally correlated with a higher income (see below) and this is strongly and positively correlated with education attainment (BREDIE & BEEHARRY, 1998).

Level of Education in the Whole Study Population and Among the Different Socio-Economic Classes

The illiteracy rate of the whole study population was 63% (n=382/606). This rate differed between the different socio-economic classes. The illiteracy rate was 80% (n=304/382) in the socio-economic class 1/2. This was significantly higher than the

rates of class 3, with 17% (n=65/382), and class 4, with 3% (n=13/382) in both studies, the rainy season ($p<0.001$) and in the dry season. In the dry season, the illiteracy rate in the socio-economic class 1/2 was the highest, at 92% (n=363/395). Class 3 had a rate of 7% (n=29/395) and class 4 had a rate of 1% (n=3/395).

In the *RAINY SEASON*, 17% (n=72/418) of class 1/2 had attended primary school and 5% (n=22/418) had attended secondary school. The majority of the study population in class 1/2 was not able to read and write (73%, n=304/418). Half of the study population in class 3 were illiterate (n=65/127). A total of 22% (n=28/127) had attended primary school and 24% (n=30/127) had attended secondary school (refer to Table 8.4.).
In class 4 only 21% (n=13/61) of the interviewed people had no formal education, 12% (n=7/61) had attended primary school and 44% (n=27/61) had attended secondary school. With the exception of one NHG in class 3, the only people with a high school degree were in class 4. A total of 20% of the people (n=12/61, only NHGs) in this class had attended high school (refer to Table 8.4.). For an overview of the current school system in Burkina Faso refer to Chapter 7, Section 7.2.6.

The results obtained in the rainy season were similar to the results obtained in the *DRY SEASON* (refer to Table 8.4.). Only 19% (n=100/521) in class 1/2 had attended primary school and 4% (n=23/521) had attended secondary school. The majority of class 1/2 was not able to read and write (70%, n=363/521). Almost half of the people in class 3 were illiterate (43%, n=29/68), 31% (n=21/68) had attended primary school and 21% (n=14/68) had attended secondary school. In class 4 only 12% (n=3/24) of the interviewed people had no formal education. A total of 21% (n=5/24) had attended primary school and about half of the people had attended secondary school (42%, n=10/24). Similar to the rainy season, in the dry season high school participants were almost exclusively found in class 4 with 25% (n=6/24) of the study population (NHGs only) having attended a high school. Moreover, one NHG of class 3 had attended high school and one HG of class 2. This HG was a retired government officer practicing home gardening as leisure-time activity (Traore, Personal Information, Ouagadougou, 1999).

Table 8.4. Level of education in the different socio-economic classes of the whole study population, of home-gardeners (HGs) and non-home gardeners (NHGs), by gender and age both in the rainy and the dry season

			No Formal Education*[1]	Primary School	Secondary School	High School	Other Schools*[2]
Rainy Season		n=606	[%]	[%]	[%]	[%]	[%]
Class 1/2	All	n=418	73	17	5	-	5
	HGs	n=256	78	15	2	-	5
	NHGs	n=162	64	21	11	1	3
	Male	n=308	68	20	6	-	6
	Female	n=110	86	11	2	-	1
	Aged 20-30	n=142	58	31	9	-	2
	Aged 31-45	n=217	78	12	4	-	6
	Aged 46-60	n=53	89	4	-	-	7
	Aged >60	n=6	100	-	-	-	-
Class 3	All	n=127	51	22	24	1	2
	HGs	n=46	67	24	7	-	2
	NHGs	n=81	42	21	33	1	3
	Male	n=94	45	27	24	1	3
	Female	n=33	70	9	21	-	-
	Aged 20-30	n=35	31	26	43	-	-
	Aged 31-45	n=77	58	22	16	1	3
	Aged 46-60	n=14	57	14	22	-	7
	Aged >60	n=1	100	-	-	-	-
Class 4	All	n=61	21	12	44	20	3
	HGs	n=2	50	50	-	-	-
	NHGs	n=59	20	12	44	20	4
	Male	n=39	26	13	36	20	5
	Female	n=22	14	9	59	18	-
	Aged 20-30	n=10	-	10	50	40	-
	Aged 31-45	n=42	24	12	50	14	-
	Aged 46-60	n=9	34	11	11	22	22
	Aged >60	n=0	-	-	-	-	-
Dry Season		n=613	[%]	[%]	[%]	[%]	[%]
Class 1/2	All	n=521	70	19	4	-	7
	HGs	n=281	77	14	1	-	8
	NHGs	n=240	62	25	8	-	5
	Male	n=360	63	23	5	-	9
	Female	n=161	86	10	3	-	1
Class 3	All	n=68	43	31	21	1	4
	HGs	n=19	68	16	11	-	5
	NHGs	n=49	33	37	24	2	4
	Male	n=61	43	31	21	1	3
	Female	n=7	43	29	14	-	14
Class 4	All	n=24	12	21	42	25	-
	HGs	n=3	33	67	-	-	-
	NHGs	n=21	9	14	48	29	-
	Male	n=23	9	22	43	26	-
	Female	n=1	100	-	-	-	-

*[1] The interviewees had no reading and writing skills.
*[2] People had attended class in Morée, the local language of the Mossi people in Ouagadougou, or a Koran school.

To summarize, a higher level of education and a lower rate of illiteracy were correlated with a higher SES in the whole study population. Similar results were seen in a study carried out after the rainy season in 1998. Few people with a low SES had a formal education and most of them were illiterate. In higher socio-economic classes the level of education increased (MEYER, 1998/99).
Furthermore, the results go along with the official data about education in Burkina Faso. The illiteracy rate was 92% in the group of people with a lower SES and 54% in the group of people with a higher SES. The school enrollment rate was three times higher for children of households with a higher SES (63%) than for children of households with a lower SES (19% / INSD, 1997b).

Level of Education in the Different Socio-Economic Classes by Age

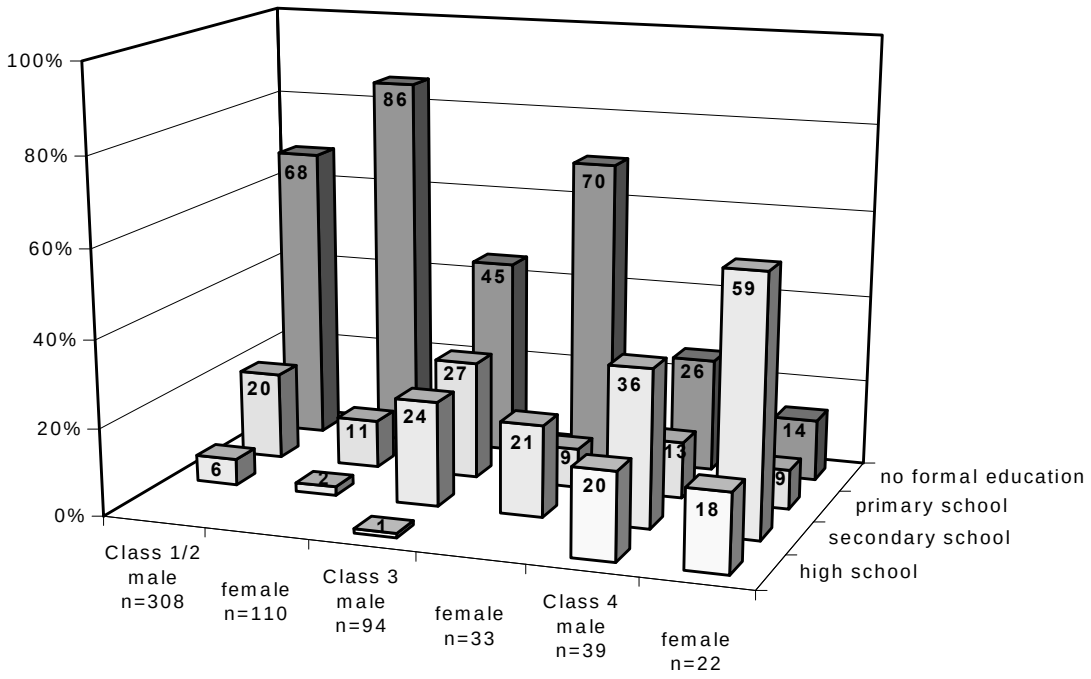
The age of the study population has to be taken into consideration when comparing the education levels of different socio-economic classes. In Burkina Faso 94% of the people aged over 50 were illiterate (INSD, 1997b).
In all socio-economic classes younger people had a higher level of education and a lower analphabetism rate than older people in the same socio-economic class (refer to Table 8.4.). However, the difference between the education level of younger people and older people within one class was not significant. In all age groups the level of education rose with higher socio-economic class. Despite the different age distribution in each of the socio-economic classes people that belonged to class 4 had a higher level of education than people that belonged to class 3 or to class 1/2.

Level of Education by Gender and Among the Different Socio-Economic Classes

The gender of the study population was also taken into consideration when comparing the education levels of different socio-economic classes. However, before looking at the differences in level of education between the classes, the differences between men and women in the whole study population was examined.
Significantly more women than men were not able to read and write (study rainy season: women: 73%, n=121/165; men: 59%, n=261/441, $p<0.001$ / study dry

season: women: 85%, n=143/169; men: 57%, n=252/444, p<0.001). Reasons for the different illiteracy rates of women and men and the high illiteracy rate in Burkina Faso are discussed in Chapter 7, Section 7.3.7. In the lower socio-economic classes more women than men were not able to read and write (refer to Table 8.4.). In the following the findings of this study carried out in the end of the rainy season will be discussed.
In class 1/2 significantly more men (32%, n=209/308) than women (14%, n=95/110) were able to read and write (p<0.001). Moreover, also more men had attended primary school (20%, n=60/308) and secondary school (6%, 20/308) than their female counterparts (primary school: 11%, n=12/110; secondary school: 2%, n=2/110 / refer to Figure 8.4.).

Figure 8.4. Comparison of the different education levels of men and women in the different socio-economic classes*[1] during the rainy season*[2]



*[1] The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.
*[2] In order to make the figure clear, the category 'other schools', which has few interviewees, is not shown; all the data of the category other schools are shown in Table 8.4.

The number of illiterate women was lower in the socio-economic class 3 than in class 1/2. However, in class 3 two-third of the interviewed women (70%, n=23/33) and only 45% of the men (n=42/94) were illiterate (p=0.011). Primary school was more frequently attended by men (27%, n=25/94) than by women (9%, n=3/33). Only secondary school was attended with the same frequency between men (24%, n=23/94) and women (21%, n=7/33 / refer to Figure 8.4.).

The distribution of the education level between men and women was different between the most privileged socio-economic class and those of the three lower socio-economic classes. In class 4 the frequency of men and women who had attended school was more or less equal for all different school levels. First, the illiteracy rate of women (14%, n=3/22) was lower than that of men (26%, n=10/39). Second, more women (59%, n=13/22) than men (36%, n=14/39) had attended secondary school. Last, at the high school level the frequency of attendance of men (20%, n=8/39) and women (18%, n=4/22) was also similar. Only primary school was more frequently attended by men (13%, n=5/39) than by women (9%, n=2/22, refer to Figure 8.4.).
Similar results were also seen in the data on the school enrollment rates for boys and girls in Burkina Faso. In higher socio-economic classes the school enrollment rate for boys (68%) was comparable to that of girls (63% / INSD, 1997b / see Chapter 7, Section 7.3.7.).

Level of Education between HGs and NHGs and Among the Different Socio-Economic Classes

It is important to look at the differences in education levels between HGs and NHGs in the whole study population before examining the different classes separately. The NHGs had an illiteracy rate significantly lower than the illiteracy rate of HGs in both studies, dry and rainy season. Furthermore, more NHGs than HGs had attended secondary schools or high schools (dry and rainy season). A detailed description of the education level of HGs and NHGs and a comparison of the monthly costs for school is given in Chapter 7, Section 7.3.7.

Similar results were seen when analyzing the education levels between HGs and NHGs in each of the different socio-economic classes (refer to Table 8.4.). In both socio-economic classes 1/2 and 3 the HGs had a higher illiteracy rate and a lower level of education than the NHGs. As there were almost no HGs in the socio-economic class 4, this class is not discussed here.

To summarize, there was a significantly higher illiteracy rate in the lowest socio-economic classes in the whole study population. In the lower socio-economic classes, women had a higher illiteracy rate and a lower level of education than men. Women of the highest SES had an education level comparable to that of men.
In socio-economic classes 1/2 and 3 HGs had a higher illiteracy rate than NHGs. In addition, HGs were rarely present in the highest SES.

In conclusion, it is more likely that people with a lower SES also have a lower education than it is for people with a higher SES. Thus, the education level is a valid indicator to estimate a certain SES for a population or population group. In another study in an urban setting in Côte d'Ivoire it was shown that years of education are a strong indicator of welfare change in a household (GROOTAERT et al., 1997).
The results of this study confirm the importance of a multi-dimensional approach to measure poverty. It is not sufficient to take households' income and expenditures and loss of income and consumption as the only measurements or indicators of poverty. Additional indicators should be taken into consideration. However, population groups, which had the same SES but different activities and therefore different external influences, had different degrees of education. Thus, in addition to the above-mentioned indicators of a population's SES, the external factors for a special environment should also be taken into consideration.

8.3.4. Income Distribution Among the Different Socio-Economic Classes

The average monthly income and expenditures are still the most common proxies to estimate a household's economic situation (RAVALLION, 1992; BLACKWOOD & LYNCH, 1994; WRATTEN, 1995b). Often income and expenditures are used as the

only two indicators to measure the living standard or the degree of poverty of a household. Today the approach to measure poverty has been widened and is turning into a multi-dimensional approach (i.e. WRATTEN, 1995b; SATTERTHWAITE, 2000). One reason to use a multi-dimensional approach is that the financial situation of a household, especially in an agricultural setting, is very hard to estimate. People are usually not aware of the exact monthly income of their household. Therefore, the monthly household income and, consequently, the monthly expenditures must always be estimated carefully, and the external factors and living conditions of the households should be taken into consideration as well (refer to Chapter 5).

Taking the multi-dimensional approach to estimating poverty the population's SES should also be analyzed in addition to the income and expenditures situation in a population or population group. The knowledge of the SES helps to both evaluate the income and expenditures data and validate these data.

In the following section the distribution of the average monthly income among the different socio-economic classes will be discussed. Income data will be considered separately for HGs and NHGs households and for each of the three sites.

Directly Estimated Average Monthly Income in the Different Socio-Economic Classes in HGs and NHGs Households

A correlation could be clearly seen between directly estimated average monthly income and socio-economic class in HGs and NHGs households both in the dry and the rainy season.

The average monthly income of NHGs households was significantly correlated with the socio-economic class in the rainy season ($p<0.001$ between class 1/2 and 3, $p=0.004$ between class 3 and 4). In class 1/2 (n=162/302) the NHGs households estimated their monthly income to be 23.800 CFAF (Q_{25}-Q_{75}: 12.500-37.500 CFAF), in class 3 (n=81/302) to be 62.500 CFAF (Q_{25}-Q_{75}: 40.000-92.200 CFAF), and in class 4 (n=59/302) to be 100.000 CFAF (Q_{25}-Q_{75}: 58.000-200.000 CFAF).

The directly estimated average monthly income of HGs households was also correlated with socio-economic class, although the income level was significantly lower than that of NHGs. The directly estimated average monthly income of HGs households in class 1/2 (n=256/304) was 8.300 CFAF (Q_{25}-Q_{75}: 1.700-12.500 CFAF).

In class 3 (n=46/304), with 13.800 CFAF (Q_{25}-Q_{75}: 2.200-22.000 CFAF), it was significantly higher than in class 1/2 (p=0.02). The two HGs households in class 4 had a directly estimated income of 3.000 CFAF. This leads to the assumption that these HGs were not aware of their real financial situation at home.

In the dry season the directly estimated average monthly income was also significantly correlated with SES (p=0.049 between HGs households in classes 1/2 and 3, p=0.049 between NHGs households in classes 1/2 and 3). The NHGs households in class 1/2 (n=240/310) estimated their average monthly income to be 32.400 CFAF (Q_{25}-Q_{75}: 20.000-70.000 CFAF), while those in class 3 (n=49/310) estimated 60.000 CFAF (Q_{25}-Q_{75}: 40.000-92.200 CFAF). Data of only six of the 21 NHGs households were available for class 4. Their directly estimated monthly income was 30.000 CFAF.

HGs households earned significantly less than NHGs households. The directly estimated monthly income of HGs households of class 1/2 (n=281/303) was 12.500 CFAF (Q_{25}-Q_{75}: 6.700-20.800 CFAF), and that of class 3 (n=19/303) was 33.300 CFAF (Q_{25}-Q_{75}: 10.000-50.000 CFAF) in the dry season. The three households in class 4 each earned 16.300 CFAF.

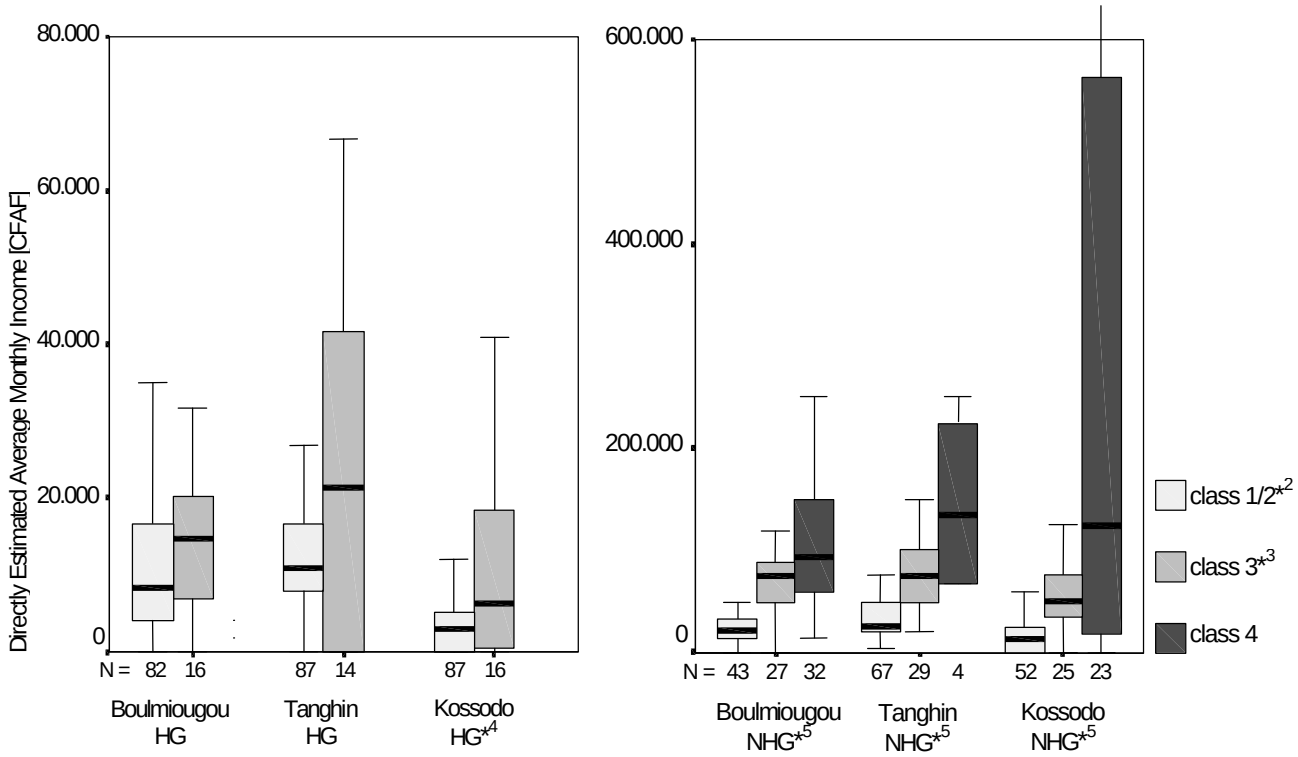
Monthly Income Distribution in the Different Socio-Economic Classes in HGs and NHGs Households in Boulmiougou, Tanghin and Kossodo

A correlation was established between directly estimated average monthly income and socio-economic class in HGs and NHGs households in each of the three sites (refer to Figure 8.5.).

The directly estimated average monthly income of HGs households in Boulmiougou was lower in socio-economic class 1/2 (8.300 CFAF, n=82/100) than in class 3 (14.600 CFAF, n=16/100). As stated above, the only two HGs households in class 4 were found in Boulmiougou. They earned 3.000 CFAF a month. In HGs households in Tanghin the directly estimated average monthly income was lower in class 1/2 (10.800 CFAF, n=87/101) than in class 3 (21.300 CFAF, n=14/101). These results were similar to those in Boulmiougou. With 3.000 CFAF, the HGs households in class 1/2 (n=87/103) in Kossodo had a significantly lower directly estimated average monthly income than the HGs households of the same class in Boulmiougou and in

Tanghin (p<0.001). In class 3 the directly estimated average monthly income was lower in Kossodo (6.200 CFAF, n=16/103) than in Boulmiougou and Tanghin. However, the directly estimated average monthly income of HGs in Kossodo was also higher in class 3 than in class 1/2 (refer to Figure 8.5. / left graph).

Figure 8.5. Distribution of the directly estimated average monthly income in home gardeners' (HG) and in non-home gardeners' (NHG) households in the different socio-economic classes*[1] in Boulmiougou, Tanghin and Kossodo during the rainy season



*[1] The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class. The different scales on the two graphs should be noted.

*[2] In the socio-economic class 1/2 HGs households had a significantly lower directly estimated monthly income than their NHGs counterparts in each of the three sites (p<0.001).

*[3] In the socio-economic class 3 HGs households had a significantly lower directly estimated monthly income than their NHGs counterparts in each of the three sites (p<0.001).

*[4] HGs households in Kossodo had a significantly lower directly estimated monthly income than the HGs households in Boulmiougou and Tanghin in the socio-economic class 1/2 (p<0.001).

*[5] NHGs households had a significantly lower directly estimated monthly income in the socio-economic class 1/2 than in 3 in Boulmiougou, Tanghin and Kossodo (p<0.001).

Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

Furthermore, in all three sites the distribution of HGs households in the different SES was fairly even. Each of the three sites had approximately the same absolute number of HGs in class 1/2 as in class 3.
To summarize, in all three sites HGs households in socio-economic class 1/2 earned less than those in class 3. In addition, in all three sites the absolute number of HGs households was comparable in these two classes. However, in class 1/2 the HGs in Kossodo had a significantly lower income than the HGs in Boulmiougou or Tanghin. This shows again that despite the same SES different external factors in the respective site can influence the income in the different sites.

The directly estimated average monthly income of the NHGs households in Boulmiougou was 22.500 CFAF in socio-economic class 1/2 (n=43/102), 75.000 CFAF in class 3 (n=27/102) and 92.500 CFAF in class 4 (n=32/102). The income of class 1/2 was, therefore, significantly lower than that of class 3 ($p<0.001$). In Tanghin the directly estimated average monthly income was also significantly lower in class 1/2 (25.000 CFAF, n=67/100) than in class 3 (75.000 CFAF, n=29/100, $p<0.001$). In class 4 (n=32/100) NHGs households earned 134.000 CFAF. In Kossodo NHGs households earned less in class 1/2 (12.500 CFAF, n=52/100), than those in class 3 (50.000 CFAF, n=25/100, $p<0.001$) and those in class 4 (125.000 CFAF, n=23/100 / refer to Figure 8.5. / right graph).
To summarize, in all three sites NHGs households in socio-economic class 1/2 earned less than those in classes 3 and 4. The average income in class 1/2 and in class 3 was comparable in the three sites. In addition, in all three sites the absolute number of NHGs households was similar in classes 1/2 and 3. In class 4 there were fewer NHG households in Tanghin, than in Boulmiougou or Kossodo. NHGs households in classes 1/2 and 3 had significantly higher directly estimated average monthly incomes than their HGs counterparts.

In conclusion, almost none of the HGs households reached a living standard of the highest socio-economic class. Moreover, HGs households always earned less than NHGs households in the same SES. These results could lead to the assumption that practicing home gardening makes it very difficult to reach a high SES.

The significantly lower level of education and higher illiteracy rate in HGs compared to NHGs in the same SES might lead one to think that people without formal education have few opportunities to get high paying work and have to look instead for activities in the informal sector, such as practicing home gardening.

Similar results were seen in a study in the southern Sudan, where those households at the bottom 25% of the income distribution had the lowest level of education (HOUSE, 1991). Those households whose members were engaged in formal sector wages were overrepresented in the richest 25% of the income distribution. The key getting one of the few available formal activities was through the attainment of primary education. In addition, the level of wages rose with the number of years of education (HOUSE, 1991). An increase in the per capita GDP seems to be positively related to average years of schooling (VINOD et al., 1999).

In the multi-dimensional approach to measure poverty, the income and expenditures indicators are amplified by other indicators of the current living situation. Nevertheless, in this study it was seen that the income indicator was still a good proxy to estimate SES in a household.

8.3.5. Expenditures and Expenditures Coverage Rates Among the Different Socio-Economic Classes

Like the household income, the monthly expenditures are also still the most common proxies to assess whether a household falls below the poverty line (see Section 8.3.4.). However, taking into consideration the multi-dimensional poverty approach, the data obtained about income and expenditures in a population should always be compared with the SES of the given population in order to evaluate and validate the data.

In the following section the distribution of average monthly predictable expenditures among the different socio-economic classes will be discussed. Expenditure data will be analyzed for HGs and NHGs households and for each of the three sites. The average monthly predictable expenditures were defined as the sum of the average monthly expenditures in a household for food, fuel for cooking, drinking water and energy (see Chapter 6, Section 6.2.6.1.).

Monthly Predictable Expenditures Among the Different Socio-Economic Classes in HGs and NHGs Households Both in the Dry and Rainy Season

There was a correlation between socio-economic class and average monthly predictable expenditures both in the dry and in the rainy season.

In the rainy season HGs households in socio-economic class 1/2 (n=256/304) spent significantly less (11.400 CFAF, Q_{25}-Q_{75}: 9.300-15.700 CFAF) than those in class 3 (15.100 CFAF, Q_{25}-Q_{75}: 10.800-23.800 CFAF, n=46/304, $p<0.001$). The two only households of class 4 spent 16.600 CFAF. The level of expenditures was significantly higher in the dry season than in the rainy season ($p<0.001$ in the socio-economic classes 1/2 and 3). In the dry season HGs households in class 1/2 (n=281/303) spent 26.700 CFAF monthly (Q_{25}-Q_{75}: 16.400-38.100 CFAF), while those in class 3 (n=19/303) spent 34.400 CFAF monthly (Q_{25}-Q_{75}: 25.700-46.700 CFAF). The three households in class 4 spent 41.600 CFAF.

In the rainy season the monthly expenditures of NHGs households correlated significantly with socio-economic class ($p<0.001$). NHGs households in class 1/2 (n=162/302) spent 15.100 CFAF monthly (Q_{25}-Q_{75}: 12.000-20.000 CFAF), while those in classes 3 and 4 spent 29.700 CFAF (Q_{25}-Q_{75}: 21.200-41.600 CFAF, n=81/302), and 42.800 CFAF (Q_{25}-Q_{75}: 36.900-58.100 CFAF, n=59/302), respectively. In every socio-economic class NHGs households spent approximately the same amount in the dry season as they did in the rainy season. In the dry season NHGs households in class 1/2 (n=240/310) spent less (27.700 CFAF, Q_{25}-Q_{75}: 18.500-38.500 CFAF) than those in classes 3 (32.500 CFAF, Q_{25}-Q_{75}: 24.200-43.100 CFAF, n=49/310, $p=0.019$) and 4 (40.700 CFAF, Q_{25}-Q_{75}: 30.300-52.400 CFAF, n=21/310).

Comparing the average monthly predictable expenditures of HGs households of those of NHGs households within the same socio-economic class HGs households spent significantly less than their NHGs counterparts in the rainy season in classes 1/2 and 3 ($p<0.001$). However, in the dry season HGs and NHGs households in class 1/2 and class 3 had the same monthly predictable expenditures.

To summarize, as well as for the average monthly income the predictable monthly expenditures also correlated with SES in HGs and NHGs households. However, in the HGs households within a SES the predictable monthly expenditures were

significantly lower in the rainy than in the dry season. Drawing conclusions from expenditures to SES and from SES to expenditures must be done carefully and will be discussed further.

Monthly Predictable Expenditures Among the Different Socio-Economic Classes in HGs and NHGs Households in Boulmiougou, Tanghin and Kossodo

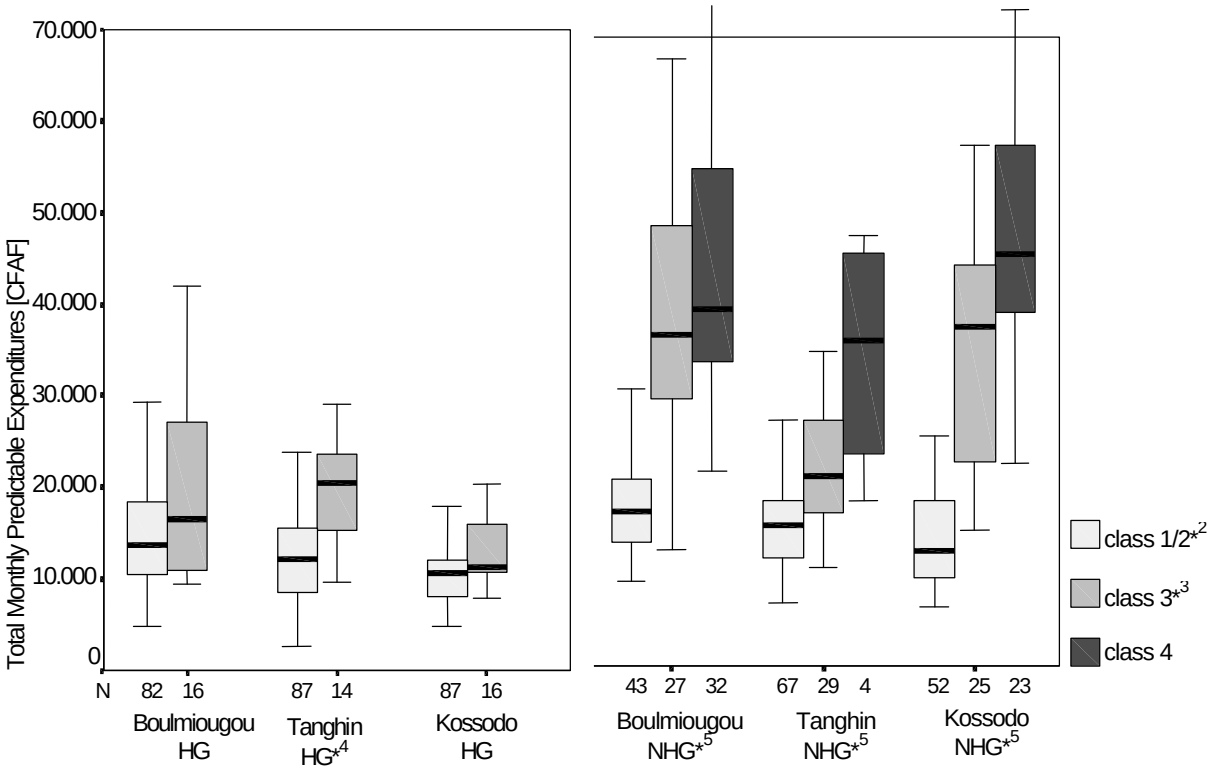
There was a correlation between the total monthly expenditures and the SES in HGs and NHGs households in each of the three sites in the rainy season (refer to Figure 8.6 / both graphs).

The predictable monthly expenditures of the HGs households in Boulmiougou were lower in the socio-economic class 1/2 (13.700 CFAF, n=82/100) than those in class 3 (16.500 CFAF, n=16/100). As stated above, the only two HGs households in class 4 were found in Boulmiougou. They spent 16.600 CFAF monthly. In Tanghin the HGs households in class 1/2 spent less (12.200 CFAF, n=87/101) than those in class 3 (20.500 CFAF, n=14/101, p=0.001). In Kossodo the HGs households in class 1/2 (n=87/103) only spent 10.500 CFAF and those in class 3 (n=16/103) spent 11.400 CFAF (refer to Figure 8.6. / left graph).

In addition, in class 1/2 expenditures differed between the sites. The HGs households in Boulmiougou had the highest monthly predictable expenditures, followed by the HGs households in Tanghin and then by the HGs households in Kossodo (between Boulmiougou and Tanghin p=0.009, Boulmiougou and Kossodo p<0.001, Tanghin and Kossodo p=0.018). In the socio-economic class 3 all HGs households in each of the three sites had the same monthly predictable expenditures (refer to Figure 8.6. / left graph).

In all three sites HGs households spent significantly less than NHGs households in class 1/2 (p<0.001). The same result was seen in class 3 for Boulmiougou and Kossodo (p<0.001). The NHGs households in Boulmiougou in class 1/2 (n=43/102) spent significantly less (17.300 CFAF) than those in classes 3 (36.900 CFAF, n=27/102) and 4 (39.800 CFAF, n=32/102, p<0.001 between all classes).

Figure 8.6. Distribution of the monthly predictable expenditures in home gardeners' (HG) and in non-home gardeners' (NHG) households in the different socio-economic classes*[1] in Boulmiougou, Tanghin, and Kossodo during the rainy season



*[1] The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.

*[2] In socio-economic class 1/2 HGs households had significantly lower predictable monthly expenditures than their NHGs counterparts in each of the three sites ($p<0.001$).
In socio-economic class 1/2 HGs households had significantly different predictable monthly expenditures in each of the three sites (between Boulmiougou and Tanghin $p=0.009$, Boulmiougou and Kossodo $p<0.001$, Tanghin and Kossodo $p=0.018$).
In socio-economic class 1/2 NHGs households had comparable predictable monthly expenditures in each of the three sites.

*[3] In socio-economic class 3 HGs households had significantly lower predictable monthly expenditures than their NHGs counterparts in Boulmiougou and Kossodo ($p<0.001$).
In socio-economic class 3 HGs households had comparable predictable monthly expenditures in each of the three sites.
In socio-economic class 3 NHGs households had comparable predictable monthly expenditures in Boulmiougou and Kossodo.

*[4] HGs households in Tanghin had significantly lower predictable monthly expenditures in the socio-economic class 1/2 than in class 3 ($p=0.001$).

*[5] NHGs households in Boulmiougou, Tanghin and Kossodo had significantly lower predictable monthly expenditures in the socio-economic class 1/2 than in class 3 and in class 4 ($p<0.001$).

Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

In Tanghin NHGs households in class 1/2 (n=67/100) spent 15.600 CFAF monthly, while those in classes 3 (n=29/100) and 4 (n=4/100) spent 21.100 CFAF and 36.200 CFAF ($p<0.001$ between all classes). In Kossodo the NHGs households in class 1/2 (n=52/100) spent, with 12.800 CFAF, less than those in class 3 (n=25/100), with 37.700 CFAF, and class 4 (n=23/100), with 45.800 CFAF ($p<0.001$ between all classes).
In contrast to the expenditures of class 1/2 HGs households, the expenditures of class 1/2 NHGs households were comparable in all three sites. The expenditures of class 3 NHGs households were also comparable in Boulmiougou and Kossodo.

To summarize, both in HGs and in NHGs households the monthly predictable expenditures were correlated with the SES. The NHGs households within a socio-economic classes had the same expenditures at each of the three sites. Although the NHGs households were located in different sectors of the town, differences in expenditures could not be noted within a SES at the three sites. The HGs households did not have the same monthly predictable expenditures within a SES. Although more than 80% of the HGs households belonged to the lowest socio-economic class their expenditures varied from one site to the next.

In conclusion, a lower SES generally indicates a lower monthly income and lower monthly expenditures. However, the range of income and, especially the range of expenditures differed within a SES. This was because of the different activities in the study population and because of the different external factors the study population depends on.
Knowing only the financial situation in a population group, the determination of the SES in that group has to be done carefully. Additionally, knowing the SES of a population group and estimating therefore the financial situation is not appropriate without taking into consideration the external conditions of the population in question. This could be clearly seen in HGs households where the economic impact of home gardening also depends on the external factors, which change from site to site and from season to season.

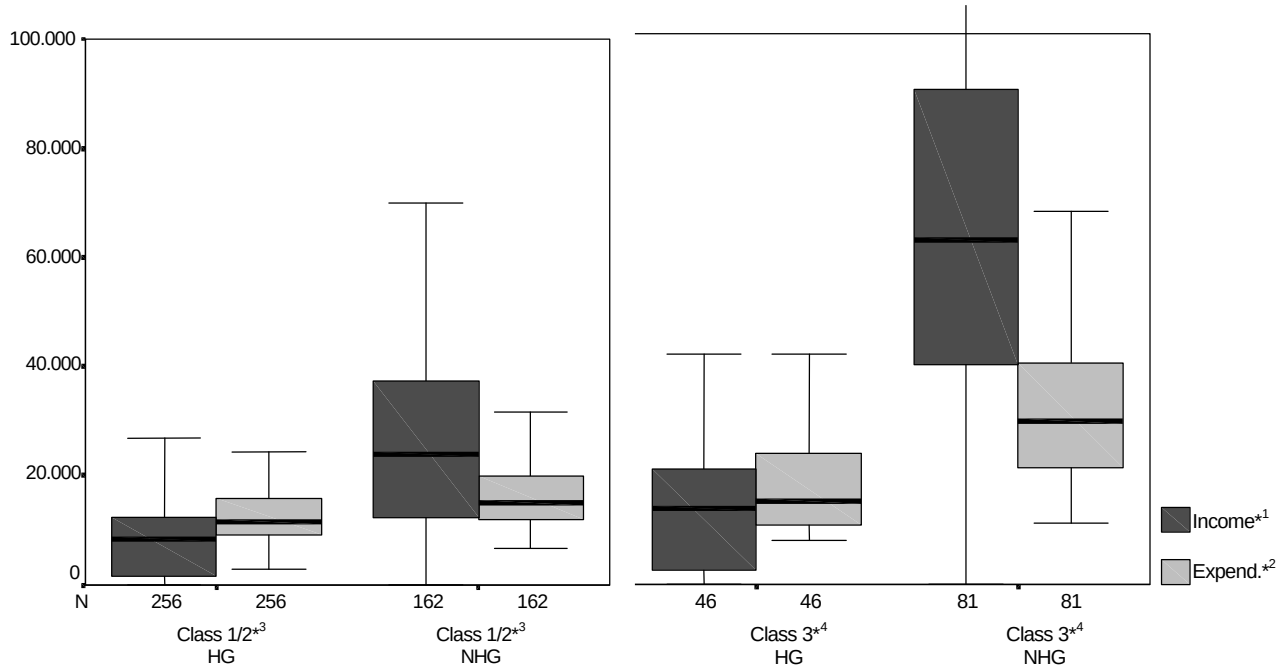
Expenditures Coverage Rates of the Different Socio-Economic Classes in HGs and NHGs Households in the Rainy Season

The directly estimated average monthly income and the monthly predictable expenditures were correlated in HGs and NHGs households with SES. However, in each of the socio-economic classes the income and expenditures were not comparable between HGs and NHGs households. Therefore it was of interest to look for the expenditures coverage rates of HGs and NHGs households in the different socio-economic classes.

In neither class 1/2 nor in class 3 could HGs households cover on average their monthly predictable expenditures with their directly estimated average monthly income (refer to Figure 8.7.). Classes 1/2 and 3 both had negative coverage rates and the expenditure coverage rate was even lower in class 3 than in class 1/2 (class 1/2: -4.800 CFAF, Q_{25}-Q_{75}: -9.900-1.900 CFAF; class 3: -5.700 CFAF, Q_{25}-Q_{75}: -14.100-8.000 CFAF). Because there were only two HGs households in class 4 they were not taken into the calculation. Despite the significantly higher average monthly income in HGs households belonging to socio-economic class 3, more than 50% of the HGs households in this class were not able to cover their basic needs.
Regardless of their SES, HGs households had on average no surplus in their finances at home. On the other hand, in all socio-economic classes the NHGs households averagely could count with a surplus in their finances at home (refer to Figure 8.7.).

The surplus was lowest in class 1/2 and highest in class 4. Nevertheless NHGs households, which belonged to the lowest socio-economic class, had an average surplus of 6.800 CFAF (Q_{25}-Q_{75}: -500-17.900 CFAF) monthly. The NHGs households of class 3 had a higher surplus, with 33.900 CFAF (Q_{25}-Q_{75}: 13.200-60.200 CFAF, $p<0.001$ to class 1/2). The NHGs households of class 4 had the highest average monthly surplus, with 48.100 CFAF (Q_{25}-Q_{75}: 18.100-141.100 CFAF, $p=0.025$ to class 3). No matter which SES NHGs households belonged to, they were able to cover their basic needs with their earnings.

Figure 8.7. Directly estimated monthly average income in comparison to the monthly predictable expenditures of home gardeners' (HG) and non-home gardeners' (NHG) households in the different socio-economic classes during the rainy season



*[1] Directly estimated average monthly income [CFAF] in HGs and NHGs households, respectively.

*[2] Monthly predictable expenditures [CFAF] in HGs and NHGs households, respectively.

*[3] Socio-economic class 1/2 represents the most underprivileged class of the study. The HGs households had significantly higher monthly predictable expenditures than directly estimated average monthly incomes than their NHGs counterparts ($p<0.001$).

*[4] Socio-economic class 3 represents a socio-economic status between the most underprivileged class and the most privileged class. The HGs households had significantly higher monthly predictable expenditures than directly estimated monthly average incomes than their NHGs counterparts ($p<0.001$).

Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}.

In conclusion, households with the same SES but different activities had different monthly financial situations. Thus, household income and expenditures can be taken as appropriate proxies to estimate the SES of a household or a population group, but only when the location of the population and all the external factors are also included in the estimation. It was clearly seen in this study that these determinants have an influence on the amount of income and expenditures within a SES.

8.3.6. Health Status and the Expenditures for Medical Care Among the Different Socio-Economic Classes

There are studies that indicate that socio-economic deprivation is associated with higher mortality and overall morbidity based on general assessments of long-term illnesses or health problems (BLAXTER, 1987; HAYNES, 1991; WILKINSON, 1992). Moreover, more advantaged groups, in terms of income, education, and social classes, tend to have a better health status than other members of the same society (BLANE, 1995).

Until the second quarter of the 20th century the dominant cause of mortality among industrialized urban populations was infectious diseases. However, mortality from infections had begun to decline due to major advances in health during the end of the 19th and the beginning of the 20th century. These advances were primarily a result of improvements in social and environmental factors, which include better housing, safer water supplies, increasing literacy and the idea of domestic hygiene, which gave further protection to infants and children (LILLIE-BLANTON & LAVEIST, 1996; MCMICHAEL, 2000).

Therefore it was of interest to look for a possible relationship between the expenditures for medical care, the frequency of illnesses and the SES in HGs and NHGs households.

Monthly Expenditures for Medical Care Among the Different Socio-Economic Classes in HGs and NHGs Households

The amount spent for medical care was very low in comparison to the total monthly costs. Care-seeking expenditures made up the lowest share of all monthly expenditures (2-7%), which include costs such as for food, water, and leisure. One exception was HGs households in Boulmiougou. They spent 11% of all their monthly expenditures for medical care (refer to Chapter 6, Section 6.3.2.3.1.f.).

There was a correlation between SES and the amount spent on medical care in HGs and NHGs households (refer to Table 8.5.). HGs households in the socio-economic class 1/2 spent 500 CFAF monthly on average, while those in class 3 spent 1.000 CFAF and the two households in class 4 spent 1.900 CFAF.

In NHGs households the monthly expenditures for medical care were lower than in HGs households. In the socio-economic class 1/2 NHGs households spent 340 CFAF monthly on medical care, while those in class 3 spent 830 CFAF ($p<0.001$ between the two classes) and those in class 4 spent 1.000 CFAF (refer to Table 8.5.).

Table 8.5. Estimated average monthly expenditures for medical care in home gardeners' (HGs) and in non-home gardeners' (NHGs) households across the different socio-economic classes*[1] during the rainy season

		Mean	Median	Q_{25}-Q_{75}	Min	Max	SD	N*[2]
Class 1/2	HGs	1.800	500	250-1.500	0	50.000	4.300	250/297
	NHGs*[3]	930	340	130-1.000	0	10.000	1.600	157/293
Class 3	HGs	1.700	1.000	1.400-2.400	0	13.800	2.400	45/297
	NHGs*[3]	1.500	830	420-1.500	0	10.000	1.900	79/293
Class 4	HGs	1.900	1.900	210-3.500	210	3.500	2.300	2/297
	NHGs	2.100	1.000	460-2.400	0	25.000	3.600	57/293

*[1] The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.
*[2] Number of interviewed persons.
*[3] The expenditures for health care differed significantly in NHGs households between the socio-economic classes 1/2 and 3 ($p<0.001$).

These results could lead to the assumption that households with a higher SES tend to spend more for health care than households with a lower SES. Furthermore, on the average the HGs households spent more than the NHGs households in the same socio-economic class. However, these results have to be regarded very carefully. First, the low average costs for medical care in the whole study population have to be noted. Second, in each class the range of the costs was very high.

A poverty and health study carried out in Burkina Faso showed that households with the highest SES and living in an urban setting tend to spend more than 100.000 CFA per year on their health (INSD, 1997a). However, another study covering several

developing countries showed that there was a regressive pattern of spending, with the wealthier quintiles spending less of their total consumption on health care than the poorer quintiles (MAKINEN et al., 2000).

Frequency of Illnesses Among the Different Socio-Economic Classes in HGs and NHGs Households

In the study after the rainy season and in the complementary study after the dry season, the interviewees were asked about their own perception of the most recent illnesses that occurred in their households. First of all, malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases were the most commonly perceived illnesses in the whole study population (see Chapter 6, Section 6.3.2.3.3.). Considering the different SES similar results could be seen (refer to Table 8.6). With 67% to 78% in all socio-economic classes malaria was the most frequently named last illness in HGs and NHGs households. In all socio-economic classes gastro-intestinal diseases including diarrhea were, with 4% to 21%, the second most frequently reported illness. These were followed in all socio-economic classes by respiratory diseases, with 3% to 20%. Considering these results it seems very likely that SES in a population group is not related to health status. No socio-economic class had a remarkably different illness pattern than any other class, and HGs and NHGs households had similar illness patterns. Reasons for the same frequency of illnesses in HGs and NHGs households are discussed in Chapter 6, Section 6.3.2.3.3.f.

The results of this study were contrary to the findings in other studies.
One study provided considerable evidence that socio-economic conditions were a powerful, although not necessarily exclusive, explanatory factor for racial disparities in health (LILLIE-BLANTON & LAVEIST, 1996). In another study substantial variations in the degree of correlation were seen comparing specific types of illnesses with different socio-economic variables. Long-term limiting illnesses and respiratory conditions were highly correlated with socio-economic variables. However, none of the disorders of the gastrointestinal system showed a high correlation with socio-economic variables (SAUL & PAYNE, 1999).

Table 8.6. Percentage of the three most frequently named last perceived disease categories -malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases- in home gardeners' (HGs) and non-home gardeners' (NHGs) households across the different socio-economic classes* both during the dry and the rainy seasons

	Class 1/2		Class 3		Class 4	
Perception of Disease	HGs	NHGs	HGs	NHGs	HGs	NHGs
Rainy Season (n=415)	n=176	n=103	n=35	n=53	n=2	n=46
	[%]	[%]	[%]	[%]	[%]	[%]
Malaria	73	67	77	70	-	70
Gastro-intestinal Diseases, incl. Diarrhea	18	14	20	21	-	15
Respiratory Diseases	9	19	3	9	-	15
Dry Season (n=342)	n=148	n=143	n=14	n=25	n=3	n=9
	[%]	[%]	[%]	[%]	[%]	[%]
Malaria	73	75	72	76	-	78
Gastro-intestinal Diseases, incl. Diarrhea	8	10	14	4	-	11
Respiratory Diseases	19	15	14	20	-	11

* The socio-economic class 1/2 represents the most underprivileged class of the study population, the socio-economic class 4 represents the most privileged class.

Another result of this study was that in almost 50% of the households the most recent illness affected a child. Unfortunately this result was expected for a country where 21% of the children do not live longer than five years (INSD, 1994b).

In this context it was of interest to see if children of households with a lower SES will be more exposed to certain illnesses than children of households with a higher SES.

In the 606 interviewed households 274 children and 317 adult household members (i.e. interviewee, wife, brother) were perceived as being the most recent ill person in the household in the rainy season. A total of 173 of these 274 children belonged to households in class 1/2, 61 to class 3 and 40 to class 4. For 19% (n=32/173) of the ill children in class 1/2 the interviewees estimated that they had a gastro-intestinal disease, including diarrhea. In class 3, 12% (n=7/61) of the children were perceived as ill with a gastro-intestinal disease, including diarrhea, and in class 4 only 8% (n=3/40). Although the sample size was very small, it could be seen that children in

the lowest socio-economic class seem to have more often gastro-intestinal problems than children in a higher socio-economic class.

In developing countries the mortality of children is typically four or more times higher in poorer segments of an urban population than in richer segments (MCMICHAEL, 2000). In Bangladesh children of a lower SES have been reported to have more diarrhea and live in less hygienic conditions than children of a higher SES (BECKER et al., 1986). However, in another study carried out in Lima, Peru the association between a low SES and a higher risk of diarrhea was not significant. A low SES did not independently determine diarrhea, but rather may be functioning through transmission factors (i.e. eating feces or soil, non-use of latrines, hygiene behavior) related to a SES affecting diarrhea (YEAGER et al., 1991). Household surveys in Ghana, Nigeria and Sudan showed that the single most important influence on child survival is the level of a mother's education (GORTER et al., 1991; WORLD BANK, 1994). And mothers (women) education is highly correlated with a higher SES (WORLD BANK, 2000/01). Child mortality was reduced to 50% in households where the mother attained secondary level education. And female literacy already reduced child mortality in the household (WORLD BANK, 1994).

In conclusion, the frequency of gastro-intestinal illnesses, including diarrhea, in children seems to be related to the SES of the children's household in this study. However, the sample size of the examined children was very low. Furthermore, no correlation could be seen between the SES and the health status in the study population. In all socio-economic classes HGs and NHGs households had similar illnesses patterns.

8.4. Summary and Conclusion

In the last few years the growth of urban centers especially in developing countries has increased enormously. This process of urbanization leads to an increase in poverty in urban areas as well. At the same time the one-dimensional approach to measure poverty, which uses income and expenditures as measurements of poverty has to become multi-dimensional including non-income/expenditures variables as well as income and expenditures variables (WRATTEN, 1995b; RAVALLION, 1996). The urban poor are not a homogenous group. Sharp divisions exist among the poor, by age, sex, occupation, shelter, land, education, health, and even clothing (SEN & BEGUM, 1998). In addition to different income and expenditures patterns, all these variables may influence the standard of living in different population groups as well.

The aim of this chapter was to compare the SES of HGs and NHGs households. The main emphasis lay on the comparison of SES to the education level, the monthly income and the household expenditures in both activity groups. The probable relationship between socio-economic class and health status was also discussed.

The level of education and the illiteracy rate were highly correlated with socio-economic class. Most of the people in the lowest socio-economic class were not able to read and write, while only people in the highest socio-economic class had attended high school. The women in the lower socio-economic classes all had lower levels of education than the men of the same class. However, in the highest socio-economic class the women had the same level of education as the men.
Considering these results, it is likely that people with a lower SES also have a lower level of education and vice versa. Thus, the level of education is a valid indicator to estimate the SES in a population or population group. However, in addition to education level, different external factors, which could additionally influence the SES should also be taken into consideration. This is well demonstrated by the HGs and NHGs of the study population.
In the lower socio-economic classes the HGs always had lower levels of education than their NHGs counterparts in the same class. Moreover, almost none of the HGs households reached the highest socio-economic class, but one-fifth of the NHGs households were found there.

Similar results could also be seen for the amount of income. In the whole study population the directly estimated average monthly income was larger in higher socio-economic classes. However, NHGs households always had a higher directly estimated average monthly income than the HGs households in the same socio-economic class.

These results could lead to the assumption that one of the most important keys getting a higher paid work is the attainment of a higher education. This assumption is confirmed by other studies, in which a higher level of education, a higher income and a higher SES were always highly correlated (LOCKHEED et al., 1989; HOUSE, 1991; GROOTAERT et al., 1997; VINOD et al., 1999).

The monthly predictable expenditures were also correlated with socio-economic class. However, the amount of predictable expenditures differed between HGs and NHGs households in the same SES. In addition, in the same socio-economic class the predictable monthly expenditures in HGs households were higher in the dry season than in the rainy season. Reasons for this could be that first, only the HGs households depend on the external factors on the home gardening sites, and second, these factors -mainly the quantity of water for irrigation- differ from season to season.

In conclusion, in all socio-economic classes the level of income and the amount of expenditures were correlated with SES. Therefore, in this study income and expenditures could be taken as fairly valid indicators of the degree of poverty of a population. However, it was also clearly seen that households with the same SES but practicing different activities did not show the same expenditures and income patterns. To estimate the SES or poverty degree of a population all relevant external factors should be considered, in addition to the expenditures/income indicators.

In addition, the selection of the indicators to estimate the SES should be tailored to the given setting. This was seen when the study households were revisited. The households of the higher socio-economic classes, especially the HGs households, owned animals, mainly sheep, but also cows, in comparison to the households of the lower socio-economic classes, which owned, in the best case, chickens (Personal Observation, Ouagadougou, 2000). In a rural setting animals are a valid indicator of welfare (SEN & BEGUM, 1998). This indicator is also appropriate in an urban setting

in the Sub-Saharan region. However, the ownership of animals was not considered in the estimation of the SES in this study. Another study carried out in Mexico also emphasized that there was no single indicator, which was always appropriate to estimate the SES of a population group (INFANTE & SCHLAEPFER, 1994).

The last finding of this chapter was related to the health status of the study population in the different socio-economic classes. Unlike the level of education and income/expenditures patterns, no correlation was seen between SES and a health status. Across all socio-economic classes and in all socio-economic classes HGs and NHGs households had similar illness patterns.
Considering these results it seems that SES did not influence the frequency of the last illness in a household. Although the HGs were practicing an activity, which may create a higher health risk than any other activity in town, and although more than 80% of the HGs households belonged to the lowest socio-economic class, no difference could be seen between their health status and the health status of the NHGs households. The correlation between income/expenditures pattern and SES did not automatically indicate a correlation between health status and SES.

In contrast, other studies showed both a relationship between specific types of illnesses and socio-economic variables and a relationship between better health and higher socio-economic classes (BLANE, 1995; LILLIE-BLANTON & LAVEIST, 1996; SAUL & PAYNE, 1999). The aim of this study was to compare the economic situations of HGs households with those of NHGs households living in the same neighborhood. Due to this criteria of selection the number of interviewees belonging to each SES was not well balanced. The unequal distribution of the study population could have had an influence on the results.

In the light of the results in the literature and the results of this study further research on this subject is necessary. To obtain valid results a ‘cohort study’ should be carried out. A defined number of people in each of the socio-economic classes should be interviewed in order to analyze a possible correlation between health status and socio-economic status. HGs and NHGs households should be analyzed separately in this ‘cohort study’, because different external factors, which are related to different activities, could also have an influence on the health status of the study population.

One implication for further action is to accept the heterogeneity of a population and to detect the population groups being at risk of greatest burden (TANNER & CISSE, 2000). Results of this study showed that many more HGs households than NHGs households belonged to the lowest socio-economic classes in Ouagadougou. They are more vulnerable than other population groups of the town, as they had the lowest SES, a very low income, no saving opportunities and very limited education. Moreover, the HGs are not a homogenous group and there is always a small proportion of them that carries the major share of burden. Therefore possible interventions should reach the lowest socio-economic classes and the population groups of highest risk first. In this study the HGs group, which probably are at the highest risk are the HGs at the site of Kossodo, particularly the women. Literacy programs would therefore be especially beneficial there. Health status and an appropriate hygienic behavior to obtain a better health also seem to be correlated with a higher education level, especially in women (MCMICHAEL, 2000). In addition, better educated women are more aware of the importance of sending their own children to school (AINSWORTH, 1994).

Next to interventions in Ouagadougou, the results of the study could also be used as a tool to start interventions in other countries of the Sub-Saharan region. The results show that the identification of the socio-economic status of a population group is a powerful tool for identifying the poorest of a population. Policies that benefit the non-poor and moderately poor may not necessarily help the extremely poor (SAUL & PAYNE, 1999). In gaining more knowledge about the socio-economic classes in a population, possible interventions could be better tailored to each of these classes. This might be a way to minimize the gap between the poor and the poorest in order to facilitate broad-based human development.

In conclusion, the multi-dimensional approach to measure poverty, which includes income and expenditures variables as well as non-income/expenditures variables is a valid tool for predicting the poverty level of a population or population group. It can therefore assist in building well-targeted intervention programs. However, next to the multi-dimensional approach additional external factors, which are specific to each setting, should always be included to predict more exactly the poverty level of a population or population group.

9. Market Vendors, the Link Between Home Gardeners and Consumers of Vegetables

9.1. Introduction

In the past the world's entire population was 'rural', living a nomadic or pastoral life and providing for their own food needs. In the course of time, this way of life gave way to trade-oriented, specialized economic and social patterns, in which people changed from their original rural setting to live in towns. Over the next 20 years, more than 90% of the urban growth will occur in the cities of the developing world. And among these, the cities of the Sub-Saharan region, which include Ouagadougou, are one of the fastest growing areas (FAO, 1998a; WORLD BANK, 2000 / Chapter 1, Section 1.1.).

The consequence is self-evident: more and more urban residents have to acquire food. For a city of three to four million inhabitants, the food requirement averages about 3.000 to 4.000 tons per day (FAO, 1998a; DRECHSEL et al., 1999). It is a huge task to feed a city of several million people, or even of only several hundred thousands, who need many tons of food every day. This requires much coordination among producers, transporters, market managers and retailers in stores, on the street and in open-air markets. As cities grow in population and space, they require more extensive and more developed transportation and distribution systems for bringing food to consumers, including roads, vehicles and market places that are accessible to all segments of the population (FAO, 1998a).

Yet in many developing countries agricultural productivity and the agricultural transportation and marketing systems are not developing at the pace needed to serve growing urban populations. Taking Ouagadougou as an example, the town has approximately 750.000 inhabitants according to the last inhabitant census of 1996 (LEREBOURS PIGEONNIERE & JOMNI, 1998), which is a very conservative estimation for today. A city of this size has to import at least 1.000 tons per day or the equivalent of more than 300 trucks per day each loaded with three tons. This implies one truck entering the city every five minutes for 24 hours a day, which is difficult to imagine knowing the bad infrastructure and the overcrowded town.

People in urban settings and especially the urban poor are facing a permanent food insecurity linked with malnutrition (see Chapter 1, Section 1.2.3.1.). It is still very difficult for urban dwellers to provide themselves with sufficient food at adequate prices and quality (BRIAND, 2000). The problem of urban food security is far from being solved. An efficient harvest, post-harvest and marketing chain would promote production and distribution in accordance with consumer needs and would ensure that the costs for food from producer to consumer could be kept to a minimum. Effective marketing is one guaranty for food availability and for the access to inexpensive food. Despite a lot of further important projects and actions to ameliorate living conditions in urban settings in developing countries, an increase in food supply, thereby reducing food insecurity and malnutrition, is seen as the major task within the next few decades (MAIRE & DELPEUCH, 2000).

The urban food chain consists of three functional components (refer to Figure 9.1.). First, there is the food that urban residents consume. Second, there is the source where the food is produced. The sources of the food may be rural producers, urban producers, imports, food aid or own production. Especially urban production has becoming more and more important in the last years. Vegetables are cultivated by home gardeners at sites on the outskirts of the town. A detailed description of urban agriculture and the economic impact of urban agriculture in town is given in the chapters five to eight. And third, there is the link that brings food from producers to consumers.

Urban residents acquire food in general through exchange (purchase or barter), production (home production, subsistence farming) or transfer (food aid, food stamps, feeding programs / DRAKAKIS-SMITH, 1992). Home gardeners sell their products, in general, to a wholesaler, to clients directly at the site, to local markets or a retail outlet, to processing facilities or to restaurants or street vendors of cooked food.

With the growing of the towns the complexity of the urban food system has also greatly increased in the last year. And especially the process of food coming from the point of production to the point of consumption became more complicated.

In most parts of Africa, the link between agriculture and market place, the urban food chain, is neither direct nor easily understood. Distribution and marketing systems are

frequently obtuse and inefficient, held together by personal relationship, private marketing networks and unregulated transactions (HARRISON, 2000). This negatively affects food prices and the access for lower income groups to available food. Rooted in tradition, existing marketing and distribution systems often fail to protect the interests of both producers and consumers. The status quo is that much selling is done ‘by chance’ because it is not clear who is the wholesaler and who is the retailer. People deal more between individuals, stay a little quiet about the conditions and negotiate these conditions anew each day and with each person.

In order to find solutions to food supply problems in developing countries, and especially in Sub-Saharan Africa, it is necessary to fully understand the often complex relationship between home gardeners, sellers and consumers. Information on the food chain includes aspects ranging from production to the final point of sale. The aim of obtaining more precise information is to improve the ability to market the products effectively. It is necessary to obtain information on, for instance: locations of production, external conditions of production, seasonal variations in production, purchase prices, wholesaler demand, size and location of the supplies, consumer demand, changes in the consumer preference and taste, seasonal variations in supply and demand, transport availability and changes, selection of the goods, and quality of food. In the urban food chain each of the different members, from home gardener via wholesaler to the market vendor, should be aware of the health risk related to working with polluted vegetables and selling them. More information on the health risk perception and the hygienic behavior of all members of the urban food chain should have the aim to reduce the health risk related to eating the transported vegetables.

In Ouagadougou 13.700 or 6.2% of the working population (population aged over 15) are involved in selling either vegetables (5.2%) or fruits (1%). The sector is highly dominated by women. The last census counted nearly 12.300 women selling vegetables and fruits in town, which is 14.8 % of all women working in Ouagadougou (INSD, 1998). Women selling vegetables and fruits in Ouagadougou are part of the estimated 50 million women in the entire world (HUGON, 1989). Despite this number of market vendors little is known about this part of the urban food chain, the link

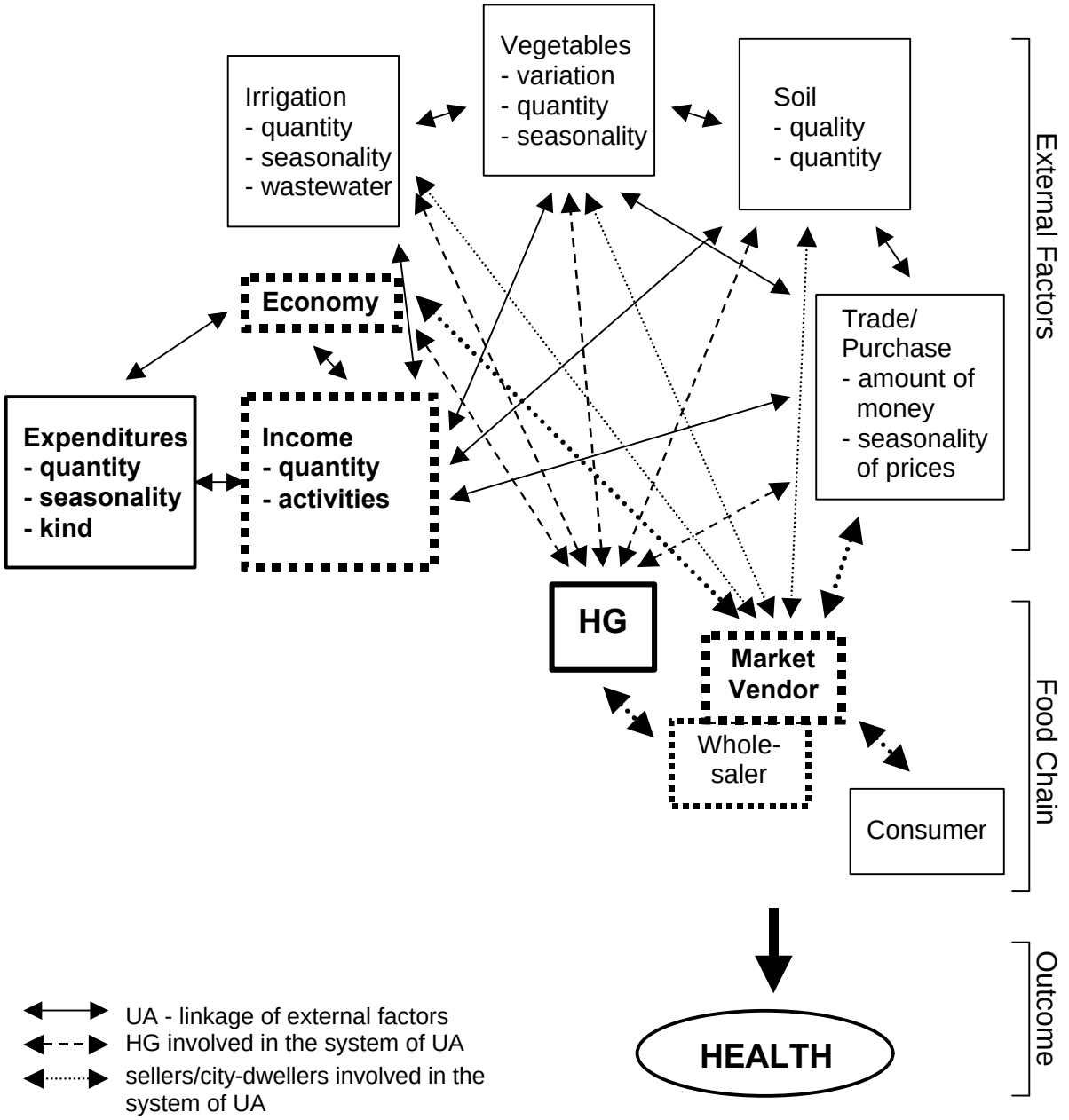
between vegetables growing at home gardener' sites and vegetables being on clients' tables in Ouagadougou.

More knowledge is already available about the production part of the urban food chain. Data about urban agriculture in Ouagadougou are available with regard to wastewater management strategies (CISSE, 1997), health care and health perception in home gardeners' and non-home gardeners' households (MEYER, 1998/99), food production patterns and agricultural practices (MÜLLER, 1999), the social impact (OUEDRAOGO, 1998), and the economic impact (refer to chapters 5-8) of people living from home gardening (see Chapter 4, Section 4.4.).

The aim of this chapter is to gain a wider knowledge about the urban food providing system. Information was collected about market vendors, representing the link between urban food producers, the home gardeners and the consumers (refer again to Figure 9.1.).

The focus of the chapter is on market vendors of the four main selling facilities in Ouagadougou, which are markets in front of supermarkets in the center of the town, night markets, day markets in the sectors of the town and daily markets along the main roads out of the town. With the help of focus group discussions a better understanding of their part of the food chain was established. Demographic data, the selling and purchase behavior, perception of vegetables with a main emphasis on high nutritional food of low health risk, clients' profile and a comparison of their incomes with the incomes of home gardeners was worked out. Moreover, different case studies of vendors of different market places in Ouagadougou were shown.

Figure 9.1. The system of urban agriculture (UA) and its outcome with a main emphasis on market vendors



9.2. Methods

9.2.1. Burkina Faso and its Capital Ouagadougou

The focus group discussions (FGDs) were carried out in Ouagadougou, the capital of Burkina Faso in West Africa, at the end of the rainy season in 1999. Additional information was recorded during a second, three-week field stay in November 2000.
Burkina Faso is situated at the southern part of the West African Sahel, has no coastal access, almost no natural resources and its land is used as for agriculture and for pasture. In 1999, the population was estimated at 11 million, with a population growth rate of 2.8% per year (WORLD BANK, 2000/01).
The basis of Burkina Faso's economy is agriculture. About 92% of the population is engaged in (mainly subsistence) agriculture, which is highly vulnerable to variations in rainfall, aridity and erosion. Since its independence in 1960, Burkina Faso has remained one of the poorest countries in the world and ranks only 172 of 174 countries in the Human Development Index (HDI) of the United Nations Development Program (UNDP, 2000). The main reasons for this low rank are its high population density, few exploitable natural resources and fragile soil. Social indicators are very low. Life expectancy at birth is 44 years, infant mortality (under five years) is 210 per 1.000 and the GNP per capita US $240 (WORLD BANK, 2000/01).
Ouagadougou with its 750.000 inhabitants (in 1996) and with an average annual growth rate of 6.8% lies in the center of the country (LEREBOURS PIGEONNIERE & JOMNI, 1998). Being situated at the Sahelian border, its annual precipitation can vary from 850 to 900 mm per year and is restricted to the rainy season from June to October (LEREBOURS PIGEONNIERE & JOMNI, 1998). The average temperature is between 24° C in January and 28° C in July (see Figure 4.1.).

9.2.2. Study Population: Market Vendors

The market vendors on the different food markets in Ouagadougou provide the city-dwellers with their daily needed fresh food. They are part of the urban food chain and represent the connection between the vegetables on the home gardener sites and

the vegetables at the clients' house (refer to Figure 9.1.) In FGDs (refer to Section 9.2.3.) their living and working conditions and their financial situation was analyzed.
All interviewed market vendors were women. This is not surprising given the history of market and trade in West Africa and, therefore, in Ouagadougou. After the independence of Burkina Faso achieved in 1960, Madl (1972) classified the trade sector in three main sections: first, the class of the wholesalers, which is dominated by the French; second, the class of the retail traders, which is dominated by the Lebanese and third, the indigenous sale on market places or streets in the town. This indigenous sale is divided in different ethnic groups. The ethnic group of the Mossi, and here exclusively the Mossi women, is only responsible for the sale of fruits and vegetables. Trade in all other commodities is dominated by ethnic groups who are traditionally engaged in trade. These are, i.e., the Hausa, Yoruba, Dioula and Yarse (MADL, 1972). This classification still exists today, and the Mossi women, to which group the interviewed women belong, are the dominant group of people selling fruits and vegetables in markets in Ouagadougou.

Market vendors were identified with regard to the four different types of vegetable sales in Ouagadougou. First, vegetables are sold in front of supermarkets in the center of the town. Second there are night markets in a few sectors and third, there are day markets in each sector of the town where vegetables are sold. Fourth, women are selling vegetables along the main roads out of the town. For more information refer to Chapter 4, Section 4.2.2.1. and Figure 4.3.

9.2.3. Focus Group Discussions

In total, four discussions were held with market vendors of the four different selling places in Ouagadougou. The discussions were carried out in November 1999 and January 2000. The team, which organized the discussions, consisted of four people: a moderator, a moderator translator, a translator and an interpreter (see Photo 13-14).
The FGD is a group interviewing technique, which was used to obtain information on the social and economic situation of market vendors at different market types. The moderator guideline for the FGD was written in French. During the four FGDs the

questions were simultaneously translated in Morée, the local language of the Mossi people living in Ouagadougou and afterwards again translated in French.
The moderator guideline addressed the following topics (for the full moderator guideline refer to Appendix III):

1) History of becoming a market vendor and years of selling experience.
2) Quantity and selection of the sold vegetables and possible changes in the variety during the dry and rainy season.
3) Clients' behavior and their perception of the quality of the vegetables; importance of the presentation of the vegetables.
4) Chronology of an average working day.
5) Income from the sale of vegetables and the perception of this income.

At the end of the FGD each participant had to respond to a small socio-economic questionnaire (refer to Appendix III/I). The data was analyzed using SPSS (Version 9.0 for Windows 1995). A synthesis of all four FGDs is given in Appendix III/II.
For more information on the FGDs and the implementation refer to Chapter 4, Section 4.2.2.2.f.

9.2.4. Quality Control of the Results

The investigation strategy was that of triangulation. A term derived from navigation for orientation and positioning, triangulation commonly refers to the complementary use of qualitative and quantitative methods in order to overcome errors and limitations implicit in each type of method and to validate research findings through different approaches (HAMMERSLEY & ATKINSON, 1996).
Next to the results of the FGD, data of the socio-economic questionnaire and personal observations were taken into account. All data obtained were compared and checked in the context of existing data and literature.

9.3. Results and Discussion

In the following section focus group discussions (FGDs) with market vendors in Ouagadougou will be described. Market vendors represent the link between urban food producers and the consumers. Or in the words of one market vendor (female, aged 30, selling on a night market) who described the typical situation of this activity in Ouagadougou:

> *"A vendor of vegetables is a person who buys vegetables and resells them again. To the same extent that this activity runs well, you increase the quantity of the vegetables."*

The market vendors for the FGDs were selected with regard to the four main possibilities of selling vegetables and fruits in Ouagadougou, but also in other West African countries or towns (ZDUNNEK, 1987).

First, vegetables and fruits are sold on day markets in almost every sector of the town. These markets are open between 8.00 and 17.00 h. Second, there are night markets in a few sectors of the town. They open at 3 p.m. and close at 10 p.m. A third possibility of selling vegetables and fruits exists along the main roads going out of the town. Women sell there daily during the day (6.30 h to 18.00 h). And last, goods are sold in front of the supermarkets in the center of the town. The supermarkets do not sell vegetables and fruits and, therefore, allow women to sell these products in front of the shop. The market vendors have the same opening hours as the supermarkets, which are daily between 6.30 h and 22.00 h. All markets are open seven days a week. Depending on their religion the women do not work either Friday or Sunday morning.

A detailed characteristic and a clients' profile of the different market places is given in Section 9.3.4. For a synthesis of all four FGDs refer to Appendix III/II.

9.3.1. Demographic Data

The average age of the interviewed 20 market vendors in the four FGDs was 37 years. Their age was between 27 and 50. In Burkina Faso, 44% of the population are

under 15 years (INSD, 1996). Therefore the market vendors belong to the group of the more elderly members of a community.
The demographic data are listed in detail in Table 9.1.

It was asked whether the market vendors could read and write whether they had attended school, because this does not automatically indicate that they obtained a formal education. In a public primary school, classes have an average of 100 pupils, which makes it very difficult for every single child to obtain some basic knowledge (Flavie Konzié, Primary School Teacher, Personal Information, Ouagadougou, 2000). More detailed information on the current school system in Burkina Faso can be found in Chapter 7, Section 7.3.7.
Fifteen of the 20 market vendors could not read and write. This number was slightly higher than the official urban illiteracy rate of women with 59% in Burkina Faso (WORLD BANK, 2000). The average age of the women, however, was also higher than the average age in the country and only in younger women the illiteracy rate has shown a decrease in the last few years (NAGEL, 1996). Five of the women had school education, four of them had attended a primary school and one a secondary school. According to another study about market vendors in Ouagadougou, 65% (n=72/110) of them were not able to read and write (KABORE, 1994). One explanation was that the women started very early in their childhood with selling vegetables or food, because their mothers took them already to the market and therefore they had no chance to obtain a formal education (KABORE, 1994). This explanation could also be true for the women of the FGDs.

On average seven persons per household depend on the income of the market vendors. This corresponds with Burkina Faso's official statistics, in which the average household size in urban regions is 6.5 members (INSD, 1996). The number of children was three and therefore lower than the average number of eight childbirths in Burkina Faso (NAGEL, 1996). One reason could be a different type of question to obtain this answer. In the FGDs women were asked for their present number of children. In other studies women were often asked for the number of children they had born. The very high child mortality of 21% dying under five years in Burkina Faso (UNDP, 2000) could explain the different numbers.

Nevertheless, Kaboré said, short and to the point that the demographic data of market vendors do not differ at all from the data of the average women living in West Africa (KABORE, 1994).

Table 9.1. Demographic data of the market vendors (all women) of the focus group discussions

Market	Age	Education	Family Status	n° House-hold*[2]	n° Chil-dren	Lodging	Electri-city*[4]
In front of a	38	No formal *[1]	Married	13	5	Adobe	No
Supermarket	35	No formal *[1]	Married	9	1	Cement	Yes
	38	No formal *[1]	Married	8	6	Mix*[3]	Yes
	33	Primary	Married	5	3	Cement	Yes
Night market	40	No formal*[1]	Married	10	7	Adobe	No
	35	No formal *[1]	Married	8	5	Mix*[3]	No
	30	No formal *[1]	Married	15	2	Mix*[3]	No
	36	No formal *[1]	Widow	3	3	Cement	Yes
Daily market on	27	No formal *[1]	Married	6	3	Mix*[3]	No
a main road	35	No formal *[1]	Married	7	5	Adobe	No
	34	No formal *[1]	Married	5	4	Cement	Yes
	38	No formal *[1]	Married	7	4	Cement	Yes
	40	No formal *[1]	Married	7	5	Adobe	No
	28	No formal *[1]	Married	5	3	Adobe	No
Day market in a	50	Primary	Married	12	3	Mix*[3]	No
a peripheral sector	27	Secondary	Married	4	2	Adobe	No
	28	Primary	Married	7	2	Mix*[3]	No
	47	No formal *[1]	Widow	11	7	Adobe	Yes
	50	No formal *[1]	Married	9	1	Adobe	No
	50	Primary	Widow	4	2	Adobe	No

*[1] No formal education, without reading and writing skills.
*[2] The woman in the discussion supports these persons with her income.
*[3] House constructed with a mix between adobes and cement.
*[4] Electricity in the house.

In the study three different types of housing were selected in Ouagadougou (see Chapter 7, Section 7.3.4.). The best possibility in housing is a fully cemented house, which is also the most expensive form of construction. Different housing conditions are therefore one indicator of different socio-economic classes in the population. Four market vendors lived in a cemented house (20%) and eight in a mix form build

with adobes and cement (40%). Only four lived in a house constructed with adobes (20%). By comparison, 7% of the interviewed home gardeners (HGs: n=20/304) lived in a cemented house but already 35% of the interviewed non-home gardeners (NHGs: n=106/302 / refer to Chapter 7, Section 7.3.4.). Socio-economic differences between these two activity groups are clearly shown in Chapter 8.

In household interviews in Ouagadougou in 1998 31% of all households declared to have electricity (INSD, 1998). This number was equivalent to the number in market vendor's households. Seven of the 20 women (35%) said to have electricity at home. In comparison, only 5% (n=15/304) of the HGs households had electricity at home. The type of housing and the existence of electricity could both be indicators that HGs and market vendors did not belong to the same socio-economic class. The small sample size of market vendors, however, did not allow statistical analyses between the two groups.

9.3.2. History of Becoming a Market Vendor

The market vendors had been selling their products for periods between 5 and 30 years. For all 20 women in the four different markets the history of becoming a market vendor was more or less the same.
Most of them had to start working to cover the basic needs of their families. Two main reasons were given. Either their husbands were unemployed and often they were not even willing to search for a job as a market vendor on a night market (female, aged 30) put it:

> *"That are the women* [who are responsible for the money]*! Because the men do not work, you have to go out and earn some money for your family."*

or they did not earn enough to cover all the expenditures for their families. A market vendor (female, aged 50) on a day market explained:

> *"My husband is working at the Hotel Silimandé* [biggest hotel in town where he works as an auxiliary]*... together with his activity we are able to support the family."*

In looking for an activity all of them started immediately with selling food products. As a market vendor on a day market (female, aged 50) remembered:

> *"Now I've been selling vegetables for 15 years already. Before I sold millet, doughnuts and peanut cookies."*

Selling food products is a typical business of women in West Africa. The Table of the national employment office ('Office National de la Promotion et de l'Emploi') about women engaged in the informal sector is headed by women selling prepared and unprepared food (ROOST VISCHER, 1997). Also in Ouagadougou this informal activity is highly dominated by women. Ninety percent (90%) of the market vendors of both vegetables and fruits are women (INSD, 1998). Another study carried out in Nigeria confirms that mainly women (94%) are selling prepared or unprepared food (ZDUNNEK, 1987). The advantages in selling food were seen in generating some cash but also in feeding their own family. Selling food can therefore be seen as a form of subsistence production.
One further reason for the high dominance of women selling vegetables was also seen in the weak income possibilities within this activity. This could deter men from doing it (ZDUNNEK, 1987; PAULAIS & WILHELM, 2000 / see Section 9.3.5.).

With the exception of the market vendors in front of the supermarket, all women started with selling prepared food such as *atieke*, pancakes, doughnuts or sweets. That means, they prepared all kinds of food the clients demanded, or in the words of a market vendor (female, aged 28) on a day market:

> *"You are selling everything your clients ask for."*

After a while they all switched to selling vegetables and in some cases also fruits. Several reasons were given, but one reason was dominant: selling vegetables and fruits was more profitable than selling prepared food.

This was vividly described in the following quote (market vendor on a day market, female, aged 47):

> *"You are trying an activity, if it does not work, you are looking for another activity, which helps you to earn some money. If it works, fine! You stay with it."*

However, the women on the daily market along a main route complained that in the last years the number of vegetable sellers increased too much and the profit for each of them therefore decreased. Two market vendors explained that:

> *"For 13 years I have been selling vegetables. In the beginning the number of sellers was limited and everybody made some profit."* *(*female, aged 35)
>
> *"In the last years a great number of market vendors arrived."* *(*female, aged 38)

In contrast to the women at the day and night markets the women in front of the supermarket in the center of the town never had any other business than selling vegetables. As their parents or mainly their mothers already sold vegetables, they started with them as children and then continued this activity. A market vendor (female, aged 35) in front of a supermarket in the center remembered:

> *"I started selling vegetables with my parents when I was very young. Now I have already been working in this business for 28 years."*

Moreover, several of the women are married with HGs of the site of Boulmiougou and are directly selling the products of their husbands' home gardening sites. In the course of the years some of them switched from selling vegetables to fruits or vice versa. Furthermore they diversified the quantity of their vegetables in order to have a different selection from that of their neighbors.
The reason was given by a market vendor in front of a supermarket (female, aged 33):

> *"We can't work together in selling the same vegetables, therefore we try to diversify our products. If my neighbor is selling vegetables I can't sell the same selection."*

In conclusion, the reasons for becoming a market vendor were economic reasons, which were influenced in different ways by the given socio-cultural environment in Ouagadougou, which represents the typical environment of West Africa.

First of all, the market vendors had to start with an income-generating activity because there was not enough money in the household to cover the basic needs of the household members. Reasons therefore were the unemployment of their husbands, the unwillingness of the husbands to work or that they did not earn enough money with their activity.

To become a market vendor was then mainly a socio-cultural decision. The women choose the opportunity of becoming a market vendor because it is one of the few income-generating activities, which can be done by women. Selling vegetables is an activity, which belongs to the informal sector of a town. According to Paulais and Wilhelm (2000), the most unprofitable level of an activity on a market is selling food because of the long working hours combined with low income possibilities. Therefore it is an activity mainly chosen by women as the only possibility to support their family and often refused by men. Time-allocation studies show that when housework and child care are considered, women in Africa work on an average 67 hours per week (seven days), compared to men's 54 hours (DESJARLAIS et al., 1995). In the FGDs the market vendors were telling about the chronology of their typical working day (refer to Section 9.3.6. for these chronologies). They worked on an average 17 hours a day, which will result in 120 hours a week.

As in other East (HAUSMANN MUELA, 2000) and West African (ZDUNNEK, 1987) regions, wage labor opportunities exist for both men and women, but the majority of salaried jobs are held by men. Women can be found in salaried jobs, but most of them require special training, i.e., hospital nurses, teachers or secretaries. In view of the difficult access for women to secondary education (refer to Chapter 7, Section 7.3.7.), only a few women have the opportunity for such training. Among unqualified workers, men are again in an advantageous position since most jobs, like road construction or guarding of houses, require a male labor force.

Moreover the women often 'inherit' the activity of being a market vendor from their mothers. Being trained in this field from an early age and having no other skills they (must) continue with this activity (ZDUNNEK, 1987; KABORE, 1994). Furthermore selling food can also be seen as a kind of subsistence production in feeding the family with the goods. And it is possible to start selling vegetables and fruits with a

small advanced capital of between 500 CFAF and 5.000 CFAF (KABORE, 1994). Big pre-investment is not required in this business.

9.3.3. Selling Behaviors in Different Market Places

Selling Pattern in Different Market Places

All the women of the different market places had a very similar selling behavior. Generally, they sell all kinds of vegetables and fruits. The range can differ from dried to fresh products and from traditional to European vegetables. As a market vendor on a daily market along a main road (female, aged 38) said:

> *"We sell all that we can find on the wholesalers' markets. If these products are dried or fresh vegetables, traditional or European, we buy them and resell them."*

Instead of traditional vegetables such as *boulvanka*, *boulmboula* or *gombo,* which were planted originally in Sub-Saharan regions, the cultivation of European vegetables (for example tomatoes or carrots) started with the colonization of Western Africa. Europeans brought the required seeds and cuttings to Burkina Faso (SMIT et al., 1996 / see Chapter 4, Section 4.2.1.1.).

However, the quantity and diversity of the sold products depend mainly on the different selection of the products available in the dry and rainy season in the Sub-Saharan region. Each product has its special purchase period. Outside this respective period the vegetables run completely out in Ouagadougou or they have to be imported from other countries such as Côte d'Ivoire or even the Netherlands.

As a market vendor (female, aged 30) on a night market explained:

> *"We are selling vegetables coming from the Netherlands and Côte d'Ivoire. As soon as the production stops here, we are supplied with vegetables coming from everywhere."*

Especially at the end of the dry season there is a shortage of vegetables and they get expensive, as these words of one market vendor (female, aged 30) clearly show:

> *"It's the shortage that increases the prices. If a vegetable disappears from the market, everybody who still has this vegetable will sell it at a very high price."*

The increase in prices in the dry season is typical of countries in the Sub-Saharan region and also seen in a study in Côte d'Ivoire (BRIAND, 2000). As a consequence, clients were often not willing or, more likely, not able to pay the high prices in a time of shortage.

Each market place sets its own priorities according to the commercial principle of making profits within the range of vegetables and fruits.
Except on the daily market along the main road, women of the other market places preferred European to traditional vegetables. As they did not have cold-storage houses or at least storage possibilities they had always problems to keep their vegetables fresh over the whole selling period of the day. They were all complaining that it was not possible to conserve traditional leafy vegetables for more than a few hours, but clients would buy exclusively fresh vegetables.
Another reason for preferring European to traditional vegetables were the higher prices, which could be obtained. In general, European vegetables are higher-priced on local markets in Ouagadougou than traditional vegetables (Personal Observation, Market Places, Ouagadougou, 1999/2000; average price estimation of 100 different households, Ouagadougou, 2000). Also HGs often switched from traditional to European vegetables, because they achieved higher selling prices for them (MÜLLER, 1999).

The quantity and diversity of the sold vegetables and fruits also differed from place to place. The women in front of the supermarket had the biggest selection of vegetables and fruits with a high priority of European products. This location is one of the few places in Ouagadougou, where they also sell strawberries from January to March. Moreover they have a monopoly of apples. They send their older children to Côte d'Ivoire to import them. The whole year round they sell the apples both to clients and to wholesalers.

One of these market women (female, aged 38) said:

> *"We sell vegetables and fruits depending on their seasons. Only apples do not depend on this rhythm, they are not from Ouagadougou, they are coming from Côte d'Ivoire."*

The women of the day market in the peripheral sector and at the night market had a smaller selection of vegetables and fruits than the women in front of the supermarket. Their selection depends strongly on the season. Nevertheless, it was also dominated by European vegetables. Only the women along the main road sell traditional vegetables and European vegetables in equal quantities.

To summarize, the quantity and diversity of the sold vegetables and fruits depend on their availability in the dry and rainy season. The priorities in selling vegetables range from a huge selection of European vegetables and fruits at the market in front of the supermarket in the center of the town to a small selection of vegetables mainly of local origin at the market along the main road. This difference may lead to the assumption that there is a different socio-economic status among the women of the different market places. This assumption will be further confirmed in Section 9.3.5.

Presentation of the Goods

All participants of the FGDs pointed out the importance of the presentation of the vegetables and fruits. Presentation is to be understood as a collective term including the exclusive display of the goods, the equipment and hygiene of the selling place and a clean and nice appearance of the vegetables. Again, each market place has its priorities in these matters.

All women in the FGDs emphasized the importance of clean, which means well-washed vegetables. Often the women thought this is the main reason why clients buy the vegetables just at this special market stand, as these words of a market vendor (female, aged 30) on a night market clearly show:

> *"I think, they* [the clients] *look first, if the vegetables are clean. The presentation is not so important, if the vegetables are washed well."*

An attractive presentation of the selling point and the vegetables, however, often was synonymous for clean vegetables, as it is explained by another market vendor (female, aged 33) in front of a supermarket in the center:

> *"If your products are presented in a nice manner, you can attract clients. They will buy anything as long as it is nicely presented."*

Moreover, it was also asked if the market vendors preferred the presentation of their vegetables on a table or on the ground. The reason for this question was to find out if there existed any perception of hygienic presentation. Although the opinions differed slightly between the vendors of the four market places, none of them was emphasizing one of the two presentation possibilities because of hygienic aspects.
The women on the day market observed that on their market place the clients avoid the vegetables presented on the ground thinking they are not of good quality. One of these women (female, aged 48) explained:

> *"The clients prefer vegetables displayed on a table, rather than on the naked ground."*

By comparison, the women along the main road emphasized that clients would prefer vegetables lying on the ground, because they seemed to be less expensive. Or in the words of a market woman there:

> *"There are clients who think that vegetables on a table are more expensive. Therefore we are presenting our vegetables on the ground."*
> (female, aged 40)

Neither the women in front of a supermarket having their goods on tables nor the women on the night market presenting their vegetables on the ground made any difference between these two possibilities. In both markets it was more important that the vegetables were presented on a clean tablecloth, which implies a protection from the permanent dust on the streets.

To summarize, it was very important for all market vendors to have a nice and well-looking presentation of their vegetables. This could be confirmed by personal observations in all four market places (Ouagadougou, 1999/2000). However, there was no consciousness of a clean, in the sense of hygienic, presentation of the vegetables. Personal observations in all four market places showed the following behavior (Ouagadougou, 1999/2000): The selling place was swept without protecting the vegetables from the dust. The children of the market vendors played everywhere on the market and touched the vegetables. Vegetables which fall down from the presentation place, were replaced without washing them.
These results confirm observations made by Cissé (1997) on different market places in Ouagadougou. He also noted no consciousness of hygienic behavior and presentation on the markets. According to him, it was very likely that the vegetables were polluted and contaminated on the way to the market or at the market place itself in the same way as on the home gardener sites (CISSE, 1997). Other publications also emphasize the insufficient hygiene in presenting food on market places (KABORE, 1994; PAULAIS & WILHELM, 2000).

Purchase Pattern in Different Market Places

In Ouagadougou the main possibility to buy vegetables was via a wholesaler.
All women in the FGDs provide their products with the help of wholesalers, the only exception being the market vendors in front of the supermarket, which will be referred to further on.
The wholesalers came either directly to the market places or, more frequently, the women went personally to the big central markets in the outskirts of the town. From 5.30 h to 7.00 h they were purchasing their vegetables and fruits there. Each day

they were buying a quantity of vegetables, which they hoped to resell again on the same day.

Contrary to expectations, the market vendors did not purchase directly on the sites. According to the market women the HGs do not sell the vegetables directly to them, because they have already informal agreements with wholesalers in the beginning of the season. At harvest time they sell them at once the crops of all the fields with one sort of vegetables. A market vendor (female, aged 50) on a daily market along a main road explained:

> *“On the sites the home gardeners have their own clients, if you arrive, they refuse to sell you their products."*

The market women explained that wholesalers buy their products as a first priority at the different home gardening sites in Ouagadougou. In the dry season the vegetables start to become scarce in town. At this time the wholesalers provide themselves with vegetables coming from outside the town. Finally, in the end of the dry season the vegetables are imported from other African countries and also from Europe.

In conclusion, the wholesalers have a lot of purchase places, which differ from season to season, but also from month to month. Therefore the market vendors do not exactly know the origin of all their products. A vendor of the night market (female, aged 30) out it:

> *“We are supplied via wholesalers. This makes it difficult for us to know where the vegetables originally come from.”*

However, it has to be pointed out that no market vendor complained about her unawareness of the origin of the products she sold.

Only the women in front of the supermarket buy most of their products directly from the home gardening site of Boulmiougou. Several of the market vendors are also married with a HG of Boulmiougou.

According to the women, shortly after the rainy season, when the quantity of the different vegetables is immense, HGs personally come to the supermarket to sell

their vegetables there. As soon as the vegetables get scarcer and scarcer the market vendors have to go personally to the site. A market vendor (female, aged 33) in front of a supermarket explained:

> *"This depends on the time of the year. In the peak season there is an abundance of vegetables and the home gardeners come to our place, but in the season, when vegetables are short in supply, we are forced to go to the site to provide us directly there."*

Through the direct connection between HGs and market vendors without an intermediary in between, the women in front of the supermarket know exactly where their vegetables originally come from. In comparison to the irrigation water on other sites in town, Boulmiougou was considered as one of the less polluted sites (CISSE, 1997; BOSSHART, 1998). Moreover, it was named in a TV campaign as a positive example of home gardening sites in town (refer to Section 9.3.4.). Therefore the women in front of the supermarket were proud of selling vegetables from Boulmiougou. Another advantage of being directly provided by a home gardener site was the lower purchase price for vegetables. The women did not have to finance a wholesaler, a fact, which could increase their profit margin (refer to Section 9.3.5. and Figure 9.2.).

9.3.4. Characteristics of the Markets, Clients' Profile and their Perception of the Quality of the Vegetables

Characteristics of the Markets and Clients' Profile

Three of the four FGDs were held with market vendors selling at defined places of the town. Urban dwellers know these places and come regularly. Therefore clients and market vendors know each other. In general clients prefer one special vendor once they come to trust them. A market vendor (female, aged 28) explained the typical situation:

> *"Each of the vendors has a regular number of clients, who are loyal to her and whom she knows. But there are also further clients coming, you don't know them."*

Kaboré (1994) describes the relation between client and market vendor as a social relationship, which was more than only a 'selling-buying-act'. They know about their family structure and their economic situation.

Considering the characteristic of the market place and the types of clients, they differed a lot between the four FGDs.
There are few *SUPERMARKETS IN THE CENTER* of Ouagadougou, which provide people with all Western products (i.e. Self Service, Marina Market). The prices for the goods are the same as in Europe and often they are even more expensive. These supermarkets do not sell vegetables in their markets, but have some informal arrangements with market vendors outside. Only a few women may exclusively sell their vegetables directly in front of a supermarket (Personal Information, Ouagadougou, 1999/2000).
Clients are in particular expatriates from Western countries and some African people belonging to one of the highest socio-economic classes in Ouagadougou (KABORE, 1994). In addition, typical clients are the owners of the big hotels in the town, as a market vendor (female, aged 32) put it:

> *"We have regular clients, who are the owners of the hotels."*

Or servants of private households:

> *"There are also the cooks from private households buying here."*
> (female, aged 38, in front of a supermarket in the center)

Moreover the market vendors have clients who are working as wholesalers. They buy vegetables in front of the supermarket and resell these again in the streets of Ouagadougou.
Most of the clients at this market place belong to a higher social-economic class in Ouagadougou. Market vendors in front of the supermarkets have the possibility to take higher prices for their vegetables than in other places of the town. First, their clients are able to pay the higher prices. And second, they are often not informed about the vegetable price situation in town and did not negotiate the prices. This could be one reason, why these market vendors had the highest directly estimated

average monthly income in comparison to the market vendors of the other three FGDs (see Section 9.3.5.).

There are only a few *NIGHT MARKETS* in the central sectors of Ouagadougou such as at Avenue de Gaulle at Sector 4 or near the electricity company 'SONABEL' at Sector 12. All day markets in the different sectors of the town close between six and seven p.m. After this time the only possibility for city-dwellers to buy fresh food is to go to night markets, which are open until 22.00 h. Therefore, the clients regularly come from all over the town and they belong to almost every socio-economic class. According to the market vendors, most of the clients are women on the way home from their work. Or in the words of one market vendor (female, aged 40) there:

> *"The clients come from everywhere in town. If you must prepare food at night, you are forced to come here to buy the needed ingredients."*

A *DAY MARKET* exists in almost all central and peripheral sectors of the town. The women of these markets also have their regular clients. The clients are mostly inhabitants of the sector of the town, where the market place is located. Clients from outside that sector are rarely purchasing there. The income situation for market vendors of this type of market absolutely depends on the socio-economic and financial situation of this special sector. The FGD was held with market women of a day market in the peripheral sector 26 of Ouagadougou. This sector is one of the poorer quarters in town and most of the inhabitants belong to a lower socio-economic class.

In contrast to the three markets mentioned above, the *VENDORS ALONG THE MAIN ROAD* do not have the typical market situation on a market place with regular clients. While driving in and out of the town people will notice the vegetables and fruits at the road side. In general they do not come regularly, because they are living everywhere in, and also out of, town. The market vendors here know little about their clients.
In addition, the daily markets along the main roads out of the town are a special form of selling vegetables. The number of the sales persons is not limited as in the other

markets. On the markets located at defined places in town, the representative for the sector, the market administrator or the women themselves regulate the number of market vendors. Along the main roads, however, there are no regulations and everybody can sell there. According to the women of the FGD, in the last few years a lot of disadvantages came up for the vegetable sellers along a main road. First, the number of women who were selling vegetables increased in the last few years. As a consequence there is now a higher competition with lower profit for everybody. Second, the number of wholesalers who are involved in the purchase of the vegetables also increased in the last few years. Thus, the purchase prices for the vegetables increased more and more. And last, more and more clients were buying the vegetables directly at the home gardener sites hoping to buy them at lower prices there.

Clients' Perception of the Quality of the Vegetables

The outward appearance of vegetables and fruits was of similar importance for all clients at all four market places. According to the market vendors, clients were always interested in buying vegetables and fruits of 'high quality'. High quality here is synonymous for fresh looking, well-washed vegetables. A market vendor (female, aged 30) on a night market explained:

> *"Others* [clients] *ask you, if your goods are fresh and they smell at the vegetables to verify the quality."*

As already discussed in Section 9.3.3. the clean and attractive presentation of the market products convinces the clients to buy them. Another market vendor (female, aged 47) on a day market put it:

> *"Only few* [clients] *ask for the size of production of the vegetables. But especially with green vegetables* [i.e. lettuce, spinach, sorrel] *they are more interested that they look good."*

Moreover, during the rainy season clients examine leafy vegetables very critically. Doing this they want to avoid buying them visibly infested with worms.

As cited above, only very few people ask the market vendors where the vegetables originally came from. And it seems that also the market vendors themselves did not particularly care about the origin of the vegetables they sell. As discussed in Section 9.3.3. most of them were unaware of the production places of their goods. The same could be observed by Cissé (1997) in three different market places in Ouagadougou. The market vendors bought their goods wherever they could get them at acceptable prices.

In the FGDs only the market vendors in front of the supermarket pointed out that they had clients, who would sometimes ask for the origin of the vegetables. Especially when they bought lettuce they were interested in its origin. According to the women in front of the supermarket clients asked them directly if the lettuce was coming from the site near the main hospital of the town (the so-called site of ‘Canal Central’). They maintain that this lettuce would increase the risk for cholera. At this site HGs irrigate the fields with the wastewater directly coming from the nearby hospital.

During the FGDs the market vendors at the night market and in front of the supermarket said they remembered a recently run TV campaign in the state channel of Burkina Faso (Télé Burkina). This campaign explained the risk of eating salad, which was not washed and came from ‘unhealthy’ home gardening sites. Unhealthy home gardening sites were explained as sites where the soil and the irrigation water were contaminated with virus, bacteria and parasites. As a negative example they named the site of ‘Canal Central’, and as a positive example they named the site of Boulmiougou. For the market vendors the questions of the clients were seen as a direct response to this campaign.

However, while buying lettuce at different market places in four sectors of the town, the question about the origin of the lettuce was always answered with ‘Boulmiougou’ (Personal Observation, Ouagadougou, 2000). But it is impossible that Boulmiougou provides the entire town with lettuce (Personal Observation, Ouagadougou, 2000). Therefore, the behavior of the market vendors could also be regarded as a direct response to this campaign.

This confirmed the account of one market vendor (female, aged 30) on a night market:

> *"Once a lady arrived asking me, where my vegetables come from. If they came from the site near the hospital, she would never buy them. Of course I calmed her down!"*

According to all market vendors the few clients who did inquiry were easily convinced of the quality of the vegetables when hearing that they did not come from so-called 'unhealthy' sites.

Regarding the answers in the FGDs it did not seem that the market vendors assumed any responsibility for providing their clients with high nutritional food of low health risk. But the clients, too, did not care about the origin and the quality of the bought vegetables. According to the market vendors it was sufficient for a successful business to buy vegetables at low prices from a wholesaler and to present them so that possible clients would buy them again.
However, few clients already knew about the importance of unpolluted vegetables and the existing differences between the home gardening sites in Ouagadougou. Until now they can still be calmed down by telling them what they wanted to hear. But in the next few years the consciousness of the clients will increase and more clients want to be informed about the origin of the purchased goods, at the same time the consciousness of the market vendors must increase, too. The market vendors should recognize the important role, they play within the urban food chain in providing a big town with the needed nutritional food of low health risk.

9.3.5. Estimated Average Monthly Income Situation of a Market Vendor

Estimated Average Monthly Income of a Market Vendor and their Own Perception

The directly estimated average monthly income of the market vendors differed between the four market places. The women were asked about their highest possible and their lowest possible daily income.

Calculated on the basis of these figures the women *IN FRONT OF A SUPERMARKET* had a directly estimated average income of 93.800 CFAF per month (refer to Figure 9.2.). They estimated the highest possible average monthly income at 125.000 CFAF and the lowest income at 43.800 CFAF. Their average monthly income was the highest directly estimated monthly income of all four market places. In the FGD the market vendors admitted to have an adequate income to cover the daily needs of their family. A market vendor (female, aged 32) in front of a supermarket explained:

> *"We succeed to cover our monthly needs within the income. But this does not mean that we have plenty of money. But, who has enough money?!"*

Altogether, they defined their financial situation as acceptable. In addition, most of their husbands also had an income-generating activity. Many of them are HGs at the site of Boulmiougou. For their estimated average monthly income refer to Chapter 5, Section 5.3.1.1.1.

The women of the *NIGHT MARKET* earned between 18.800 CFAF and 62.500 CFAF a month with an average estimated income of 40.600 CFAF (refer to Figure 9.2.). This directly estimated average monthly income was the second highest in comparison to the other market places of the FGDs. Nevertheless, the market vendors had a negative perception of their financial situation. This perception was different from that of the vendors in front of the supermarket and also of the other two market places. The women at the night market complained that the money earned was not sufficient to cover the daily expenditures of the household. One reason could be that most of their husbands were unemployed and could therefore not contribute to ameliorate the financial situation at home. The women were fully responsible for the household. And a second reason for this negative perception could be that these women had the longest working day of all women of the FGDs. Since the night market closed at 22.00 h they were never at home before half past ten at night and did not see the financial benefit in working so long.

However, none of these market vendors wanted to return to their former activities. As a kind of subsistence business they take the vegetables home, which were not sold during the day. A market vendor (female, aged 30) on a night market explained that:

> *"In comparison to our former activities, the situation today is slightly better. At least we can take the vegetables for our own consumption, this reduces the daily household expenditures."*

The women on a *DAILY MARKET ALONG A MAIN ROAD* out of the town had already a lower directly estimated average income. They earned on the average 28.100 CFAF per month (refer to Figure 9.2.) with a lowest estimation of 12.500 CFAF and a highest estimation of 43.800 CFAF. Despite the disadvantages of the business during the last few years (refer to Section 9.3.4.), the market vendors described their monthly income still as sufficient. According to them, it was enough to cover the basic needs for their families and therefore they did not want to change this activity again. However, the women emphasized the importance to keep the exact amount of their income a secret from their husbands. A strategy, which was also seen in women doing home gardening in Kampala (MAXWELL, 1995). A market vendor (female, aged 38) along a main road explained the situation at home:

> *"We are working seven days out of seven. Only on holidays we have half of the day off. We 'hide-and-seek' with our money in front of our husbands, so that it is enough to cover the basic needs."*

Moreover, the work is very exhausting and time consuming, which is clearly seen in the advice of a market vendor (female, aged 35) to men:

> *"If you have a wife, who wants to sell vegetables, you should make her a child before giving her the permission. If not, she never will have the time for making babies."*

The market vendors of a *DAY MARKET* in a poor, peripheral sector in town had the lowest directly estimated average income of all four market places. They earned between 9.400 CFAF and 18.800 CFAF per month with an average estimated directly income of 13.300 CFAF (refer to Figure 9.2.).

Nevertheless, they said in the FGD that their income was sufficient to cover the daily household expenditures. This was also the main reason for them to give up all their former activities and to sell now mainly vegetables. The profit of their business allows them to have a relatively settled financial situation at home, even when their husbands did not contribute to this. This was vividly described in the following quote of a market vendor (female, aged 50) on a day market:

> *"Yes it's worth while* [to sell vegetables]*, if not I would immediately change my activity. I'm earning more in selling vegetables and I can cover my small needs. I'm married, but my husband is too old, he can't work anymore."*

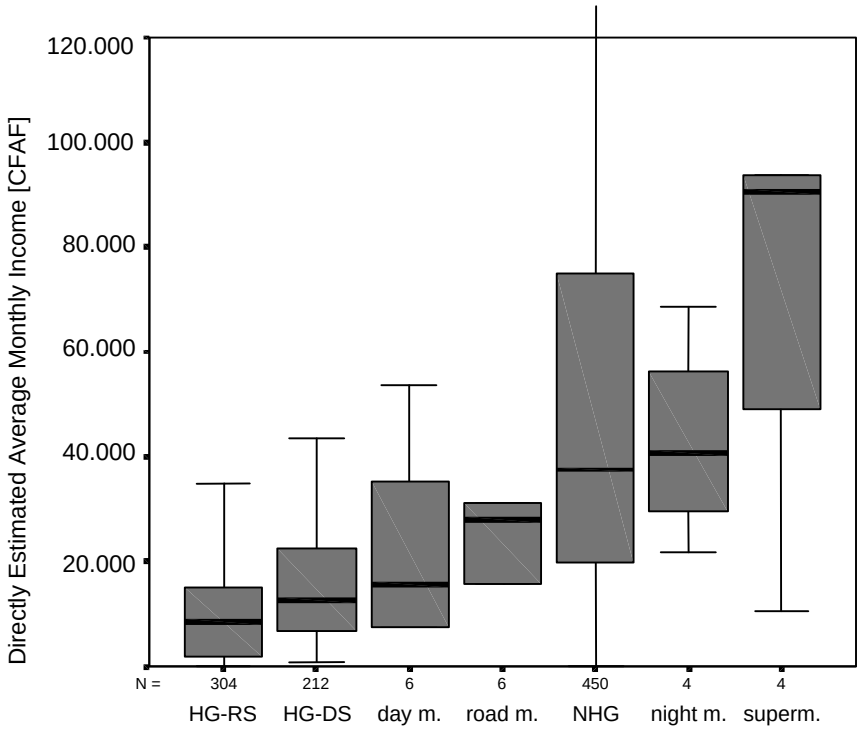
These results indicate clearly that the different estimated monthly income must be seen in relation to the different locations of the markets (see Figure 4.3.), the different characteristic of the market and the clients' profile, which is discussed in Section 9.3.4.

Comparison of the Directly Estimated Average Monthly Income of Market Vendors with those of HGs and NHGs Households

As seen in the previous section, the directly estimated average monthly income of the market vendors was not homogenous and differed from market place to market place. But nevertheless in all four market places the women had a higher directly estimated average monthly income than the interviewed HGs (refer to Figure 9.2.). This result was valid for the dry as well as for the rainy season.

During the dry season the directly estimated average monthly income in HGs households was 12.500 CFAF and during the rainy season it was 8.300 CFAF. When analyzing the directly estimated average monthly income of the interviewed NHGs their income and the income of the market vendors was more or less equivalent (see Figure 9.2.). Taken the dry season and the rainy season together NHGs households earned an average of monthly 37.500 CFAF (see Chapter 5).

Figure 9.2. Difference of the directly estimated average monthly income in home gardeners' households during the dry season (HG-DS), in home gardeners' households during the rainy season (HG-RS), of market vendors on a day market (day m.), of market vendors on a daily market along a main road (road m.), in non-home gardeners' (NHG) households in the dry and rainy seasons, of market vendors on a night market (night m.) and in front of a supermarket in the center of the town (superm.) in Ouagadougou



Boxplot showing the median as cross-section line, the box represents the 50% distribution of the costs with Q_{25} and Q_{75} as limits, the external limits show Q_5 and Q_{95}

In conclusion, in all four market places of the town the market vendors earned more than the HGs who provide them with the needed vegetables. Market vendors and NHGs households had a comparable monthly estimated income.

With the exception of the market vendors on the night market the women on the other markets had all a positive estimation of their income, which helped them to cover their basic needs. This positive assessment of the situation speaks for the validity of the estimated amount. The results may lead to the assumption that being the first link of the urban food chain was less profitable than being one of the last links. The assumption that being a market vendor is an activity known for the low income possibilities and therefore chosen mainly by women (PAULAIS & WILHELM,

2000) could not be confirmed with the FGDs. The market women had a higher income than the HGs households and were, in general, content with their financial situation.

Two income cut-points are commonly used to calculate poverty lines (WORLD BANK, 2000 / see Chapter 1, Section 1.1.2.). People who have to live on less than US $1 per day are defined as ‘extremely poor’ and those who have to live on less than US $2 per day are defined as ‘poor’ (in 1999 the exchange rate was 600 CFAF = US $1). According to the study HGs households were falling in the category of being extremely poor. They earned an average of US $0.6 a day. The market vendors as well as the NHGs households were falling into the next following class with a daily income of either US $1.7 and $2.1.

9.3.6. Short Chronology of a Typical Day in the Life of a Market Vendor- 4 Different Cases

CASE 1

Market Vendor in Front of a Supermarket in the Center- a Typical Day in the Life of Georgette Z.

Georgette Z. is 33 years old and belongs to the ethnic group of the Mossi (see Photo 34 and 35). She attended primary school and is able to read and write, which is still an exception among market vendors and especially women. She is married and has three children, all of them are attending school. Together with her husband she lives in the sector 17, which is one of the peripheral sectors of the town. Although her husband also works, he does no contribute to the monthly income of the household. Only her income covers the daily basic needs. Her house is fully cemented and contains electricity. The family is owner of a radio and a TV. As means of transportation, she uses her motorcycle. Since her parents already sold vegetables and fruits, she started selling vegetables when she was very young. Today she sells vegetables in front of a big supermarket in the center of the town.

Her working day begins between four and five o’clock in the morning. Because their older children or a maid run the household, she must not look after that. Immediately after getting up she leaves the house and buys the vegetables of the day. Depending

on the season there are several possibilities to do the purchases. She buys most of the vegetables directly on the home gardening site of Boulmiougou. Only in the beginning of the dry season, when the home gardening sites have plenty of vegetables, the HGs come to her market stand and sell the products. Together with the women in front of the supermarket Georgette has the monopoly of apples in Ouagadougou. Apples are always imported from Côte d'Ivoire or in the dry season via Côte d'Ivoire from France. She and her colleagues are regularly sending their older children to Côte d'Ivoire.

Between 6.00 h and 6.30 h she arrives at her sales stand. In the beginning of her work, her husband was suspicious and went with her to the market to supervise her activities. In the course of time it was getting too tiring for him and now she is allowed to work on her own. Six out of seven days she stays until the supermarket and all the other shops in the surroundings close in the evening, which is normally around eight o'clock in the evening. Often she is waiting until the last train at the nearby train station arrives and brings further clients or she is discussing their daily problems with other women of the market. Around nine o'clock she is back at home after 17 hours of working. At four o'clock a new working day will start again.

CASE 2

Market Vendor on a Big Night Market in a Central Sector of the Town- a Typical Day in the Life of Fatoumata O.

Fatoumata O. is 35 years old, illiterate and belongs to the ethnic group of the Mossi. She is married and has five children. Two of these are going to school. Together with her husband she lives in the same central sector, where the night market is located. Her husband worked as a tailor, but over the years his dresses went out of fashion and he lost his clients. Today, she is the only financial supporter of the family. Her house is a mix between adobes and cement and has no electricity. The family owns a battery-operated radio. A motorcycle helps her to reach the different working and selling places. After a short period of selling cookies, she has already been selling vegetables on the night market for the last 12 years.

At four a.m. she gets up and leaves the house immediately to buy the vegetables for the day. Before seven a.m. she finishes buying her vegetables at wholesalers on different central markets. Between 7.00 and 11.00 h she sells these vegetables in the streets and on a small day market in her sector. Around eleven a.m. she is back at home. Now she does all her daily home work: cooking for the family, cleaning the house and the courtyard, washing dishes and doing the laundry. Before three p.m. she is washing and preparing the vegetables of the morning and goes to her market place at the night market.

Every day of the week she stays there until 22.00 h. When she returns home at about half past ten, she prepares the food for the next morning before she goes to bed after having worked for 19 hours.

CASE 3

Market Vendor on a Daily Market Along a Main Road out of Ouagadougou- a Typical Day in the Life of Alizeta G.

Alizeta G., 35, belongs to the ethnic group of the Mossi and lives with her husband and her five children in a peripheral sector of the town. She never went to school and is unable to read and write, but she is sending two of their five children to school. With only her income she covers all the monthly expenditures of the family. Her husband has sometimes part-time jobs. But his money does not contribute to the household income. She is always afraid that her income is not sufficient for all the necessary household expenditures. Therefore, she hides her financial situation from her husband. She does not want to support him with her money. The family lives in a house constructed with adobes and without electricity. They have only a battery-operated radio, but a lot of her colleagues on the market have a TV, too. As means of transportation, she uses her motorcycle. For more than 20 years she has been selling her vegetables along the main road out of Ouagadougou going to Kaya. Earlier, when she was still a child, she sold peanuts and sweets as a street vendor.

Her working day begins at three o’clock in the morning. She washes herself and heats up the food for her children, which is left over from the day before. Then she leaves the house to buy the needed merchandise. She goes to the big central markets at the border of the town, where the wholesalers are selling the vegetables.

It is not possible for her to buy the vegetables directly at the home gardener sites. The HGs have exclusive clients and refuse to sell her their products.
No later than half past six she arrives at her selling place along the road. Until the evening she sells vegetables. For six and a half days a week she is there. On Friday, the Moslem holiday, she takes a half day off for praying.
Between half past six and seven she arrives at home. At first, she prepares food for her family. Then she starts doing the laundry, cleaning the house, doing all the necessary housework. As soon as she finishes the housework, she goes to bed. This is between nine and eleven o'clock, depending on the remaining housework. She is too tired to watch TV at the neighbor's house or to talk with her husband after 18 hours of work.

CASE 4

Market Vendor on a Day Market in a Peripheral Sector of the Town- a Typical Day in the Life of Asseta G.

Asseta G. is 50 years old and never had the possibility of attending school to learn reading and writing like some younger colleagues of hers on the market (see Photo 32 and 33). As most of Ouagadougou's population, she also belongs to the ethnic group of the Mossi. Together with her husband and only one child she lives in the same peripheral sector of the town where her market stand is located. Her house is made of adobes and has no electricity. The family owns a battery-operated radio. She has no means of transportation, neither a motorcycle nor a bicycle and has always to walk. For 15 years she has been selling vegetables, before that she sold prepared food. Although a lot of her colleagues of the market are cultivating cereals or breeding animals such as pigs or chicken, she has no further activity. Since her husband is too old to work anymore, she is fully responsible for the financial situation of the family.
Between four and five o'clock in the morning she gets up and leaves the house to buy the needed vegetables. Because she has no means of transport she depends on wholesalers and HGs who visit her on her market place. Sometimes she also walks to a central market, which is relatively close to her selling place.

Between 6.30 h and 7.00 h she arrives at the market stand. The day market closes at 17.00 h and she goes back home. With all the other market women she is selling vegetables at the market for seven days a week. Only few women take the Sunday off to go to church.

In the evening at home she prepares food for the family and is doing all the usual housework. Each day she works about 15 hours. Sometimes she has the time to watch TV at a neighbor’s house.

Photo 32: Asseta G.–market vendor on a day market, Ouagadougou, 1999

Photo 33: One of her colleagues on the same day market, Ouagadougou, 1999

Photo 34: Georgetta Z.–market vendor in front of a supermarket, Ouagadougou, 2000

Photo 35: One of her colleagues in front of a supermarket, Ouagadougou, 2000

9.4. Summary and Conclusion

The urban food chain consists of three functional components: the urban dweller, who consumes the food; the home gardener or farmer, who grows the food on the fields; and the market vendor, who buys the food and resells it again (refer to Figure 9.1.). Behind these three functional components of the urban food chain, however, there is a very complex system. Especially in Africa it can neither easily nor directly be understood.

The aim of the study was to gain a better understanding of the urban food providing system with a focus on market vendors. One focus of the study was the perception of health risk in selling vegetables. Four FGDs were held with market vendors representing the typical forms of vegetable sales in Ouagadougou, but also in other West Africa towns (ZDUNNEK, 1987).

The results of the study show that market vendors were a very homogenous group of people in respect to sex, age, education and living conditions.

Reasons to become a market vendor were economic reasons linked with the socio-cultural environment of West Africa. The market vendors of the FGDs started selling vegetables because their mothers did it already or they started first selling prepared food. After some time, having become more experienced in the business, they could open a fixed market stand on a market place. Again they started selling a small quantity of goods and finally, when the activity went successfully, they could increase the quantity and diversity of the vegetables and fruits sold.

Selling food, prepared and unprepared, is a very common activity for women in African countries and the business is often given from mothers to daughters. Market women are highly engaged in the informal sector and represent the majority of the working population in the sector of trade and services (KABORE, 1994). Already in 1989, women stood for two thirds of the persons engaged in the informal sector and 67% of them worked in trade (CHARMES, 1989). Today 90% of the market vendors selling food in Ouagadougou are women (INSD, 1998).

Furthermore, the women of the FGDs had to start with an income-generating activity because there was not enough money at home to cover the monthly household’s expenditures. Their husbands were unemployed, too old to work, had only part-time

jobs or did not contribute to the household's expenditures with their money. With increased economic hardship and a decline of poor men's traditional livelihood strategies, more poor women have had to make their way into the informal economy (NARAYAN et al., 2000b). Women have assumed the role of breadwinner in many households.

The quantity, the quality and the diversity of the vegetables and fruits sold depend mainly on the two different seasons in Burkina Faso and in all other countries of the Sub-Saharan region. During the rainy season there is an oversupply of vegetables in town and the prices for them are low. During, and especially at the end of the dry season there is a shortage of vegetables in the town and in the country. They have to be imported from countries with coastal access and, thus, other climate conditions than in the Sub-Saharan region, or even from Europe. The prices for them increase.

Contrary to expectations, most of the market vendors do not get their needed vegetables directly from the home gardening sites. According to the market vendors home gardeners (HGs) do not sell their products directly to them. They have some informal arrangements with wholesalers and sell exclusively to them. Therefore the women must also buy the vegetables via a wholesaler. They are coming directly to the market places or, more common, the women are going to the big central markets. According to the market vendors, in the last few years the number of wholesalers has increased. And with each wholesaler the selling price for the vegetables increases, too.

This entails several disadvantages for the market vendors and, as a consequence, also for the clients. These disadvantages arise not only in Ouagadougou, but also in all other towns in West Africa where the same market system dominates.

The market vendors can not adapt the selection of the vegetables to the needs of the consumer. Instead, they depend on the daily offer of the wholesalers and can not differ from the selection of other market vendors to attract further clients. It is a common picture of African markets that a lot of market vendors all sell the same selection of vegetables.

But clients also have no other choice than to buy the available vegetables of the day at the prices demanded. Especially at the end of the dry season the products become very expensive. People of lower socio-economic classes can not afford to buy the high-priced vegetables.
The vegetables passed several wholesalers until they reached the consumer. Each of them made some profit in reselling them again, and especially in periods of food shortage the vegetables reach very high prices; a fact that contributes to the high food insecurity prevailing mainly in Sub-Saharan countries (COURADE, 2000 / see Chapter 1, Section 1.2.3.1.).

Considering food insecurity it must be pointed out that there are no storage facilities on the market places. Without a cool storage possibility traditional leafy vegetables can only be conserved for several hours. European vegetables look fresh for a longer time, but can not be stocked for more than 24 hours (Market Vendors, Personal Information in FGDs, Ouagadougou, 1999/2000). This again minimizes the vegetable selection for the clients, but maximizes also the selling risk for the market vendors. The vegetables must be sold on the same day. If not, the market vendors must throw them away or use them to nourish their own family, a practice, which always reduces the margin of profit of the day.

As the market vendors purchase via wholesalers they do not know anything about the origin of the vegetables. It is a fact, however, that due to different water sources for irrigation and different qualities of the soil (CISSE, 1997; BOSSHART, 1998; NIANG, 1998) the different home gardening sites in Ouagadougou have different levels of contamination. This, as a consequence, could increase the health risk of people eating vegetables from more polluted sites. Moreover, the link between environmental factors, hygiene practices and an incidence of diarrhea and parasitic infections has already be seen in several studies (BUKENYA & NWOKOLO, 1991; TRAORE et al., 1994; CURTIS et al., 1995). A contamination of the environment, water, hands and fingers dirty with human feces, creates best conditions for a high transmission of diarrhea and gastro-intestinal diseases (HUTTLY, 1990). Nevertheless, with a small exception in one FGD the market vendors did not show any consciousness in this respect. A health risk perception in their selling behavior was not found. This could clearly be seen in their unawareness of the size of

production of the vegetables and the matter of presentation, which was nice looking but disregarding any hygienic aspects. The behavior of the market vendors could directly be linked with the clients' behavior. Still today most of the clients have only been interested in buying fresh-looking, well washed vegetables. Only a few clients asked the market vendors about the origin of the products.

A different behavior was observed in the FGDs with the women in front of the supermarket. First, they provide themselves directly from the site of Boulmiougou and do not need a wholesaler to get the needed vegetables. This could be one reason that these women had the highest directly estimated average monthly income in comparison to the other market vendors in town.
Second, owing to the direct purchase they know about the origin of most of their vegetables and they have already a certain consciousness of the importance of selling vegetables coming from unpolluted sites. Boulmiougou is known for its high quality of vegetables, because the site is irrigated with water from the nearby water reservoir, which did not pass the town before use (TRAORE, 1999). The behavior of these market vendors could be also directly linked with the type of clients purchasing the vegetables in front of the supermarket. Coming from higher socio-economic classes, they were probably more sensitive about nutritional food of low health risk and their clients could have already had more knowledge about the importance of buying non-contaminated vegetables in order to stay healthy after the consumption. A recent education campaign in the TV also contributed to this knowledge.

These results may lead to the hypothesis that in the next few years more and more clients will develop a consciousness of nutritional food with low health risk and of the importance of knowing about the origin of the vegetables. As a consequence, they would buy the products from market vendors who could guarantee them the quality of the goods. If a guaranty could not be given, the clients would purchase directly on the home gardeners' sites or change the market vendor. A lot of women may then loose parts of their business.
Further research is needed in order to clarify the two hypotheses that first people of higher socio-economic classes already have a greater consciousness of food, which causes a lower health risk and second that the number of clients with this consciousness will increase in the next few years. Moreover, it is important to know

more about the purchase practices of clients and market vendors and their perception of a related health risk in doing this. A useful approach would be a retrospective and a prospective cohort study with a defined questionnaire about hygiene behaviors. The questionnaire should be complemented with personal, structured observations of the households and market places. Especially in studies of hygiene practices there should be a particular emphasis on observation techniques. In another study on this subject poor agreement between questionnaire response and observations was found, which gives evidence of overreporting of 'good' behaviors (CURTIS et al., 1993).
For the retrospective cohort study non-home gardeners (NHGs) of different socio-economic classes should be interviewed again. As discussed in Chapter 8, 600 NHGs have already been classified according their socio-economic status. These represent consumers, and therefore clients, on the different markets, and their consciousness of the origin of food should be worked out. Moreover, in a prospective cohort study, market vendors in several markets located in the central and peripheral sectors of the town should be interviewed about their purchase behavior.

The aim of the FGDs was to gain a better understanding of the role of market vendors within the urban food chain. As the urban food chain is a very complex system, it was only possible to give a rough outline of this subject. However, only a better understanding of the urban food chain and the coordination and cooperation of the different parts will provide city-dwellers regularly with high nutritional food of low health risk at affordable prices. Market information helps producers, traders and consumers to balance supply and demand in the marketing system. This avoids surplus and deficits in supply and corresponding price fluctuations. Food supply would then be guaranteed also in times when food production is reduced in town due to the lack of water to irrigate the sites in the dry season.

The results of the study show that market vendors and HGs are faced with a lot of similar problems because they are all involved in the purchase of vegetables. Problems can arise for both components of the food chain since the clients' demand of vegetables remains an unknown factor. The same can be said for the different price structure and availability of the vegetables sold and the different quality. In addition, problems arise because neither the HGs nor the market vendors are unified

in a powerful association in order to achieve more economic power as an important part of the urban economy.

Knowing the above mentioned results two main interventions seem to be appropriate: consensus meetings between HGs and market vendors and ‘information education-communication’ campaigns in order to achieve an official acceptance of both working groups in town. In order to make such interventions effective, the ‘participatory action research’ approach should always be taken into account (TANNER et al., 1999). A successful translation of the interventions can only be guaranteed with the participation of the people involved (see Chapter 5, Section 5.4.).

Until the present day, HGs do not have standard prices for any type of vegetables. Furthermore, they have no knowledge about the prices for the vegetables of other HGs at their sites or at other sites of the town. Thus they must accept the offered prices of any sales person in town. The wholesaler therefore forces them into a very weak selling position (ADAMA et al., 1997).

In consensus meetings mutual agreements between market vendors and HGs could be worked out. The markets and the home gardening sites should be located in the same sector. The focal point of these meetings should be to get to know each other better and to discuss the problems of being a member of the urban food chain. The aim of these meetings should be to find some sort of agreement to work together more closely and to found associations where HGs and market vendors are organized. There would be advantages for the market vendors as well as for the HGs. The market vendors would know where their vegetables originally come from and they could buy them at lower prices as there are no wholesalers in between. The HGs could sell the vegetables at higher prices than to a wholesaler and would further gain more knowledge about the current demand of vegetables in town due to the closer contact to the market vendors. Furthermore, as members of one association they would both be more powerful in order to achieve being accepted as economic activity in town.

These meetings could be combined with training to develop a responsibility in HGs and market vendors for providing the city-dwellers with high nutritional food of low health risk and to teach them how to achieve this. Positive examples of an existing

responsibility not to contaminate food could be noted in FGDs with vendors of prepared food such as mixed salads. They were aware of their risk to contaminate the vegetables during preparation. They therefore emphasized that they disinfect the vegetables and the place of preparation (CISSE & NANA, 1994).

Still today home gardening and vegetable sale belong to the informal sector. Information-education-communication campaigns about the importance of the urban food chain should be started in order to achieve an official acceptance of both working groups in town. A governmental support of this sector would stabilize the food security in the fast growing towns. Positive examples are already seen in Namibia and Côte d'Ivoire. In Namibia municipalities set up small market malls for small, individual traders. Sellers pay for electricity and space, but are not taxed. Health inspectors visit the markets to ensure they are clean and well maintained. The market now accommodates only traders, so that farmers could bring their produce directly there (HARRISON, 2000). At Côte d'Ivoire a national network has just been instituted, with the goal of building 14 wholesalers markets and 30 collection centers (HARRISON, 2000).

PART IV GENERAL DISCUSSION AND CONCLUSION

Photo 36: Dolo brewery in a small village in the South of Ouagadougou, 1999

10. General Discussion and Conclusion

Urban agriculture is practiced by approximately one billion people worldwide. It exists in almost every country in the world and is practice is currently increasing in towns of the Sub-Saharan region (SMIT et al., 1996). Urban agriculture constitutes a very complex system consisting of many factors. The main factors are the quality, sources and quantity of water for irrigation, the quality and quantity of the soil, the variation of vegetables, economy and trade possibilities and seasonal variations for each of these factors. All these factors are difficult to influence from the outside, but they all influence each other in different ways (refer to Figure 1.3.).

The aim of this study was to evaluate the economic costs and impact of home gardening in different home gardening sites in Ouagadougou, Burkina Faso's capital. A possible link between the economic status and the health status of households engaged in home gardening (HGs households) compared with households involved in an activity other than home gardening (NHGs households) was to be identified.

In the following sections the main results of the study will be discussed. They will then be analyzed in the context of benefits and risks related to urban agriculture. These benefits and risks are complements of a SWOT analysis shown in Figure 1.4. Finally an outlook for further research and intervention possibilities will be given.

10.1. Main Results

Average Monthly Income and Expenditures Coverage Rates in HGs and NHGs Households

Both in the dry and in the rainy season HGs households had lower estimated average monthly incomes than their counterparts practicing an activity other than home gardening. On average, only nine percent of the NHGs households earned less than the average estimated monthly income of HGs households.

In addition to the generally lower income level, a different seasonal pattern could also be seen in the average monthly estimated income in HGs households. In all three sites the average monthly income in HGs households was higher in the dry than in the rainy season.

As the amount of income was related to seasonal variations, it seemed to be very difficult for the interviewed HGs to estimate the available monthly income in their households. In an indirectly estimated income approach calculated on the basis of the prices obtained for the vegetables sold, the HGs income was higher than the directly estimated one in all three sites. Aside from the income differences between the directly and indirectly estimated monthly income approaches, there was also a difference in HGs income in the three examined sites. In both approaches Boulmiougou was the site with the highest average monthly income and Kossodo was the site with the lowest average monthly income in HGs households (see Chapter 5).

When analyzing the relationship between monthly income and monthly predictable expenditures for food, fuel for cooking, water and energy, the expenditures coverage rate differed immensely between HGs and NHGs households in the dry as well as in the rainy season. In all three sites the HGs households were not able to cover their monthly expenditures with their estimated income, but the NHGs households always had a surplus.

In addition, the HGs households of the three sites have to be considered separately. Many external factors influenced the urban agriculture system. Some of these external factors differed in each of the three sites. These were mainly the quality and the source of the water for irrigation, the quality of the soil, and the variation of vegetables. The HGs households of Ouagadougou were therefore not a homogenous group and their households' expenditures coverage rate differed from site to site. Boulmiougou was the site with the best external conditions for practicing home gardening in comparison with the other two sites (see Chapter 6, Section 6.3.2.3.3.2.).

Although the HGs households in Boulmiougou had the highest monthly expenditures of all interviewed HGs households, they also had the highest average monthly income and the highest expenditures coverage rate. In contrast, Kossodo had very bad external conditions for home gardening and also the lowest expenditures coverage rate (refer to Chapter 7, Section 7.3.8.).

Average Monthly Predictable Expenditures in HGs and NHGs Households

More than 50% of the average monthly predictable costs, or half of the household expenditures, were spent to obtain food in all households of the study population in the dry as well as in the rainy season.

In addition to the high expenditures for food, seasonal variations in the food costs could also be clearly seen in HGs households in each of the three sites. In the rainy season the HGs households had significantly lower expenditures for food than the NHGs households. In the rainy season all HGs households could obtain most of their needed food through subsistence production of both vegetables and cereals. Cereals are exclusively cultivated in the rainy season. The production of vegetables is at its peak after the rainy season in the months of December to February. Almost 80% of the HGs households cultivated their own cereals such as millet, maize and, less frequently, rice. A new aspect of the study was that NHGs also cultivated cereals during the rainy season.

In the dry season HGs households had significantly higher expenditures for food than in the rainy season. HGs and NHGs households had the same expenditures for food in the dry season. In the dry season the subsistence production of vegetables is reduced to a very low level and has to stop totally at the end of this season, as there is no more water to irrigate the fields. In Ouagadougou and in all towns of the Sub-Saharan region, rainwater runs short in the dry season and is no longer available at the end of the dry season. There are not enough water reservoirs available in town to collect all the rainwater during the rainy season. In addition, the water reservoirs are not protected from the sun and therefore a lot of the collected rainwater evaporates in the hot, dry season.

Like the NHGs households, the HGs households now also have to buy their food at the local markets. In addition, the vegetables and cereals at the local markets are the most expensive in the dry season. The so-called European vegetables, which were first brought to Africa by the European colonial powers, cost one to four times more in the dry season than in the rainy season. The traditional vegetables, which were planted originally in Sub-Saharan Africa, are also slightly higher priced during this season. Cereals also cost 10-25% more in the dry than in the rainy season (Personal Information, Ouagadougou, 1999; average price estimation of 100 different households, Ouagadougou, 2000).

To summarize, the predictable monthly expenditures in HGs households almost doubled in the dry season because of the higher food costs in this season. All other monthly predictable costs (for drinking water, fuel for cooking and energy) were not different between the two seasons. In contrast to the HGs households, the examined NHGs households showed no seasonal pattern in their average monthly predictable costs (see Chapter 6).

Education

In this study less than one quarter of the interviewed HGs were able to read and write, but half of the interviewed NHGs were able. In Ouagadougou home gardening can also be seen as an activity for the part of the urban population that has fewer skills and a limited education. In many countries schooling has been found to promote management practices and increase productivity (LOCKHEED et al., 1989). It may also help people to find better employment outside of the informal sector. Women in particular, with higher education tend to place more value on their children's education (AINSWORTH, 1994). This can result in inter-generational improvement of the living situation through children's education. The primacy of the income/expenditure definition of poverty has changed to a definition of poverty based on the capacity of the poor to improve their living conditions and to consider health and education as important as income (SEN, 1998).

This can clearly be seen in the poverty definition given by a worker (male, aged 33, socio-economic class 3) in Tanghin, Ouagadougou, 2000:

> *"Poverty for me is the lack of potential and capacity to improve my current life."*

Current works on poverty and the (re-)definition of poverty show the importance of education as a dimension of poverty (WORLD BANK, 2000/01).

Another worker (male, aged 32, socio-economic class 3) in Kossodo, Ouagadougou (2000) explained his view of poverty:

> *“For me being poor is the same as the inability to have enough food, to take care of myself and my family and to send my children to school.”*

In Chapter 7, Section 7.3.7. and Chapter 8, Section 8.3.3. more information on the illiteracy rate and the education level in HGs and NHGs households is found.

Health Status in HGs and NHGs Households

All the external factors such as water sources, quantity and quality of the soil, and variation of vegetables were different in each of the three sites and might, thus, have different influences on the health status of HGs working on the fields. All sites take their water for irrigation from the nearby drains, water reservoirs, or open waste-water channels and wells, which are all polluted with virus, bacteria, parasites and chemicals (CISSE, 1997; BOSSHART, 1998). However, the water taken from the water reservoirs seems to be less polluted than the water taken from wells (CISSE, 1997). This is the situation in Boulmiougou, where HGs use the relatively clean water from the nearby water reservoir. (CISSE, 1997; BOSSHART, 1998). In addition, the water for irrigation did not run through the town before being used.

In contrast, the HGs in Kossodo did not have access to clean water. The water there was highly polluted with wastewater and chemicals from the nearby tannery, the slaughterhouse, and the brewery (CISSE, 1997; BOSSHART, 1998). Kossodo therefore seems to be the most polluted of the three sites examined. A HG in Kossodo (female, aged 35) explained the situation at her home gardening site:

> *"Our problems are not equivalent to other sites. On other sites they depend on the quantity of water, however we depend on the wastewater from industry."*

The interviewees were asked about their own perception of the most recent illnesses that occurred in their households. Although the different home gardening sites in Ouagadougou have different degrees of contaminated water, the HGs households of the different sites did not have higher frequencies of illness than NHGs households of the same site. In all three sites, in HGs and NHGs households and in the rainy as well as in the dry season malaria, gastro-intestinal diseases including diarrhea, and respiratory diseases were most often named as the most recent illness. Furthermore, the average number of days of illness was equivalent in HGs and NHGs households. In the whole study population children had the highest frequency of illness in a household (see Chapter 6, Section 6.3.2.3.f.).
The study population was categorized into different socio-economic classes according to the following socio-economic indicators: the level of lodging, electrical appliances and means of transportation. NHGs households had a significantly higher socio-economic status than HGs households. However, no correlation was seen between the health status of a population group and their socio-economic status. No socio-economic class had a remarkably different illness pattern than any other class, and HGs and NHGs households had similar illness patterns (see Chapter 8).

The monthly expenditures for medical care did not differ between HGs and NHGs households. In all households the costs for health care were very low in comparison to the other predictable monthly costs (i.e. food, fuel for cooking, water). Nevertheless, seasonal variations could be observed: the expenditures for medical care were higher in the dry season than in the rainy season. A possible explanation, at least for HGs households, could be the higher monthly income in the dry season. In addition, the study population reported more episodes of illness in the dry than in the rainy season.

One issue concerning the health status of the study population remains to be discussed: the total unawareness of the health risk related to eating contaminated vegetables or irrigating the fields with polluted water.

A HG (male, aged over 50) in a focus group discussion (FGD) held in Tanghin explained (CISSE, 1997):

> *"You can use the water of the hand-dug well to irrigate the fields as well as for drinking. You don't need to treat it before. Always when we see some microbes in the water, we treat them with peanut oil in very small amounts."*

This unawareness could be observed in the case of HGs and of market vendors and their clients, the city-dwellers. In FGDs, market vendors admitted to have no knowledge about the production location of the vegetables they purchased. The vegetables were sold via wholesalers and the most important issue was a cheap purchase price. But the market vendors explained also that clients were not very concerned with the nutritional value or health risk of their food. An attractive presentation of the goods and cheap purchase prices were still the main arguments for selling the vegetables (see Chapter 9).

In summarizing this section, the expenditures coverage rate was lower in HGs than in NHGs households. Seasonal variations in income and expenditures were seen in HGs households, but not in NHGs households. The NHGs households belonged to higher socio-economic classes than the HGs households.

Furthermore, the HGs households can not be regarded as a homogenous group. The expenditures coverage rate in HGs households was related to the external factors of the respective site, which differed mainly in regard to the water sources, the quality of the water and the soil, and the variation of vegetables.

However, the differences in the socio-economic status and the income and expenditures pattern between HGs and NHGs households within the sites and among HGs households across the sites did not influence the health status of the study population. The entire study population experienced the same frequency of illnesses. This could be observed for HGs and NHGs households, in different socio-economic classes and in the dry as well as in the rainy season.

10.2. Urban Agriculture in Ouagadougou: Benefits and Risks

The results of the study carried out in Ouagadougou must be analyzed in the context of the known benefits and risks of urban agriculture in general. Urban agriculture is a very complex system, which consists of many different factors and therefore must be analyzed taking many different aspects and views into account. It may provide many benefits and advantages for one group involved in this system, but at the same time it can generate risks and disadvantages for the same group or another group (see Chapter 1, Section 1.2.3.f.).

Today in the expanding literature on urban agriculture, two main benefits of urban agriculture are seen. Urban agriculture is an important factor for the economy of a household, as it is a *CASH-PROVIDING ACTIVITY* used to cover basic needs and essential commodities (VASEY, 1990; SMIT & NASR, 1992; ILEIA, 1994; DRESCHER, 1996a; SMIT et al., 1996; RABINOVITCH & SCHMETZER, 1997). In addition, urban agriculture contributes to the achievement of food security through *SUBSISTENCE PRODUCTION* (SMIT & NASR, 1992; SMIT et al., 1996; BROWN & JAMETON, 2000 / refer to Chapter 1, Section 1.2.3.1.).

Despite the given benefits, urban agriculture can also create risks, mainly for people who are engaged in home gardening but also for residents who consume vegetables from the home gardening sites. Some of the major risks of urban agriculture are related to *HEALTH* (FEACHEM et al., 1983; MARA & CAIRNCROSS, 1991; CAIRNCROSS & FEACHEM, 1993; CISSE, 1997; BOSSHART, 1998; BLUMENTHAL et al., 2000), *SEASONALITY* (CHAMBERS et al., 1981; SAUERBORN et al., 1995; SMIT et al., 1996) and a *LACK OF LEGISLATION* (GOLHOR, 1995; MAXWELL, 1995; NUGENT, 1997 / see Chapter 1, Section 1.2.3.2.).

Food Security of Urban Agriculture?

FOOD SECURITY is obtained when people have physical and economic access to obtain adequate food supplies for their nutritional needs at all times (i.e. MOUGEOT, 1994; DEZA, 1999; IPTRID, 1999; FAO, 2000; COURADE, 2000). The ‘access’ can be understood in two ways: the household income is high enough to buy the food

needed each day, and/or the subsistence production of the vegetables and cereals in a household is high enough to meet the daily food demand. Food security as one of the benefits of urban agriculture is described in Chapter 1, Section 1.2.3.1.
In the study HGs and NHGs households of different socio-economic status were asked to define poverty. It can be demonstrated that poverty was closely related to the absence of food or the inability to obtain enough food. Two quotes are cited here as examples (for all definitions of poverty refer to Appendix IX):

> *"You are poor if you don't have at least enough money for food."*
> HG (male, aged 47, socio-economic class 1/2) living with his two wives, his eight children, his mother and three cousins in the same courtyard in Boulmiougou, Ouagadougou, 2000

> *"Poverty is the absence of food, shelter and medicine."*
> HG (female, aged 53, socio-economic class 1/2) in Tanghin, Ouagadougou, 2000

In the whole study population, which is a representative group of the urban population of Ouagadougou, the main burden for all households was paying for food. These costs were so high that they might contribute to food insecurity in times of income variations or fluctuations.

Food Security linked to Seasonality?

One of the above-mentioned risk factors mainly for people involved in urban agriculture is the related *SEASONALITY* of this activity (refer to Chapter 1, Section 1.2.3.2.).
Considering the results of this study and the complementary study carried out after the dry season, the benefit of food security in practicing home gardening must estimated taking the type of season into consideration. In the rainy season food security for the town was provided by home gardening. HGs could reduce their expenditures for food by *SUBSISTENCE PRODUCTION.* In the rainy season HGs households spent almost half of the amount that they spent in the dry season.

Control over food production at the household level provided HGs households with more food security, as these words of one HG (male) in Tanghin clearly showed:

> *"Home gardening helps me to cover some basic needs, but moreover our whole family can be provided with the vegetables of our fields."*

In the rainy season subsistence production reduced the high expenditures for food in HGs households. This could be seen equally in all three sites, despite the fact that the three sites had different levels of subsistence production. At least for half of the year home gardening offered HGs households an opportunity to shift household expenditures toward other needs, such as health care and better living conditions. Moreover, it might contribute to savings at the household level.
In addition, city-dwellers that did not practice home gardening had lower expenditures for food in the rainy season. In this season there is a sufficient selection of locally produced vegetables in town, which can be purchased at affordable prices.
In the dry season, however, the benefit of food security disappeared in the same way, as home gardening had to stop because of the scarcity of water to irrigate the fields.

The results of this study confirmed the view expressed in relevant literature that urban agriculture provides for food security in the population of a town (RABINOVITCH & SCHMETZER, 1997; MOUGEOT, 1999; QUON, 1999; BRIAND, 2000; OULD ISSELMOU, 2000). However, it was also clear that this advantage must be regarded with reservation because food security is related to seasonal variations. Especially it is related to water scarcity at the end of the dry season. The climatic conditions are one of the external factors that can be observed equally in all countries of the Sub-Saharan region. All Sub-Saharan towns where home gardening is practiced are subjected to the same climatic conditions. Therefore, the results of this study that are linked to seasonality can also be applied to other countries in this region.
In Sub-Saharan countries, rural-urban migration and the subsequent increase in urban poverty are current problems. As a consequence, malnutrition and the number of undernourished people are increasing in urban settings (i.e. WRATTEN, 1995b; BIRLEY & LOCK, 1998). As HGs belong to the lower socio-economic classes, urban

agriculture helps them, at least for half of the year, to improve the quantity, quality and type of food without spending too much money. Not only for the HGs, but also for city-dwellers and especially the urban poor, urban agriculture has the capacity to assure some food security.

Urban Agriculture, a Cash-Providing Activity?

In addition to providing food security, urban agriculture is a *CASH-PROVIDING ACTIVITY,* especially for people with few skills and limited education (HELMORE & RATTA, 1995; SMIT et al., 1996 / see Chapter 1, Section 1.2.3.1.).
From poverty definitions in other studies (NARAYAN et al., 2000a), it was foreseen for this study that poverty would be closely related to lack of money. Two quotes from the study population are cited here as examples:

> *"Poverty is if you don't have money."*
> HG (male, aged 41, socio-economic class 1/2) in Kossodo
> Dealer (female, aged 46, socio-economic class 1/2) in Tanghin

> *"Poverty is the lack of money to buy all that you want."*
> HG (female, aged 40, socio-economic class 1/2) in Kossodo

The results of this study lead to the assumption that home gardening in Ouagadougou is a market-orientated activity, providing money especially for untrained people. It has been confirmed that the economic benefits of urban agriculture are at least as great as the nutritional benefits and that urban agriculture is an important employer in the South (LEE-SMITH et al., 1987; MVENA et al., 1991; SCHILTER, 1991). In the words of a HG (female) in Tanghin:

> *"With the money obtained by home gardening I'm able to look after my family. ...*[ ]*...It's this money that helps me to pay some of the expenditures of food, health and clothes."*

However, it is important to note that the income obtained from home gardening was low in Ouagadougou. Moreover, the average monthly income differed in the different

HGs sites. The sites with a better quality of water for irrigation and a vegetable pattern with a focus on European vegetables generated a higher income than the sites with a lower quality of water and mainly a traditional vegetable pattern.
A higher income in HGs households was also found in the few similar studies about the financial situations of HGs in other towns in Africa. In these studies the HGs had, on average, higher incomes than the minimum salary in town (SAWIO, 1993; EGZIABHER, 1994; ZALLE, 1999; MOUGEOT, 1999).

In the Sub-Saharan region, with the increasing number of urban (poor) people, urban agriculture is an economic activity that helps them to earn money to cover at least their basic needs. The majority of the urban poor often have a low education and few skills. Fifty percent of the population are illiterate in the Sub-Saharan region (WORLD BANK, 2000/01).
However, the results of this study clearly indicate that HGs did not generate the same amount of income despite the fact that they were all practicing the same activity. On the contrary, in the three examined home gardening sites in Ouagadougou the income margin ranged from a very low to a more acceptable income in relation to the monthly expenditures. The few studies about the financial situations of HGs referred to above also showed very different incomes in practicing home gardening. HGs are heterogeneous regarding the variation of vegetables grown on their sites, the quality of the water and, thus, the income situation.

It is important to consider this for other Sub-Saharan towns and when assessing the cash-providing potential of urban agriculture there. Although urban agriculture can be seen as an income-generating activity, the external factors (see above) of the specific surroundings must be carefully considered before estimating income-generating potential due to urban agriculture. Not only the different towns but especially the different home gardening sites in the towns must be considered independently because of the differences in external determinants.

Economic Impact of Urban Agriculture linked to Seasonality?

This study showed that the impact of home gardening depended on seasonal variations. In addition to food security, the economic benefit of home gardening was also subjected to *SEASONALITY* in Ouagadougou.

The economic situation (income and expenditures) in HGs households did not remain stable for the duration of the year. The economic situation depended on external factors and on the different seasonal conditions, and varied thus from month to month. HGs could not count on a predictable economic situation over a long period of time. This made it very difficult for them to maintain a secure economic situation in their households, as there were no opportunities to save money for unpredictable future costs. One HG (female) explained the situation during a FGD held in Tanghin at the end of the dry season:

> *"Well, home gardening helps us in some way, but with the changeable rain it is not very profitable. There are three months that we can not work. And here where we are sowing we could also be victimized by inundation at the end of the rainy season."*

In contrast, the NHGs households had a predictable and stable economic situation at home, as neither their activity nor the related income was subject to seasonal variations.

When analyzing vulnerability for a household or a population group, attention must be paid to people's actual living conditions in order to discern what could make them particularly vulnerable if an adverse event occurred. Considering the results of the study it seems that HGs households are vulnerable to seasonality. Vulnerability has two sides (DELOR & HUBERT, 2000): the external side, to which HGs households are subjected, due to the fact that the economic benefit (and food security) of their activity changes from month to month; and the internal side, which is their defenselessness, or lack of means to cope with this situation. HGs households do not have the potential to react in periods of low income with savings or sellable assets (or food stocks).

From this point of view vulnerability comes up with three coordinates: the risk of being exposed to critical situations (exposure), the risk of not having the necessary

resources to cope with these situations (capacity), and the risk of being subjected to serious consequences as a result of the crisis (potentiality). These three dimensions are connected in time, but influenced by different factors (DELOR & HUBERT, 2000 / see Chapter 1, Section 1.1.4.).
On the level of the population, the HGs are vulnerable to seasonality. They run the risk in the dry season of running out of water and therefore facing a crisis situation. This could cause serious consequences as they do not have the potential to react appropriately to hazardous situations.

On the level of the individual, the HGs households are a heterogeneous group in regard to the external factors in their sites, and their income and expenditure patterns. Therefore there is an inter-household variation in the degree of impact of external factors, which is, in the case of seasonality, the quantity of water. The degree of vulnerability therefore also varies at an individual level. It is important to acknowledge the heterogeneity and aggregation of a population in order to determine the population groups that are exposed to the greatest risk. Possible research and action should then start here (see below).

Health Risk related to Urban Agriculture?

Some of the greatest risks of urban agriculture are related to health. Practicing home gardening exposes individuals to many *HEALTH RISKS*. First, home gardening fields and the vegetables produced there are polluted. Some of the most common parasites of the fields are *Ascaris lumbricoides* and *Ancylostomes.* Secondly, the water for irrigation is polluted as well (i.e. FEACHEM et al., 1983; MARA & CAIRNCROSS, 1991). Moreover, urban agriculture is an activity requiring much physical effort (see Photos 5, 9 and 10). This exertion of the daily manual work in home gardens is vividly described in the following quotes by two HGs:

> *"There are plenty of risks linked with home gardening: we have aching chests, arms and hips and we are always dirty while working. We have no water pumps to irrigate and our wells are very deep. In the evening we look like beaten animals and we are just very tired."*
> HG (female, aged 45) of Tanghin

> *"You can fall into a hand-dug well and you can slip on the wet ground blessing yourself. Moreover, you can poison yourself with insecticides if you aren't very careful with them."*
> HG (male, aged 35)

As practicing urban agriculture is tiring and hard physical work, women and older people are disadvantaged in practicing this activity over the years. A female HG in Tanghin (aged 54) explained that:

> *"It has to be pointed out that with older age we are no longer as flexible and strong. Each effort becomes exhausting. We become thinner and thinner due to the loss of our weight."*

Urban agriculture represents a large burden of work. It is linked with long working hours, especially in the peak season. Therefore the HGs have only a limited capacity to look for other income-generating activities. As a consequence they are more vulnerable to a low and unstable income. In addition, urban agriculture requires a lot of physical force because HGs lack equipment such as water pumps to facilitate the irrigation of the fields. The main assets of HGs, and of most poor people, are their bodies. Their ability to work is determined largely by their physical capacity, which makes them more vulnerable to physical disability as well as illness and aging.
In addition, city-dwellers might also face a health risk in consuming contaminated vegetables produced on the HGs fields (BELLOWS, 1999 / see Chapter 1, Section 1.2.3.2. and Figure 1.1.).

The results of the study suggest that, contrary to expectations, practicing home gardening did not increase the health risks of HGs in comparison with other city-dwellers in Ouagadougou. Moreover, the varying degree of contamination in the examined home gardening sites did not influence the health status of HGs working there. In all three sites HGs and NHGs households had the same frequency of illnesses. These results must be considered very carefully.
The consciousness of the origin of diseases in the study population was very different from biomedical interpretations of causality. A study in Tanzania, which tried to identify how traditional and biomedical elements interrelate in local illness concepts, found a dichotomy between traditional and modern/biomedical

interpretations of causality (HAUSMANN MUELA, 2000). In contemporary Africa where traditional ideas and biomedicine have co-existed for so many years, it is evident that interpretations of an illness are based on different types of knowledge. A syncretism in the interpretation of the illnesses might be seen in this study as well. It seems very likely that the whole study population could not state exactly, which illness they suffered from.

Furthermore, it seems to be very difficult to estimate precisely the seriousness of the perceived illnesses. The perception of illnesses in a household might depend on the actual economic situation in that household. NHGs households with a higher monthly income could perceive and treat illnesses, which would not be noticed in low-income HGs households. This difference could also exist across home gardening sites, because the income of HGs households varied from site to site. The HGs households in Kossodo had the lowest income of all three sites under examination. Although they had the most polluted site, they might perceive and treat only more severe illnesses in comparison to the HGs of Boulmiougou, which had the highest monthly income of all three home gardening sites in town and the least polluted site as well.

Health risk related to practicing home gardening were not seen in the results of the study for Ouagadougou. These results are confirmed by two other studies carried out in Ouagadougou between 1994 and 1998 (CISSE, 1997; MEYER, 1998/99). There was no correlation between working as a HG and increases perceived illness.

However, in comparable towns of the Sub-Saharan region, a health risk related to urban agriculture was observed (GAGNEUX et al., 1999). It is also well established that there is a higher health risk for persons practicing urban agriculture (i.e. FEACHEM et al., 1983; CURTIS et al., 1995). Moreover, there are different levels of risk according to the different home gardening sites. A high degree of variability of the health risks related to practicing urban agriculture is seen in different countries, towns and even sites within the same town. Therefore it is difficult to make generalizations about health risks related to practicing urban agriculture without performing in-depth studies at each of these sites. However, different external factors such as the quality of water for irrigation and the degree of contamination of the soil could be distinguished for each of the examined sites. These factors indicate a higher health risk for the respective site and could therefore be used to estimate the related health risk of home gardening sites in the Sub-Saharan region.

Despite the fact that there were no differences between HGs and NHGs households concerning health status, the high rate of illnesses in the whole study population should be noted. More than 90% of the examined households had an ill person at home in the three months prior to the study carried out after the rainy season. These results reflect the data of health statistics of the Sub-Saharan region and Africa (i.e. DEP, 1996; INSD, 1996; UNDP, 2000; WHO, 2000).

The results of this study confirmed the economic and nutritional benefits of urban agriculture in HGs households (i.e. HELMORE & RATTA, 1995; SMIT et al., 1996). In quantitative and qualitative analyses the economic benefit of urban agriculture could be demonstrated. Urban agriculture contributes to the household's economy, especially in poorer households, and should, therefore, be regarded as an important economic activity in an urban setting. Possibilities for urban agriculture are closely related to adequate land management. Municipalities can support the development of urban agriculture by developing land tenure, land capacity, markets and water, and providing for urban agriculture in urban planning. Redefinition of land use and creation of market places are necessary (WEGELIN & BORGMANN, 1995). Positive examples for a legislation for urban agriculture are already existent in Zaire, Zimbabwe and Nigeria (TRICAUD, 1987; GEFU, 1992; SMIT et al., 1996). In addition, legal reforms to establish equal rights of inheritance for women including rights to land must also have a high priority. Still today women of the ethnic group of the Mossi in Burkina Faso do not have the right to be owners of land (see Chapter 1, Section 1.2.5.). Especially in Sub-Saharan countries the authorities of cities should finally accept urban agriculture and should no longer treat it as either a remnant of rural activities or as a part of the informal sector (refer to Chapter 1, Section 1.2.3.2.).

The relation between poverty and household economy is of special importance to any discussion of poverty and poverty alleviation. Poverty renders people more vulnerable by limiting opportunities of income earning and reducing work capacity. Low income in turn perpetuates poverty. In addition, the relationship between poverty and health is also very tangible. Poverty renders people more vulnerable by

undermining health. This vulnerability requires a risk assessment of a most comprehensive nature.

Until now, the effects of urban agriculture on the health status and the health behavior of the whole population of a town or on parts of this population, such as HGs, were not sufficiently established. There is always a small proportion of the population that carries the majoring of the burden. The implication for research and action is to accept the heterogeneity and aggregation and to develop diagnostic strategies to detect the population groups carrying the greatest burden (TANNER & CISSE, 2000).

10.3. Implication for Further Research

The results in this study support the findings of the few studies already carried out examining the main benefits of urban agriculture: the economic impact and food security (i.e. SMIT et al., 1996). However, in this study a clear restriction of these benefits to a certain time of the year is discussed, which was not specifically mentioned in the previous studies.

As only few studies have been undertaken it would be valuable to carry out studies with a similar approach in order to compare these findings with the situation in other home gardening sites.

First of all, the assumption that a lower expenditures coverage rate, lower income, and seasonal variations in the economic situation of HGs households did not influence the health status of this urban population group in comparison to their urban counterparts without gardens, should be validated. As it was clearly seen that the external factors (as mentioned above) in a home gardening site influence the average monthly income and the predictable monthly expenditures, at least two different home gardening sites with different external conditions should be included in a study in Ouagadougou. As it was further seen in other studies that there could be a relationship between practicing home gardening and being ill more frequently, the study should have a multi-country approach including several HGs sites in different countries of the Sub-Saharan region. The aim of the study should be to find out if the climatic conditions, which are comparable in the Sub-Saharan region, or the external

factors of the sites, which are not comparable across the Sub-Saharan region, influence the urban agriculture system and the related health status of HGs.

As traditional social science and epidemiological methods are often too time-consuming to address the immediate and urgent need for actions, rapid assessment methods should be established parallel to the above-mentioned research study as well (VLASSOFF & TANNER, 1992). The development of rapid assessment methods requires validating them first against traditional techniques in epidemiology and social science, and to evaluate them critically as to their scope and limitations of their applications within a given setting (VLASSOFF & TANNER, 1992).
Rapid assessment methods will help to provide faster information about the socio-economic status and health status of HGs in different sites and towns of the Sub-Saharan region. This information then helps in the assessment of high-risk situations or the identification of particular groups at risk. Rapid assessment methods are therefore an essential basis for the translation of research results into action, as they are a helpful tool for local level decision-makers, opinion-leaders, and community members.

Further research is also needed on the different socio-economic status in an urban population and the related health status. In this study a high correlation between socio-economic status and monthly income, monthly expenditures and education was seen. This was similar for HGs and NHGs households. However, no relation was seen between socio-economic status and health status of population groups. Since the aim of this study was to look for occupational-specific differences in HGs and NHGs households, the number of interviewed people was not well balanced for the defined socio-economic classes. Among the higher socio-economic classes there were very few interviewees. Further research should therefore be more carefully conducted with a defined number of interviewed people in each of the defined socio-economic classes.

Finally an important area which emerges from the results, but is not further elaborated is the community understanding and the consciousness of the origin of diseases in the urban population in Ouagadougou. This understanding is closely linked to the understanding of hygiene and hygienic behavior.

The results of this study lead to the conclusion that the local understanding of illnesses and the out-break of illnesses is not closely related to the biomedical understanding. In addition, the results of this study showed the unawareness about contaminated food and health risks among the HGs households and among city-dwellers who buy vegetables on local markets.
In-depth interviews with key figures would help to get more familiar with this subject. Key figures are people who are involved in medical care, such as employees of a primary health care center, nurses in private and municipal hospitals, physicians and pharmacists. In addition, FGDs with the urban population of all socio-economic classes and different activities should be held.

10.4. Recommendations for Action

Specific recommendations that arise from the findings of the study are made at both the micro and macro levels. On the micro level so-called ‘HGs banks’ should be established at the different home gardening sites. In addition, a process of participatory action research should be established in order to achieve successful translation of interventions in each of the sites.
On the macro level a wider acceptance of home gardening as an important activity should be achieved. This could be obtained by establishing a risk mapping of home gardening and by organizing ‘information-education-communication’ campaigns.

Micro Level-
Establishment of ‘Home Gardeners’ Banks’ on the Different Home Gardening Sites in Ouagadougou

Considering the results it seems appropriate to establish HGs banks in order to improve the economic situation in HGs households.
Credit schemes enable the poor to sustain their level of consumption in difficult times by allowing them to pay for physical investments as well as services such as health care and education. In addition, they may offer poor people opportunities to participate in the labor market for the production of goods, thus allowing them to create new assets from which to draw (SKÖLD, 1998; SCHMIDT, 2001).

The same is valid for HGs households. Their income can be raised with two main intervention possibilities: increasing the income of the home gardening activity and/or starting with another income-generating activity. These two possibilities are not mutually exclusive and must carefully be tailored to the specific needs of each of the different home gardening sites in Ouagadougou.

Still today it is very difficult for HGs to obtain money for purchases or emergency spending. Often banks refuse them because of the high risk in lending them money and because of the HGs incapability to handle all the needed formalities (i.e. fill in a requested document). They can either turn to traditional savings and loan associations with limited credit volumes or to private moneylenders with horrible interest rates of up to 120 percent (ADLER, 2001).
A HGs bank could provide loans for about 20-30% interest so they would have a profit margin of about 10-20% to cover their costs. The HGs in the different sites decide to establish a HGs bank. Moreover, they elect the employees of the HGs bank from among their own people. The HGs bank needs three people: a manager, a treasurer and a controller. In the first, or installation phase an external advisor should be involved in all the required activities of the HGs bank. He/she should be qualified in establishing micro-credits and would help, thus, to start the HGs bank successfully and professionally. Part of the HGs bank funds could be used for literacy programs and initial and advanced training to educate the elected HGs as bank managers. Once the HGs banks are well established on the HGs sites the external advisor should give up his involvement in the daily work and act only as a supervisor. This would ensure an orderly handling of the financial transactions and training of the HGs bank staff in financial management.

Initial successes with micro-projects have already been seen in Ouagadougou and, thus, encourage the foundation of a HG bank. HGs women in Kossodo used micro-credits to establish alternative income-generating activities to home gardening: a food stall in front of the tannery, and animal-breeding, particularly pigs. The credits amounted to sums between 1.000-5.000 CFAF, with an interest of 5% per year (KUELA, 1999).
Successful examples of credit schemes have been seen in all regions and include, for example, investment in income-generating activities for women in Bangladesh

and farming cooperatives in Zimbabwe (OXFAM, 1995). One of the best-known credit schemes is the Grameen Bank in Bangladesh, which since 1983 has been giving credit mainly to the landless and to poor women (BORNSTEIN, 1995; ZELLER, 2001).

Micro Level-
Interventions on the Level of the Sites, the Approach of 'Research-Action-Formation'

In Boulmiougou the HGs households had the highest income and the best home gardening conditions of the three sites. Possible interventions could be to extend the home gardening activity at the end of the dry season in order to shorten the period without income. In Tanghin the quality of water and soil are still suitable to do home gardening. There, HGs should change the vegetable pattern of their fields in order to produce more European vegetables. These can be sold for higher prices than traditional local vegetables at the local markets. In addition, HGs at this site could start some further activities, i.e., animal breeding, which would not interfere with their work on the home gardening fields. In Kossodo both the quality and quantity of the water for irrigation and the soil indicate against home gardening. Here, the HGs should start with an activity other than home gardening. As one intervention their field could be used for subsistence production and for horticulture. This could be an income-generating activity for the HGs in Kossodo, because there are so few sites for horticulture in town, so the competition in this market niche is low.

All the different interventions are very specific to the individual sites because the HGs population is not homogenous. Accepting this heterogeneity and complexity makes it necessary to shift from a town or municipality perspective to the level of the sites and households. Thus, the process of participatory action research or the approach of Research-Action-Formation should be established in order to achieve the successful translation of interventions in each of the sites due to the participation of the respective HGs. The multidisciplinary participatory action research regards the commitment of the population as its main priority (TANNER et al., 1998; TANNER, 2000). The population concerned identifies the problems and the priorities and decides on the intervention measures. All the interventions are only feasible with the

participation and the willingness of the HGs to change and improve their current situation. The participatory process can be understood as a process with the overriding aim of empowering the poor themselves.

Macro Level-
Acceptance of Home Gardening as an important Activity in Ouagadougou

Still today urban agriculture is not accepted or regarded as an economic activity in Ouagadougou. One reason for this could be the lack of knowledge about the importance of it.
Therefore a risk mapping according to the rapid assessment method should be established in order to provide fast information about the benefits and risks of home gardening in Ouagadougou. This would help to amplify the knowledge about home gardening in Ouagadougou and, as a second step, to raise the consciousness of the importance of this activity in town. By providing decision-makers with tools for talking with and understanding program beneficiaries, public policy can be more effective and focused (DE KONING & MARTIN, 1997).

The process of policy formulation in partnership with cities and communities and effective planning and subsequent management, calls for higher transparency among all partners through more effective information and communication. There is a great need to strengthen the exchange of information. Thus, information-education-communication campaigns are an important tool to bring together decision-makers, representatives of the town and municipality, and the HGs themselves as a particular group at risk (ENDA-GRAF, 1993; CHAMBERS & GUIJT, 2000).
The information-education-communication campaigns should include consensus meetings between HGs and representatives of the sections in town where home gardening fields are located in order to obtain legal status of home gardening and legal access to their home gardening fields for several years. This again would strengthen the intervention at the micro level, as long-term investments could be made on the home gardening sites.

The overall aim of these interventions would be a synthesis of all of them: the establishment of a HG bank with the participation of all HGs. The HGs banks should be established with a special emphasis on those sites which are most vulnerable to external determinants. These interventions at the micro-level should involve a macro-environment that accepts home gardening as an important economic activity in Ouagadougou.

It is hoped that these results will therefore serve as an information base for future planning of projects to improve the economic situations of people engaged in home gardening.

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PART V APPENDIX

Photo 37: Driving home after a wedding in the countryside of Burkina Faso, 1999

Appendix I Questionnaire of the quantitative study carried out during the rainy season in 1999

The 'QUESTIONNAIRE GENERAL' had the same structure without the questions number 20, 23, 24, 27 and 29.

QUESTIONNAIRE DE CÔNTROLE

Questions adressées aux maraîchers et aux non-maraîchers avec plus de 20 ans

NOM ENQUETEUR

1 Ramata [illegible]aore 2 Amédée Kaguembèga
3 Noël 4 Désiré Sawadogo
5 Driss 6 Jean - Sylvère Dipama

IDENTIFICATION

1 Date de l'enquête ______ / 1999
Heure début ______
fin ______

2 Nom et prénom de l'exploitant ______

3 Maraîcher
1 oui
2 non

4 Nom du site
1 Boulmiougou
2 Tanghin
3 Kossodo

5 Dans quel secteur / village habitez-vous? ______

6 Sexe de l' exploitant
1 masculin
2 féminin

TRAJECTOIRE SOCIALE

7 Quel âge avez-vous? ______ ans

8 Savez - vous écrire et lire?
1 oui ⇨ question 9
2 non ⇨ question 10

9 Quel est votre niveau de scolarisation?
1 école primaire
2 école secondaire
3 école supérieure
4 autre ______

10 Quel est votre situation matrimoniale?
1 mariéle
2 célibataire
3 veufive
4 divorcéle
5 autre ______

11 Combien de personnes dépendent de vous (inclusivement [illegible])? ______ personnes

12 Combien d' enfants ont entre 6 et 15 ans? ______ personnes

QUESTIONNAIRE DE CONTROLE

Questions adressées aux maraichers et aux non-maraichers avec plus de 20 ans

13	Combien d'enfants ont moins de 5 ans? VERIFIER LE TOTAL	personnes	
14	Combien d'enfants partent à l'école?	personnes	
15	Quelles sont les frais de scolarisation pour tous les enfants par année ?	FCFA	
16	Combien avez vous dépensé pour l'habillement dernièrement acheté?	FCFA	
17	Combien de fois avez-vous acheté des vetements pour tous les membres du menage dans les dernière 3 mois (inclusivement interogé)?	fois	

MENAGE

18	Quel moyen de déplacement utilisez vous ?		
	Voiture	1 oui / 2 non	
	Moby ette	1 oui / 2 non	
	Vélo	1 oui / 2 non	
	Autre - specifiez!		
19	De quel type est votre logement? (SEULEMENT UNE RE	1 ciment 2 banco 3 banco amelioré 4 autre	
20	Payez vous pour votre logement?	1 oui ⇨ question 21 2 non ⇨ question 22	
21	Combien de loyer payez-vous par mois?	FCFA	
22	Avez - vous de l'électricité dans votre ménage?	1 oui ⇨ question 23 2 non ⇨ question 24	
23	Combien payez - vous pour l'électricité par mois?	FCFA	
24	Combien payez - vous pour le petrole par mois?	FCFA	
25	Quels appareils electriques avez-vous?		
	Réfrigerateur	1 oui / 2 non	
	Télévision	1 oui / 2 non	
	Radio	1 oui / 2 non	
	Ventilateur	1 oui / 2 non	
	Autre - Specifiez!		
26	Pour faire la cuisine, qu'est-ce que vous utilisez? (SEULEMENT UNE REPONSE EST REQUISE)	1 bois 2 gaz 3 charbon 4 tige de mille 5 pétrole 6 ne fait pas la cuisine	
27	Combien payez vous pour faire la cuisine par mois?	FCFA	

QUESTIONNAIRE DE CONTROLE

Questions adressées aux maraîchers et aux non-maraîchers avec plus de 20 ans

28	Quel est votre source pour l'eau potable? (SEULEMENT UNE REPONSE - LE PLUS FREQUENT)	1 robinet au ménage 2 fontaine publique 3 vendeur de l'eau 4 puits / forage 5 autre _____	
29	Combien payez - vous pour l'eau par mois?	_____ FCFA	
30	Quelle type de toilette avez-vous? (SEULEMENT UNE R	1 chasse d'eau 2 latrines en ciment 3 latrines sans ciment 4 pas de toilettes 5 autre _____	

SITUATION SOCIOPROFESSIONNELLE

31 MARAICHER - activités pendant l'année

activité		activité pr gagner / saison; mois; jour	
saison sèche	_____	_____ FCFA/	
	_____	_____ FCFA/	
	_____	_____ FCFA/	
	_____	_____ FCFA/	
saison pluvieuse	_____	_____ FCFA/	
	_____	_____ FCFA/	
	_____	_____ FCFA/	
	_____	_____ FCFA/	

32	NON - MARAICHER - Quel est votre métier?	1 mécanicien 2 ouvrier (menuisier, plombier électricien etc.) 3 commercant 4 cultivateur 5 gardien 6 ouvrier temporaire 7 menagère 8 eleveur 9 autre _____	
33	Combien gagnez-vous avec ce métier par saison, mois, jour?	_____ FCFA/	

QUESTIONNAIRE DE CONTROLE

Questions adressées aux maraîchers et aux non-maraîchers avec plus de 20 ans

NOURRITURE PENDANT LA SAISON PLUVIEUSE

34 Production dans votre champ(s) pendant la saison pluvieuse ECRIVEZ LE NOMBRE!

	riz	millet	maïs
sac de 25 kilos			
sac de 50 kilos			
sac de 100 kilos			

35 Commercialisation pendant la saison pluvieuse ECRIVEZ LE NOMBRE!

	riz		millet		maïs	
	nombre/à combien FCFA		nombre/à combien FCFA		nombre/à combien FCFA	
sac de 25 kilos	/		/		/	
sac de 50 kilos	/		/		/	
sac de 100 kilos	/		/		/	
	/		/		/	
	/		/		/	

36 Consommation pendant la saison pluvieuse VERIFIER LE NOMBRE!

	riz	millet	maïs
sac de 25 kilos			
sac de 50 kilos			
sac de 100 kilos			

37 Achat ailleurs pendant la saison pluvieuse

	riz	millet	maïs
sac de 25 kilos			
sac de 50 kilos			
sac de 100 kilos			

38 Qu'est-ce que la sauce contient normalement?

1 légumes
2 viande
3 poisson
4 épices
5 autre _____

QUESTIONNAIRE DE CONTROLE

Questions adressées aux maraîchers et aux non-maraîchers avec plus de 20 ans

39 Production / Commercialisation: les légumes les plus fréquents

légumes	combien de planches	prix / planche	
1			
2			
3			
4			
5			
6			
7			
8			

40 Consommation: les légumes les plus fréquents

légumes	propre production	achat (SEULEMENT UNE POSSIBILITE)	
1			
2			
3			
4			
5			
6			
7			
8			

41 Combien dépensez-vous pour la sauce par jour? _____ FCFA

MALADIE

42 Quand est-ce qu'était la dernière maladie dans votre ménage _____ (-15)

43 Qui était / est malade? (SEULEMENT UNE PERSONNE) _____

44 Quelle maladie? _____

45 Combien de temps est-ce qu'elle a durée? _____ jours

46 Combien avez-vous dépensé pour cette maladie? _____ FCFA

47 Combien de personnes au ménage étaient malades dans les derniers 3 mois (inclusivement ce ménage)? _____ personnes

LOISIRS

48 Combien de fois sortez-vous en général par mois (cinéma, danse)? _____ fois

49 Combien dépensez vous en général

- pour danser? _____ FCFA
- pour le cinéma? _____ FCFA
- pour le tabac? _____ FCFA
- pour l'alcool? _____ FCFA

Appendix II Questionnaire of the quantitative study carried out during the dry season in 1998

GUIDE DE QUESTIONS POUR LES ENTRETIENS

I) Identification

Codes

I.1) Date de l'interrogation : _____ / _____ 1998

I.2) Nom de l'enquêteur : _____

I.3) Lieu de l'interrogation : *site de Boulmiougou = 1*
site de Tanghin = 2
site de Kossodo = 3

autre = _____

I.4) Nom et prénom de l'exploitant :_____

I.5) Sexe de l'exploitant : *masculin = 1* *féminin = 2*

I.6) Age de l'exploitant : _____ *ans*

I.7) Où est-ce que vous êtes né ? *Ouagadougou = 1*
autre = _____

I.8) De quelle religion êtes-vous ? *islam = 1*
catholicisme = 2
protestant = 3
religion traditionnelle = 4

autre = _____

I.9) De quelle ethnie êtes-vous : *Mossi = 1*
Gourounsi = 2
Sénoufo = 3
Fulani = 4
Lobi = 5
Bobo = 6

autre = _____

I.10) Quel est votre situation matrimonial ? *marié = 1*
célibataire = 2
divorce = 3
veuf = 4

autre = _____

I.11) Quel est votre niveau de scolarisation ? *sans niveau = 1*
alphabétisé = 2
école primaire = 3
école secondaire = 4
école supérieure = 5

2) Activités

2.1) Avez-vous fait des autres métiers avant le maraîchage ? *Qui = 1 Non = 2*
Si Qui : Lesquels ? _____
_____

2.2) Avez-vous des activités en plus de maraîchage ? *Qui = 1* *Non = 2*
Si Qui : Lesquels ? (*élevage*) _____
_____
_____
_____
_____

2.3) Quel sont les plus importants ? 1_____
2 _____
3 _____
4 _____
5 _____

2.4) Lesquelles est-ce que vous faites temporaires = 1 pendant tout l'année = 2
écrivez les chiffres dans les cadres au dessus

2.5) Quand est-ce que vous faites les activités temporaires ?
1 _____
2 _____
3 _____
4 _____
5 _____

2.6) Pourquoi est-ce que vous faites les activités temporairement ?
1 _____
2 _____
3 _____
4 _____
5 _____

2

2.7) Est-ce que vous êtes dans une association ? *Qui = 1* *Non = 2*
Pourquoi Oui / Non ? _____
_____
_____

3) Sources de revenues

3.1) D'ou viennent vos revenues principales pendant la saison sèche ?
maraîchage = 1 *commerce = 2*
autre = _____

3.2) D'ou viennent vos revenues principales pendant la saison de pluie ?
maraîchage = 1 *commerce = 2*
autre = _____

3.3) Il y a des transferts familiaux ? *Oui = 1* *Non = 2*
Si Qui : De qui ? _____
_____
Si Qui : De don ou de prêt ? _____
_____

3.4) Est-ce que votre conjoint(e) contribue aux revenues ? *Oui = 1 Non = 2*
Si Qui : Il y a des changements pendant les différents saisons ?
Oui = 1 *Non = 2*
Si Qui : Lesquelles ? _____
_____
_____

3.5) Est-ce que vous recevez des retraites ? *Oui = 1* *Non = 2*

3.6) Est-ce qu'il y a ses transferts dans l'association ? *Oui = 1* *Non = 2*
Si Qui : De quelle nature ? _____
_____
_____
Si Qui : De don ou de prêt ? _____
_____

3.7) Il y a encore d'autres sources de revenues ? *Oui = 1* *Non = 2*
Si Qui : Lesquelles ? _____

_____
_____
_____
_____

4) Aide Social

4.1) Est-ce que vous recevez une aide sociale ? *Oui = 1* *Non = 2*
Si Qui : De quelle nature est'il ? _____
_____
Si Qui : De qui recevrez-vous l'aide ? _____
_____
_____

5) Infrastructure

5.1) Est-ce qu'il y a une centre de soin de santé dans votre quartier ? *Oui = 1 Non = 2*
Si Qui : Est-ce que vous avez la possibilité d'y aller ? *Oui = 1 Non = 2*

5.2) Est-ce qu'il y a une école dans votre quartier ? *Oui = 1 Non = 2*
Si Qui : Est-ce que vous avez la possibilité d'y aller ? *Oui = 1 Non = 2*

5.3) Est-ce qu' il y a une source pour l'eau potable dans votre quartier ?
Oui = 1 Non = 2
Si Qui : Quel est votre source pour l'eau potable ? _____
_____
Si Qui : Est-ce que vous avez la possibilité de l'utiliser ? *Oui = 1 Non = 2*

5.4) Est-ce que votre ménage dispose des toilettes ? *Oui = 1 Non = 2*
Si Qui : Quel type ? _____
_____

5.5) Où es-ce que vous jetez les ordures ménagères ? _____
_____

5.6) Est-ce qu'il y a des lieus de dépôt d'ordure ? *Oui = 1 Non = 2*

5.7) Est-ce qu'il y a un service d'enlèvement des ordures ? *Oui = 1 Non = 2*

5.8) Est-ce qu'il y a des problèmes de nuisance à la présence des ordures dans votre quartier ? *Oui = 1 Non = 2*

5.9) Est-ce qu'il y a l'électricité dans votre quartier ? *Oui = 1 Non = 2*

Si Qui : Est-ce que vous avez la possibilité de l'utiliser ?
Oui = 1 Non = 2

Si Qui : Avez-vous des appareils électrique (radio, TV) ?
Oui = 1 Non = 2

Si Qui : Lesquels ? _____

5.10) De quel type est votre logis ? _____

5.11) Combien des chambres avez vous ? _____

5.12) Quel moyen de déplacement utilisez-vous ? _____

5.13) Quel est votre statut d'occupation du logement ? *propriétaire = 1*
locataire = 2
logé = 3

Si 2 : Combien de loyer payez-vous par mois ? _____ FCFA

5.14) Avez-vous de l'argent par le biais de quelques structures ?
usurier = 1
tantine = 2
caisse populaire = 3
poste = 4
banque = 5
autre = _____

Si Qui : Combien ? _____ FCFA
Si Qui : Combien des fois ? _____

5.15) Est-ce que vous épargnez ? *Qui = 1* *Non = 2*
Si Qui : Combien par mois ? _____ FCFA
Si Qui : Sous quelle forme? _____

6) Charge

A. la ménage

6.1) Quelles sont les différents types de charge que vous avez dans votre ménage ?

_____
_____

6.2) Pouvez-vous catégoriser les charges ?
(écrivez les numéros dans les cadres au-dessous – les plus importants = 1 jusqu' aux moins importants = par exemple 4)

6.3) Combien avez-vous payé pour toue les charges au ménage le dernier mois ?
_____ FCFA

6.4) Comment parvenez-vous de ajointer les deux buts ? _____
_____
_____

6.5) Comment avez vous fait pour le dernier mois ? _____
_____
_____

6.6) Pour faire la cuisine , qu'est-ce que vous utilisez ? _____
_____

6.7) Combien avez vous payez pour l'énergie pour faire la cuisine le dernier mois ? _____ FCFA

6.8) Combien avez vous payez pour l'électricité par mois ?
_____ FCFA

6.9) Combien avez vous payez pour l'eau par mois ?
_____ FCFA

6.10) Est-ce que vous payez les taxes / impôts ? *Qui = 1* *Non = 2*
Si Qui : De quelle nature ? _____
Si Qui : Combien ? _____ FCFA

<u>B. La malade et la santé</u>

6.11) Il y avait des maladies au ménage le dernière mois ? *Qui = 1 Non = 2*
Si Qui : Lesquelles ? _____
_____
Si Qui : Que était malade ? _____
_____

6.12) Quelles charges avez-vous eu à cause de ces maladies ?
_____
_____

6.13) Est-ce que la maladie a cause un déficit de revenue dans le ménage ?
Qui = 1 *Non = 2*

Si Qui : Qui n'a pas pu travailler pendant la maladie ? _____
_____
Si Qui : Pourquoi ? _____
_____
_____

C. Prévention de maladie

6.14) Avez-vous eu des dépenses pour prévenir des maladies le dernier mois ?
Qui = 1 *Non = 2*

Si Qui : De quoi ? *vaccination = 1*
vaporisateur = 2
moustiquaire = 3
traitement prophylactique du paludisme = 4
visite prénatal = 5

autre = _____

_____

D. La nourriture

6.15) Comment se pose la question de nourriture chez vous ? _____
_____
_____
_____

6.16) Combien payez-vous pour la nourriture préparé à la maison par jour ?
_____ FCFA

6.17) Combien avez-vous payez pour la nourriture préparé à la maison hier ?
_____ FCFA

6.18) Quand il vous arrive de manger dehors da la maison combine payez-vous pour le repas en général ? _____ FCFA

6.19) Est-ce que vous recevrez la nourriture du village origine ?
Qui = 1 *Non = 2*

Si Qui : Quel type de nourriture ? _____
_____

6.20) Est-ce que vous cultivez du millet ailleurs que Ouagadougou pendant l'hivernage ? *Qui = 1* *Non = 2*

E. Les Loisirs

6.21) Quelles sont les charges des loisirs que vous êtes responsable ?

_____
_____
_____
_____

6.22) Avez-vous eu des charges pour les loisirs hier ? *Qui = 1 Non = 2*

Si Qui : Combien ? _____ FCFA

6.23) Combien avez-vous payé pour la dernière cérémonie ?
(baptême, mariage, funérailles) _____ FCFA

6.24) Combien avez-vous payé pour la dernière fête ?
(Pâques, Noëlle, Tabaski) _____ FCFA

Appendix III Guideline of questions for the focus group discussions with the market vendors

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GUIDE DES QUESTIONS POUR LES DISCUSSIONS GROUPE FOCAL AVEC DES FEMMES VENDEUSES SUR LES MARCHES

1) Introduction

- Présentation de thème
- Présentation de groupe :
  nom, age, situation familiale, nombre d'enfants, lieux de vente

2) Commercialisation générale

- Expérience en travailler
  de la pratique
- La durée d'expérience dans le temps et dans l'espace
- Vendre légumes locales par rapport aux légumes importe

3) Changement habitude alimentaire

- Variation saisonnière de la vente et la nature de légume
- Quelle distinction existe entre les légumes de la saison sèche et ceux de la saison pluvieuse ?

4) Relation à la santé

- Connaissance de la clientèle
- Perception des légumes de vos clients
- Souci clientèle de légumes : aspect étalage / espace de vente

5) Vende / Achat

- Personne et lieu de ravitaillement / variation fidélité
- (D'ou viennent les légumes ? Sur les sites directes ?)
  (Avez-vous un site privilège ?)
- Suffisant / Insuffisant pour faire face au dépenses ordinaires de ménage

6) Remerciements

Appendix III/I Quantitative questionnaire for the market vendors of the focus group discussions

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QUESTIONNAIRE SUR LE CONDITION DE VIE

Questions adressées aux vendeuses sur les marchés

IDENTIFICATION

1 Date de discussion groupes focaux _____ / 1999

Heure début _____

fin _____

2 Nom et prénom de l'exploitant _____

3 Nom du Marché
1 Grand route vers Kaya
2 Charles de Gaulle
3 Kossodo
4 Supermarché

4 Dans quel secteur / village habitez vous? _____

5 Sexe de l'exploitant
1 masculin
2 féminin

TRAJECTOIRE SOCIALE

6 Quel âge avez-vous? _____ ans

7 Savez - vous écrire et lire?
1 oui ⇨ question 8
2 non ⇨ question 9

8 Quel est votre niveau de scolarisation?
1 école primaire
2 école secondaire
3 école supérieure
4 autre _____

9 Quel est votre situation matrimoniale?
1 mariée
2 celibataire
3 veuf/ve
4 divorcée

10 Combien de personnes dépendent de vous (exclusivement interagé)? _____ personnes

11 Combien d'enfants avez-vous? _____ enfants

12 Combien d'enfants partent à l'école? _____ enfants

MENAGE

13 Quel moyen de déplacement utilisez-vous (pour le transport des vos produits) ?

Voiture 1 oui / 2 non

Mobylette 1 oui / 2 non

Velo 1 oui / 2 non

Autre - specifiez! _____

QUESTIONNAIRE SUR LE CONDITION DE VIE

Questions adressées aux vendeuses sur les marchés

14	De quel type est votre logement? SEULEMENT	1 ciment 2 banco 3 banco amélioré 4 autre _____	
15	Avez - vous de l'électricité dans votre ménage?	1 oui 2 non	
16	Quels appareils électriques avez-vous?		
	Réfrigérateur	1 oui 2 non	
	Télévision	1 oui 2 non	
	Radio	1 oui 2 non	
	Ventilateur	1 oui 2 non	
	Autre - Spécifiez	_____	
17	Pour faire la cuisine, qu'est-ce que vous utilisez? (SEULEMENT UNE RÉPONSE (LE PLUS FRÉQUENT)	1 bois 2 gaz 3 charbon 4 type de métal 5 pétrole 6 ne fait pas la cuisine	
18	Quel est votre source pour l'eau potable? (SEULEMENT UNE RÉPONSE (LE PLUS FRÉQUENT)	1 robinet au ménage 2 fontaine publique 3 vendeur de l'eau 4 puits / forage 5 autre _____	
19	Quelle type de toilette avez-vous? (SEULEMENT	1 chasse d'eau 2 latrines en ciment 3 latrines sans ciment 4 pas de toilettes 5 autre _____	

SITUATION SOCIOPROFESSIONNELLE

20	Dans le meilleur des cas, combien gagnez-vous par jour (comme bénéfice)?	_____ FCFA	
21	Dans le pire des cas, combien gagnez-vous par jour (comme bénéfice)?	_____ FCFA	
22	Avez vous autres activités à part de vendre sur le	1 oui ⇨ question 23 2 non	
23	Quelle sont ces autres activités ?	_____	
24	Qu'est-ce que vous gagnez avec ces autres activités par jour / semaine / mois?	_____ FCFA	

Appendix III/II Synthesis of the four focus group discussions held with market vendors

DISCUSSIONS GROUPE FOCAL AVEC DES FEMMES VENDEUSES SUR LES MARCHES

Synthèse des discussions

MARCHE	DATE	HEURE	TEMPS [min]	LIEU	ENQUETEURS	COMMERCIALISATION GENERALE (expérience, métier avant de vendre des légumes)	CHANGEMENT HABITUDE ALIMENTAIRE (quels légumes, différences entre saisons)	CLIENTELE / PERCEPTION DES LEGUMES (à cause de la santé)/ PRESENTATION	VENDE / ACHAT	HORRAIRES DE LA JOUR	BENEFICE
Av. de Gaulle	18.11.99	13.50 - 15.20	90	maison S. Gerstl	Modérateur: Sibylle Gerstl, Traduction: Dourema Ouedraogo, Traduction enregistrement: Drissa Kone, Enregistrement: Willi Nestor	expérience [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
							[illegible]	[illegible]			
Route vers Kaya	19.11.99	13.35 - 15.00	85	route Kaya	Modérateur: Sibylle Gerstl, Traduction: Dourema Ouedraogo, Traduction enregistrement: Drissa Kone, Enregistrement: Willi Nestor	expérience [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
						problèmes 1) [illegible] 2) trop d'intermédiaires, 3) [illegible]		présentation [illegible]	problèmes [illegible]	problèmes [illegible]	

DISCUSSIONS GROUPE FOCAL AVEC DES FEMMES VENDEUSES SUR LES MARCHES

Synthèse des discussiones

MARCHE	DATE	HEURE	TEMPS [min]	LIEU	ENQUETEURS	COMMERCIALISATION GENERALE (expérience, métier avant de vendre des légumes)	CHANGEMENT HABITUDE ALIMENTAIRE (quels légumes, différences entre saisons)	CLIENTELE / PERCEPTION DES LEGUMES (à cause de la santé)/ PRESENTATION	VENDE / ACHAT	HORRAIRES DE LA JOUR	BENEFICE
marché à Kossodo	29.11.99	12.15 - 13.20	55	Kossodo Site	Modération: Sibylle Gerst. Traduction et Enregistrement: Willi Nestor, Traduction enregistrement: Drissa Kone	expérience entre 2-15 ans avant tous produits et surtout cuisinière/ménagère, mais "on vend à la clientèle, ce qu'est ce qu'ils veulent on vend"	vendent tous légumes européens, légumes locaux, mais légumes importés plus importants différences saisonnières variation entre les saisons de la quantité des légumes	clients [illegible] de quartier perception apparence des légumes = bonne qualité = frais [illegible] légumes (salade) présentation très important: nappe sur table, clients préfèrent les légumes sur les tables hautes et non par terre	elles-mêmes font l'achat, 1) auprès de grossistes, 2) auprès de cultivateurs de sites se déplacent sur le marché, 3) auprès de clients sont aussi producteurs	3-4h réveiller avant 7h achat des légumes 9-17h vente sur le marché 17-22h maison, préparer manger, faire le ménage travaillent 7 jours/7, seul celles qui sont à l'église, elles ne travaillent pas les dimanches	on gagne mieux en vendant des légumes que d'autres choses la vente des légumes suffit pour les dépenses ordinaires
marché devant le super-marché Self-Service / centre ville	17.01.00	14.10 - 15.00	50	au marché	Modération: Sibylle Gerst, Traduction et Enregistrement: Willi Nestor, Traduction enregistrement: Drissa Kone	expérience 15-20 ans avant légumes ou fruits, changement pour diversifier des produits	vendent tous légumes européens, légumes locaux différences saisonnières variation des légumes selon les saisons sont [illegible] (manque [illegible])	clients plupart [illegible], italiens, cuisiniers et femmes que vendent au supermarché perception demande de la provenance des légumes, qualité visible importante = bien lavée présentation très important: nappe sur table, clients préfèrent les légumes sur les tables hauts et non par terre	1) elles-mêmes font l'achat sur le site, particulière [illegible] 2) les enfants vont au Côte d'Ivoire pour acheter des [illegible]	4-5h réveiller avant 6-6:30h achat des légumes/fruits 6:30-20/21:00h vente au marché travaux domestiques fait par des enfants ou une bonne	suffisant aux besoins, plupart des maris travaillent aussi

Appendix IV List of the most common vegetables planted during the rainy season 1999 at the home gardening sites in Ouagadougou, Burkina Faso

Common English Name	Common French Name/*Local Name*	Scientific Species Name	Scientific Familly Name
Aubergine	Aubergine	Solanum melongena	Solanaceae
Carrot	Carotte	Daucus carota	Ombellifereae
Cauliflower	Choux fleur	Brassica oleracea var.	Cruciferacea
Cabbage	Choux simple	Brassica oleracea	Cruciferacea
Celery	Céleri	Apium graveolens	Ombellifereae
Chili Pepper	Piment	Capsicum frutescens	Solanaceae
Cucumber	Concombre	Cucumis sativus	Cucurbitaceae
Green Bean / Green Bean Leafs	Haricot / Feuilles de Haricot	Phaseolus vulgaris	Papilioaceae
Guinea Pepper	Poivron	Piper guineense	
Leek	Poireau	Allium porrum	Liliaceae
Lettuce / Salad	Laitue / Salade	Lactuca sativa	Composceae
Onion / Onion Leafs	Oignon / Feuilles de Oignon	Allium cepa	Liliacea
Parsley	Persil	Petroselinum crispum	Ombeliferaceae
Sorrel	Oseille	Hibiscus sabdariffa	Malvaceae
Spinach	Epinard	Spinacia oleraceae	Chenopodiaceae
Tomato	Tomate	Lycopersicon esculentum	Solanaceae
	Betteraves		
	Boulmboula	Amaranthus caudatus	
	Boulvanka		
	Gombo	Hibiscus esculentus	

Appendix V Questionnaire of the average price for food both during the dry season and during the rainy season in Ouagadougou

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PRIX MOYENS DE LA NOURRITURE

Date d'interrogation _____

Heure .. début _____

fin _____

Nom et prénom de l'exploitant (sexe) _____

Fonction de l'exploitant _____

Location de l'exploitant _____

	Saison Pluvieuse		Saison Sèche		Calcul / Inflation	
	Prix	par	Prix	par	Prix	Par
POISON						
1 poison						
1 tête						
1 queue						
autres:						
VIANDE						
poulet						
pintade						
bœuf						
mouton						
porc						
autres:						

	Saison Pluvieuse		Saison Sèche		Calcul / Inflation	
	Prix	par	Prix	par	Prix	Par
LEGUMES						
EUROPEENES						
aubergines						
carottes						
courgettes						
tomates						
autres:						
LOCALES						
gombo						
oseille						
boulvanka						
autres:						

Appendix VI Guideline of questions of the current school system in Burkina Faso for interviews with school teachers

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GUIDE DES QUESTIONS

Système Scolaire au Burkina Faso

Date d'interrogation _____

Heure _____

Nom et prénom de l'exploitant _____

Fonction _____

1) STRUCTURE DE L`ECOLE

I) différents types d'enseignement
(primaire, secondaire, supérieure, école du soir, ...)

II) durée de chaque type d'enseignement

III) langue utilisé dans l'école

IV) différents matières enseignées dans des différentes école

V) uniforme d'école obligatoire

VI) vacances:
- quand?
- combien des semaines?

VII) âge des élèves à l'école par type d'enseignement

VIII) nombre moyen d'élèves dans des classes

IX) enseignement obligatoire ou facultatif
SI QUI: - jusqu'à quel âge ou jusqu'à quel niveau
- quand des enfants ne viennent pas à l'école, qu'est-ce qu'on fait?

2) FRAIS DE SCOLARITE

I) frais d'inscription à l'école
- quelles écoles
- combien par an / mois

II) autres frais
- uniforme _____
- cahiers _____
- livres _____
- stylos etc. _____
- autres _____
_____
_____

III) parent ne payent pas, qu'est-ce qu'on fait

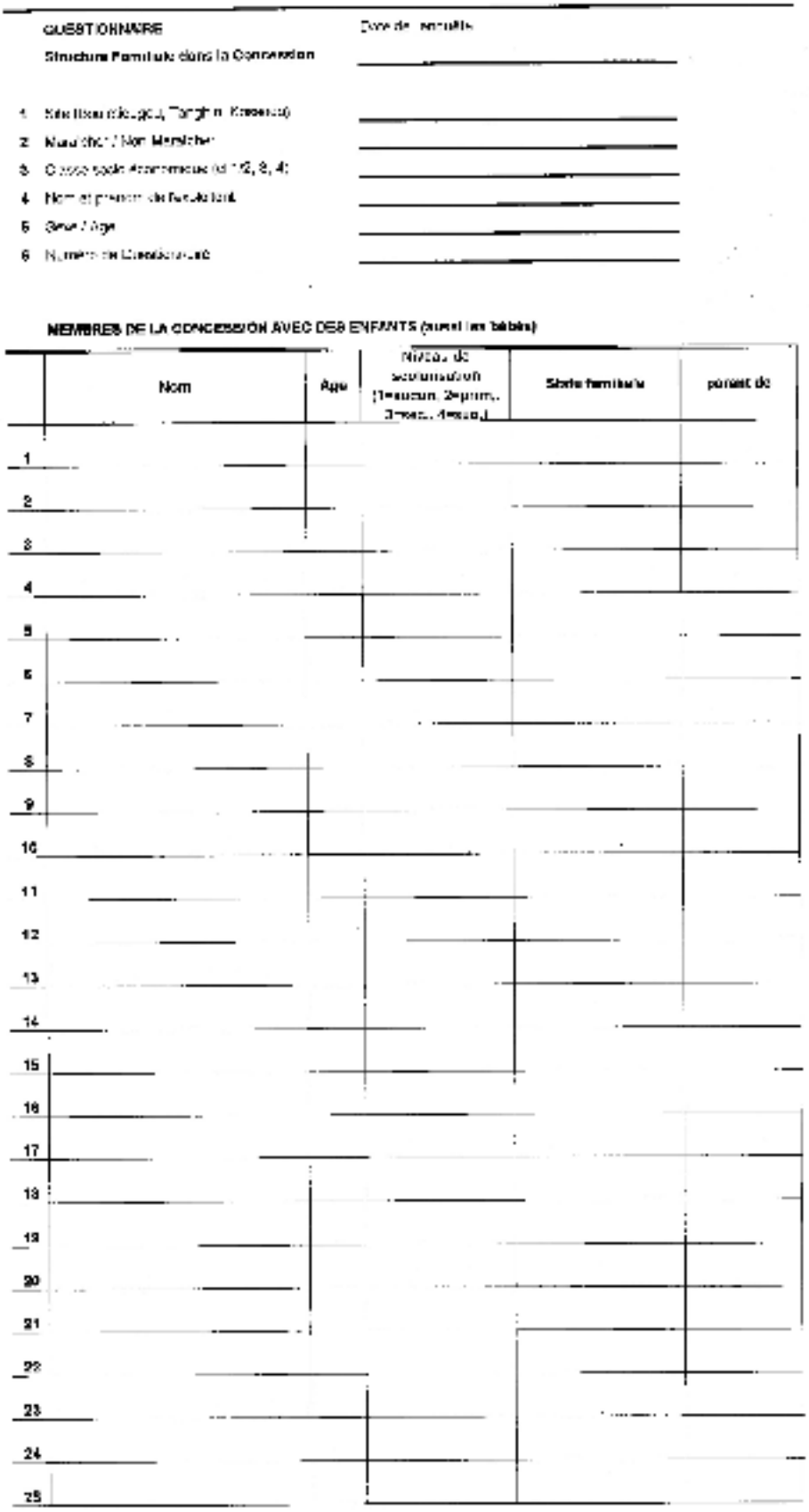
3) PROFESSION PROFESSEUR

I) quelle formation pour devenir professeur
école primaire
école secondaire
école supérieure

4) A votre avis quelles sont les causes de l'analphabétisme de la majorité du Burkinabé?

5) Pour améliorer le taux d'alphabétisation qu'est-ce que vous voudriez faire personnellement?

Appendix VII Questionnaire of the family structure in households among different socio-economic classes



QUESTIONNAIRE

Structure Familiale dans la Concession

MEMBRES DE LA CONCESSION AVEC DES ENFANTS (suite au tableau)

	Nom	Age	Niveau de scolarisation (1=aucun, 2=prim., 3=sec., 4=sup.)	Statut familial	parent de
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

Appendix VII/I Examples of the family structure in households among different socio-economic classes

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Example 1

Questionnaire of the quantitative study carried out during the rainy season

11	Combien de personnes dépendent de vous (inclusivement interogé)?	8	personnes	08
12	Combien d' enfants ont entre 6 et 15 ans?	2	personnes	02
13	Combien d' enfants ont moins de 5 ans? ! VERIFIER LE NOMBRE !	1	personnes	01
14	Combien d' enfants partent à l' école?	3	personnes	03

Questionnaire of the family structure in households among different socio-economic classes

MEMBRES DE LA CONCESSION AVEC DES ENFANTS (aussi les bébés)

	Nom	Age	Niveau de scolarisation (1=aucun, 2=prim., 3=sec., 4=sup.)	père ET mère dans la concession: oui / non	Status familiale	parent de
1	Sori Mahamadi	42			Père	
2	Kaonda Zenabo	30			Mère 1	
3	Ouédraogo Abibou	25			Mère 2	
4	Sori Issouf	12	2		fils	1/2
5	" Boureima	09	2		fils	1/2
6	" Issa	07	2		fils	1/2
7	" Fatimata	03	1		fille	1/3
8	" Koudini	9 mois	1		fille	1/3
9	Sori Karim	22	1		frère	1
10	" Kadi	15	1		sœur	1

Example 2

Questionnaire of the quantitative study carried out during the rainy season

11	Combien de personnes dépendant de vous (inclusivement interogé)?	7	personnes	07
12	Combien d' enfants ont entre 6 et 15 ans?	2	personnes	02
13	Combien d' enfants ont moins de 5 ans? ! VERIFIER LE NOMBRE !	1	personnes	01
14	Combien d' enfants partent à l' école?	7	personnes	03

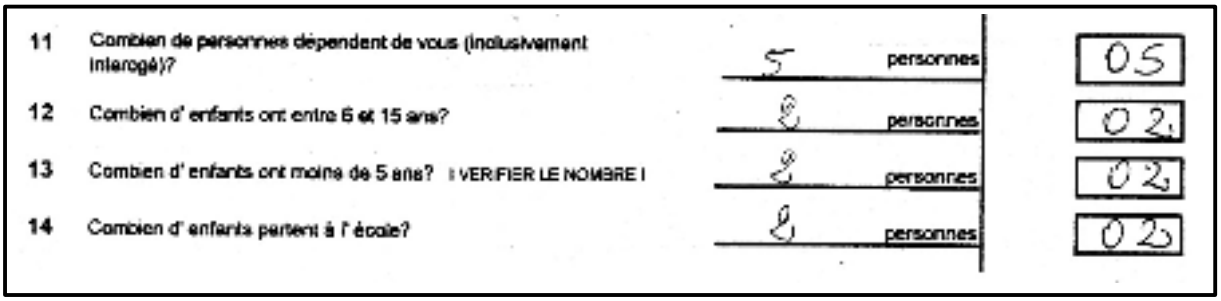
Questionnaire of the family structure in households among different socio-economic classes

MEMBRES DE LA CONCESSION AVEC DES ENFANTS (aussi les bébés)

	Nom	Age	Niveau de scolarisation (1=aucun, 2=prim., 3=sec., 4=sup.)	pere et mère dans la concession: qui / non	Status familiale	parent de
1	Zougrana Denis	33	3		père	
2	Ilboudo Noélie	25	2		epouse	1
3	Zougro Stéphane	5	1		fils	1 + 2
4	" Stéphanie	2	1		fille	1 + 2
5	Ilboudo Paule	14	3		frère	2
6	Zougrana Adalbert	12	1		cousin enfant de l'oncle	1

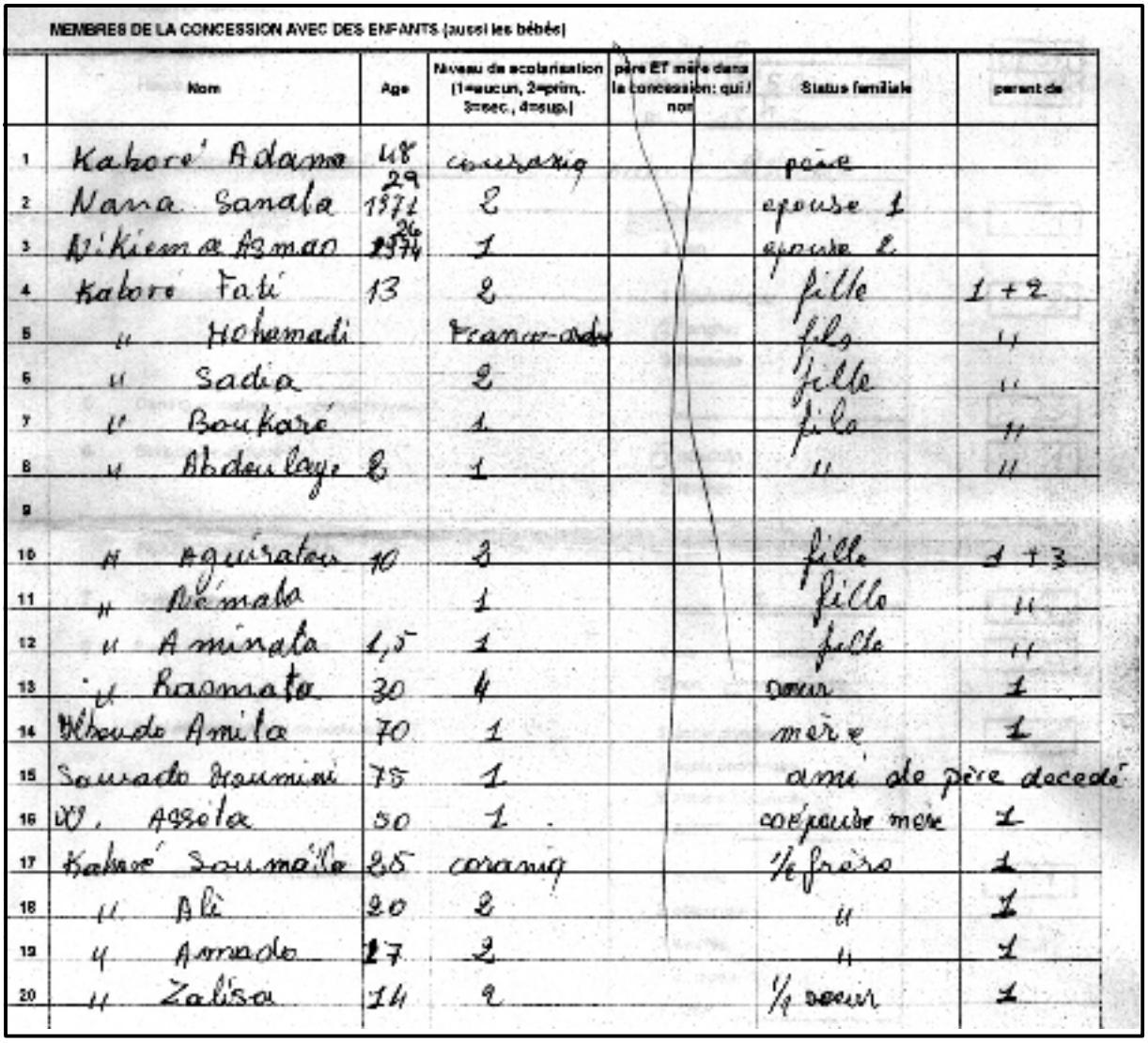
Example 3

Questionnaire of the quantitative study carried out during the rainy season



11	Combien de personnes dépendent de vous (inclusivement interogé)?	5	personnes	05
12	Combien d' enfants ont entre 6 et 15 ans?	2	personnes	02
13	Combien d' enfants ont moins de 5 ans? ! VERIFIER LE NOMBRE !	2	personnes	02
14	Combien d' enfants parent à l' école?	2	personnes	02

Questionnaire of the family structure in households among different socio-economic classes



MEMBRES DE LA CONCESSION AVEC DES ENFANTS (aussi les bébés)

	Nom	Age	Niveau de scolarisation (1=aucun, 2=prim., 3=sec., 4=sup.)	père ET mère dans la concession: qui / non	Status familiale	parent de
1	Kaboré Adama	48	coranig		père	
2	Nana Sanata	29 1971	2		epouse 1	
3	N'Kiema Asmao	26 1974	1		epouse 2	
4	Kaboré Fati	13	2		fille	1 + 2
5	" Hohamadi		Franco-arabe		fils	"
6	" Sadia		2		fille	"
7	" Boukaré		1		fils	"
8	" Abdoulaye	8	1		"	"
9						
10	" Aguiratou	10	3		fille	1 + 3
11	" Némata		1		fille	"
12	" Aminata	1,5	1		fille	"
13	" Raomata	30	4		Sœur	1
14	Kboudo Amita	70	1		mère	1
15	Sawado Soumini	75	1		ami de père decedé	
16	W. Assita	50	1		coépouse mère	1
17	Kaboré Soumaïla	25	coranig		½ frère	1
18	" Ali	20	2		"	1
19	" Amado	17	2		"	1
20	" Zalissa	14	2		½ sœur	1

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Study Population	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	6	1%	412	68%	127	21%	61	10%	606	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	4	1%	38	30%	57	93%	99	16%
hand-dug well	3	50%	121	29%	12	9%	0	0%	136	22%
water seller	0	0%	29	7%	15	12%	1	2%	45	7%
public well in a quarter	3	50%	258	63%	62	49%	3	5%	326	54%
total	6	100%	412	100%	127	100%	61	100%	606	100%
electricity at home										
yes	0	0%	2	0%	63	50%	61	100%	126	21%
no	6	100%	410	100%	64	50%	0	0%	480	79%
total	6	100%	412	100%	127	100%	61	100%	606	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	12	20%	12	2%
cemented latrine	0	0%	114	28%	107	84%	48	79%	269	44%
simple latrine	5	83%	293	71%	20	16%	1	2%	319	53%
no toilet	1	17%	5	1%	0	0%	0	0%	6	1%
total	6	100%	412	100%	127	100%	61	100%	606	100%
fuel for cooking										
gas	0	0%	13	3%	17	13%	21	34%	51	8%
kerosene	0	0%	2	0%	0	0%	0	0%	2	0%
charcoal	0	0%	6	1%	2	2%	2	3%	10	2%
wood	0	0%	339	82%	107	84%	38	62%	484	80%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	6	100%	52	13%	1	1%	0	0%	59	10%
total	6	100%	412	100%	127	100%	61	100%	606	100%
level of lodging										
cemented house	0	0%	2	0%	65	51%	59	97%	126	21%
mix form	0	0%	82	20%	36	28%	2	3%	120	20%
house with adobes	6	100%	328	80%	26	20%	0	0%	360	59%
total	6	100%	412	100%	127	100%	61	100%	606	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	10	8%	52	85%	62	10%
no	6	100%	412	100%	117	92%	9	15%	544	90%
total	6	100%	412	100%	127	100%	61	100%	606	100%
refrigerator										
yes	0	0%	1	0%	2	2%	42	69%	45	7%
no	6	100%	411	100%	125	98%	19	31%	561	93%
total	6	100%	412	100%	127	100%	61	100%	606	100%
TV										
yes	0	0%	4	1%	85	67%	58	95%	147	24%
no	6	100%	408	99%	42	33%	3	5%	459	76%
total	6	100%	412	100%	127	100%	61	100%	606	100%
radio										
yes	1	17%	325	79%	118	93%	59	97%	503	83%
no	5	83%	87	21%	9	7%	2	3%	103	17%
total	6	100%	412	100%	127	100%	61	100%	606	100%
means of transportation										
car										
yes	0	0%	0	0%	0	0%	18	30%	18	3%
no	6	100%	412	100%	127	100%	43	70%	588	97%
total	6	100%	412	100%	127	100%	61	100%	606	100%
motorcycle										
yes	0	0%	93	23%	101	80%	51	84%	245	40%
no	6	100%	319	77%	26	20%	10	16%	361	60%
total	6	100%	412	100%	127	100%	61	100%	606	100%
bicycle										
yes	2	33%	260	63%	37	29%	4	7%	303	50%
no	4	67%	152	37%	90	71%	57	93%	303	50%
total	6	100%	412	100%	127	100%	61	100%	606	100%

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Home Gardeners`	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
Households	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	3	1%	253	83%	46	15%	2	1%	304	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	4	2%	6	13%	0	0%	10	3%
hand-dug well	2	67%	91	36%	12	26%	1	50%	106	35%
water seller	0	0%	9	4%	2	4%	0	0%	11	4%
public well in a quarter	1	33%	149	59%	26	57%	1	50%	177	58%
total	3	100%	253	100%	46	100%	2	100%	304	100%
electricity at home										
yes	0	0%	1	0%	11	24%	2	100%	14	5%
no	3	100%	252	100%	35	76%	0	0%	290	95%
total	3	100%	253	100%	46	100%	2	100%	304	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	0	0%	0	0%
cemented latrine	0	0%	72	28%	38	83%	2	100%	112	37%
simple latrine	2	67%	176	70%	8	17%	0	0%	186	61%
no toilet	1	33%	5	2%	0	0%	0	0%	6	2%
total	3	100%	253	100%	46	100%	2	100%	304	100%
fuel for cooking										
gas	0	0%	5	2%	7	15%	0	0%	12	4%
kerosene	0	0%	0	0%	0	0%	0	0%	0	0%
charcoal	0	0%	2	1%	1	2%	0	0%	3	1%
wood	0	0%	224	89%	38	83%	2	100%	264	87%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	3	100%	22	9%	0	0%	0	0%	25	8%
total	3	100%	253	100%	46	100%	2	100%	304	100%
level of lodging										
cemented house	0	0%	2	1%	17	37%	1	50%	20	7%
mix form	0	0%	63	25%	21	46%	1	50%	85	28%
house with adobes	3	100%	188	74%	8	17%	0	0%	199	65%
total	3	100%	253	100%	46	100%	2	100%	304	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	2	4%	2	100%	4	1%
no	3	100%	253	100%	44	96%	0	0%	300	99%
total	3	100%	253	100%	46	100%	2	100%	304	100%
refrigerator										
yes	0	0%	1	0%	0	0%	2	100%	3	1%
no	3	100%	252	100%	46	100%	0	0%	301	99%
total	3	100%	253	100%	46	100%	2	100%	304	100%
TV										
yes	0	0%	2	1%	21	46%	2	100%	25	8%
no	3	100%	251	99%	25	54%	0	0%	279	92%
total	3	100%	253	100%	46	100%	2	100%	304	100%
radio										
yes	1	33%	197	78%	42	91%	2	100%	242	80%
no	2	67%	56	22%	4	9%	0	0%	62	20%
total	3	100%	253	100%	46	100%	2	100%	304	100%
means of transportation										
car										
yes	0	0%	0	0%	0	0%	0	0%	0	0%
no	3	100%	253	100%	46	100%	2	100%	304	100%
total	3	100%	253	100%	46	100%	2	100%	304	100%
motorcycle										
yes	0	0%	51	20%	27	59%	2	100%	80	26%
no	3	100%	202	80%	19	41%	0	0%	224	74%
total	3	100%	253	100%	46	100%	2	100%	304	100%
bicycle										
yes	1	33%	164	65%	31	67%	1	50%	197	65%
no	2	67%	89	35%	15	33%	1	50%	107	35%
total	3	100%	253	100%	46	100%	2	100%	304	100%

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Non-Home Gardeners`	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
Households	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	3	1%	159	53%	81	27%	59	20%	302	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	0	0%	32	40%	57	97%	89	29%
hand-dug well	1	33%	30	19%	0	0%	0	0%	31	10%
water seller	0	0%	20	13%	13	16%	0	0%	33	11%
public well in a quarter	2	67%	109	69%	36	44%	2	3%	149	49%
total	3	100%	159	100%	81	100%	59	100%	302	100%
electricity at home										
yes	0	0%	1	1%	52	64%	59	100%	112	37%
no	3	100%	158	99%	29	36%	0	0%	190	63%
total	3	100%	159	100%	81	100%	59	100%	302	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	12	20%	12	4%
cemented latrine	0	0%	42	26%	69	85%	46	78%	157	52%
simple latrine	3	100%	117	74%	12	15%	1	2%	133	44%
no toilet	0	0%	0	0%	0	0%	0	0%	0	0%
total	3	100%	159	100%	81	100%	59	100%	302	100%
fuel for cooking										
gas	0	0%	8	5%	10	12%	21	36%	39	13%
kerosene	0	0%	2	1%	0	0%	0	0%	2	1%
charcoal	0	0%	4	3%	1	1%	2	3%	7	2%
wood	0	0%	115	72%	69	85%	36	61%	220	73%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	3	100%	30	19%	1	1%	0	0%	34	11%
total	3	100%	159	100%	81	100%	59	100%	302	100%
level of lodging										
cemented house	0	0%	0	0%	48	59%	58	98%	106	35%
mix form	0	0%	19	12%	15	19%	1	2%	35	12%
house with adobes	3	100%	140	88%	18	22%	0	0%	161	53%
total	3	100%	159	100%	81	100%	59	100%	302	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	8	10%	50	85%	58	19%
no	3	100%	159	100%	73	90%	9	15%	244	81%
total	3	100%	159	100%	81	100%	59	100%	302	100%
refrigerator										
yes	0	0%	0	0%	2	2%	40	68%	42	14%
no	3	100%	159	100%	79	98%	19	32%	260	86%
total	3	100%	159	100%	81	100%	59	100%	302	100%
TV										
yes	0	0%	2	1%	64	79%	56	95%	122	40%
no	3	100%	157	99%	17	21%	3	5%	180	60%
total	3	100%	159	100%	81	100%	59	100%	302	100%
radio										
yes	0	0%	128	81%	76	94%	57	97%	261	86%
no	3	100%	31	19%	5	6%	2	3%	41	14%
total	3	100%	159	100%	81	100%	59	100%	302	100%
means of transportation										
car										
yes	0	0%	0	0%	0	0%	18	31%	18	6%
no	3	100%	159	100%	81	100%	41	69%	284	94%
total	3	100%	159	100%	81	100%	59	100%	302	100%
motorcycle										
yes	0	0%	42	26%	74	91%	49	83%	165	55%
no	3	100%	117	74%	7	9%	10	17%	137	45%
total	3	100%	159	100%	81	100%	59	100%	302	100%
bicycle										
yes	1	33%	96	60%	6	7%	3	5%	106	35%
no	2	67%	63	40%	75	93%	56	95%	196	65%
total	3	100%	159	100%	81	100%	59	100%	302	100%

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Boulmiougou	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	2	1%	123	61%	43	21%	34	17%	202	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	3	2%	24	56%	31	91%	58	29%
hand-dug well	1	50%	35	28%	2	5%	1	3%	39	19%
water seller	0	0%	5	4%	3	7%	0	0%	8	4%
public well in a quarter	1	50%	80	65%	14	33%	2	6%	97	48%
total	2	100%	123	100%	43	100%	34	100%	202	100%
electricity at home										
yes	0	0%	0	0%	32	74%	34	100%	66	33%
no	2	100%	123	100%	11	26%	0	0%	136	67%
total	2	100%	123	100%	43	100%	34	100%	202	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	8	24%	8	4%
cemented latrine	0	0%	43	35%	41	95%	26	76%	110	54%
simple latrine	1	50%	75	61%	2	5%	0	0%	78	39%
no toilet	1	50%	5	4%	0	0%	0	0%	6	3%
total	2	100%	123	100%	43	100%	34	100%	202	100%
fuel for cooking										
gas	0	0%	3	2%	6	14%	11	32%	20	10%
kerosene	0	0%	1	1%	0	0%	0	0%	1	0%
charcoal	0	0%	4	3%	2	5%	2	6%	8	4%
wood	0	0%	109	89%	34	79%	21	62%	164	81%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	2	100%	6	5%	1	2%	0	0%	9	4%
total	2	100%	123	100%	43	100%	34	100%	202	100%
level of lodging										
cemented house	0	0%	0	0%	32	74%	32	94%	64	32%
mix form	0	0%	30	24%	8	19%	2	6%	40	20%
house with adobes	2	100%	93	76%	3	7%	0	0%	98	49%
total	2	100%	123	100%	43	100%	34	100%	202	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	7	16%	27	79%	34	17%
no	2	100%	123	100%	36	84%	7	21%	168	83%
total	2	100%	123	100%	43	100%	34	100%	202	100%
refrigerator										
yes	0	0%	0	0%	2	5%	23	68%	25	12%
no	2	100%	123	100%	41	95%	11	32%	177	88%
total	2	100%	123	100%	43	100%	34	100%	202	100%
TV										
yes	0	0%	1	1%	25	58%	32	94%	58	29%
no	2	100%	122	99%	18	42%	2	6%	144	71%
total	2	100%	123	100%	43	100%	34	100%	202	100%
radio										
yes	0	0%	67	54%	37	86%	32	94%	136	67%
no	2	100%	56	46%	6	14%	2	6%	66	33%
total	2	100%	123	100%	43	100%	34	100%	202	100%
means of transportation										
car										
yes	0	0%	0	0%	0	0%	12	35%	12	6%
no	2	100%	123	100%	43	100%	22	65%	190	94%
total	2	100%	123	100%	43	100%	34	100%	202	100%
motorcycle										
yes	0	0%	49	40%	35	81%	30	88%	114	56%
no	2	100%	74	60%	8	19%	4	12%	88	44%
total	2	100%	123	100%	43	100%	34	100%	202	100%
bicycle										
yes	0	0%	69	56%	10	23%	4	12%	83	41%
no	2	100%	54	44%	33	77%	30	88%	119	59%
total	2	100%	123	100%	43	100%	34	100%	202	100%

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Tanghin	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	0	0%	154	77%	43	21%	4	2%	201	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home			0	0%	6	14%	3	75%	9	4%
hand-dug well			33	21%	2	5%	0	0%	35	17%
water seller			18	12%	4	9%	0	0%	22	11%
public well in a quarter			103	67%	31	72%	1	25%	135	67%
total			154	100%	43	100%	4	100%	201	100%
electricity at home										
yes			2	1%	20	47%	4	100%	26	13%
no			152	99%	23	53%	0	0%	175	87%
total			154	100%	43	100%	4	100%	201	100%
type of toilet										
water toilet			0	0%	0	0%	3	75%	3	1%
cemented latrine			21	14%	28	65%	1	25%	50	25%
simple latrine			133	86%	15	35%	0	0%	148	74%
no toilet			0	0%	0	0%	0	0%	0	0%
total			154	100%	43	100%	4	100%	201	100%
fuel for cooking										
gas			10	6%	11	26%	2	50%	23	11%
kerosene			1	1%	0	0%	0	0%	1	0%
charcoal			2	1%	0	0%	0	0%	2	1%
wood			119	77%	32	74%	2	50%	153	76%
millet stalk			0	0%	0	0%	0	0%	0	0%
no cooking			22	14%	0	0%	0	0%	22	11%
total			154	100%	43	100%	4	100%	201	100%
level of lodging										
cemented house			2	1%	16	37%	4	100%	22	11%
mix form			15	10%	5	12%	0	0%	20	10%
house with adobes			137	89%	22	51%	0	0%	159	79%
total			154	100%	43	100%	4	100%	201	100%
electrical appliances										
ventilator										
yes			0	0%	2	5%	4	100%	6	3%
no			154	100%	41	95%	0	0%	195	97%
total			154	100%	43	100%	4	100%	201	100%
refrigerator										
yes			1	1%	0	0%	1	25%	2	1%
no			153	99%	43	100%	3	75%	199	99%
total			154	100%	43	100%	4	100%	201	100%
TV										
yes			3	2%	35	81%	4	100%	42	21%
no			151	98%	8	19%	0	0%	159	79%
total			154	100%	43	100%	4	100%	201	100%
radio										
yes			134	87%	42	98%	4	100%	180	90%
no			20	13%	1	2%	0	0%	21	10%
total			154	100%	43	100%	4	100%	201	100%
means of transportation										
car										
yes			0	0%	0	0%	1	25%	1	0%
no			154	100%	43	100%	3	75%	200	100%
total			154	100%	43	100%	4	100%	201	100%
motorcycle										
yes			38	25%	34	79%	3	75%	75	37%
no			116	75%	9	21%	1	25%	126	63%
total			154	100%	43	100%	4	100%	201	100%
bicycle										
yes			93	60%	12	28%	4	100%	109	54%
no			61	40%	31	72%	0	0%	92	46%
total			154	100%	43	100%	4	100%	201	100%

Appendix VIII Socio-Economic Indicators

Rainy Season 1999	**SOCIO-ECONOMIC STATUS**									
Kossodo	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	4	2%	135	67%	41	20%	23	11%	203	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	1	1%	8	20%	23	100%	32	16%
hand-dug well	2	50%	53	39%	8	20%	0	0%	63	31%
water seller	0	0%	6	4%	8	20%	0	0%	14	7%
public well in a quarter	2	50%	75	56%	17	41%	0	0%	94	46%
total	4	100%	135	100%	41	100%	23	100%	203	100%
electricity at home										
yes	0	0%	0	0%	11	27%	23	100%	34	17%
no	4	100%	135	100%	30	73%	0	0%	169	83%
total	4	100%	135	100%	41	100%	23	100%	203	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	4	17%	4	2%
cemented latrine	0	0%	50	37%	38	93%	19	83%	107	53%
simple latrine	4	100%	85	63%	3	7%	0	0%	92	45%
no toilet	0	0%	0	0%	0	0%	0	0%	0	0%
total	4	100%	135	100%	41	100%	23	100%	203	100%
fuel for cooking										
gas	0	0%	0	0%	0	0%	8	35%	8	4%
kerosene	0	0%	0	0%	0	0%	0	0%	0	0%
charcoal	0	0%	0	0%	0	0%	0	0%	0	0%
wood	0	0%	111	82%	41	100%	15	65%	167	82%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	4	100%	24	18%	0	0%	0	0%	28	14%
total	4	100%	135	100%	41	100%	23	100%	203	100%
level of lodging										
cemented house	0	0%	0	0%	17	41%	23	100%	40	20%
mix form	0	0%	37	27%	23	56%	0	0%	60	30%
house with adobes	4	100%	98	73%	1	2%	0	0%	103	51%
total	4	100%	135	100%	41	100%	23	100%	203	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	1	2%	21	91%	22	11%
no	4	100%	135	100%	40	98%	2	9%	181	89%
total	4	100%	135	100%	41	100%	23	100%	203	100%
refrigerator										
yes	0	0%	0	0%	0	0%	18	78%	18	9%
no	4	100%	135	100%	41	100%	5	22%	185	91%
total	4	100%	135	100%	41	100%	23	100%	203	100%
TV										
yes	0	0%	0	0%	25	61%	22	96%	47	23%
no	4	100%	135	100%	16	39%	1	4%	156	77%
total	4	100%	135	100%	41	100%	23	100%	203	100%
radio										
yes	1	25%	124	92%	39	95%	23	100%	187	92%
no	3	75%	11	8%	2	5%	0	0%	16	8%
total	4	100%	135	100%	41	100%	23	100%	203	100%
means of transportation										
car										
yes	0	0%	0	0%	0	0%	5	22%	5	2%
no	4	100%	135	100%	41	100%	18	78%	198	98%
total	4	100%	135	100%	41	100%	23	100%	203	100%
motorcycle										
yes	0	0%	6	4%	32	78%	18	78%	56	28%
no	4	100%	129	96%	9	22%	5	22%	147	72%
total	4	100%	135	100%	41	100%	23	100%	203	100%
bicycle										
yes	0	0%	98	73%	15	37%	0	0%	113	56%
no	4	100%	37	27%	26	63%	23	100%	90	44%
total	4	100%	135	100%	41	100%	23	100%	203	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Study Population	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	59	10%	462	75%	68	11%	24	4%	613	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	9	2%	23	34%	21	88%	53	9%
hand-dug well	3	5%	59	13%	12	18%	1	4%	75	12%
water seller	11	19%	163	35%	26	38%	0	0%	200	33%
public well in a quarter	33	56%	209	45%	4	6%	2	8%	248	40%
no information	12	20%	22	5%	3	4%	0	0%	37	6%
total	59	100%	462	100%	68	100%	24	100%	613	100%
elctricity at home										
yes	1	2%	14	3%	30	44%	24	100%	69	11%
no	58	98%	448	97%	38	56%	0	0%	544	89%
total	59	100%	462	100%	68	100%	24	100%	613	100%
type of toilet										
water toilet	0	0%	0	0%	1	1%	5	21%	6	1%
cemented latrine	1	2%	76	16%	51	75%	19	79%	147	24%
simple latrine	38	64%	373	81%	16	24%	0	0%	427	70%
no toilet	18	31%	12	3%	0	0%	0	0%	30	5%
no information	2	3%	1	0%	0	0%	0	0%	3	0%
total	59	100%	462	100%	68	100%	24	100%	613	100%
fuel for cooking										
gas	0	0%	1	0%	14	21%	17	71%	32	5%
kerosene	0	0%	12	3%	5	7%	0	0%	17	3%
charcoal	0	0%	9	2%	5	7%	0	0%	14	2%
wood	24	41%	402	87%	42	62%	7	29%	475	77%
millet stalk	8	14%	9	2%	0	0%	0	0%	17	3%
no cooking	23	39%	15	3%	1	1%	0	0%	39	6%
no information	4	7%	14	3%	1	1%	0	0%	19	3%
total	59	100%	462	100%	68	100%	24	100%	613	100%
level of lodging										
cemented house	0	0%	19	4%	38	56%	23	96%	80	13%
mix form	0	0%	17	4%	7	10%	0	0%	24	4%
house with adobes	59	100%	425	92%	23	34%	1	4%	508	83%
no information	0	0%	1	0%	0	0%	0	0%	1	0%
total	59	100%	462	100%	68	100%	24	100%	613	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	10	15%	22	92%	32	5%
no	59	100%	462	100%	58	85%	2	8%	581	95%
total	59	100%	462	100%	68	100%	24	100%	613	100%
refrigerator										
yes	0	0%	0	0%	2	3%	14	58%	16	3%
no	59	100%	462	100%	66	97%	10	42%	597	97%
total	59	100%	462	100%	68	100%	24	100%	613	100%
TV										
yes	0	0%	4	1%	30	44%	24	100%	58	9%
no	59	100%	458	99%	38	56%	0	0%	555	91%
total	59	100%	462	100%	68	100%	24	100%	613	100%
radio										
yes	18	31%	327	71%	57	84%	14	58%	416	68%
no	41	69%	135	29%	11	16%	10	42%	197	32%
total	59	100%	462	100%	68	100%	24	100%	613	100%
means of transportation										
car										
yes	0	0%	1	0%	3	4%	4	17%	8	1%
no	59	100%	461	100%	65	96%	20	83%	605	99%
total	59	100%	462	100%	68	100%	24	100%	613	100%
motorcycle										
yes	0	0%	103	22%	44	65%	20	83%	167	27%
no	59	100%	359	78%	24	35%	4	17%	446	73%
total	59	100%	462	100%	68	100%	24	100%	613	100%
bicycle										
yes	8	14%	240	52%	37	54%	8	33%	293	48%
no	51	86%	222	48%	31	46%	16	67%	320	52%
total	59	100%	462	100%	68	100%	24	100%	613	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Home Gardeners`	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
Households	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	31	10%	250	83%	19	6%	3	1%	303	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	6	2%	8	42%	2	67%	16	5%
hand-dug well	3	10%	33	13%	4	21%	0	0%	40	13%
water seller	3	10%	68	27%	6	32%	0	0%	77	25%
public well in a quarter	16	52%	127	51%	1	5%	1	33%	145	48%
no information	9	29%	16	6%	0	0%	0	0%	25	8%
total	31	100%	250	100%	19	100%	3	100%	303	100%
elctricity at home										
yes	1	3%	7	3%	6	32%	3	100%	17	6%
no	30	97%	243	97%	13	68%	0	0%	286	94%
total	31	100%	250	100%	19	100%	3	100%	303	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	0	0%	0	0%
cemented latrine	0	0%	43	17%	16	84%	3	100%	62	20%
simple latrine	19	61%	201	80%	3	16%	0	0%	223	74%
no toilet	12	39%	6	2%	0	0%	0	0%	18	6%
no information	0	0%	0	0%	0	0%	0	0%	0	0%
total	31	100%	250	100%	19	100%	3	100%	303	100%
fuel for cooking										
gas	0	0%	1	0%	0	0%	2	67%	3	1%
kerosene	0	0%	5	2%	1	5%	0	0%	6	2%
charcoal	0	0%	0	0%	1	5%	0	0%	1	0%
wood	17	55%	220	88%	17	89%	1	33%	255	84%
millet stalk	8	26%	8	3%	0	0%	0	0%	16	5%
no cooking	6	19%	5	2%	0	0%	0	0%	11	4%
no information	0	0%	11	4%	0	0%	0	0%	11	4%
total	31	100%	250	100%	19	100%	3	100%	303	100%
level of lodging										
cemented house	0	0%	6	2%	6	32%	2	67%	14	5%
mix form	0	0%	7	3%	4	21%	0	0%	11	4%
house with adobes	31	100%	236	94%	9	47%	1	33%	277	91%
no information	0	0%	1	0%	0	0%	0	0%	1	0%
total	31	100%	250	100%	19	100%	3	100%	303	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	2	11%	3	100%	5	2%
no	31	100%	250	100%	17	89%	0	0%	298	98%
total	31	100%	250	100%	19	100%	3	100%	303	100%
refrigerator										
yes	0	0%	0	0%	1	5%	3	100%	4	1%
no	31	100%	250	100%	18	95%	0	0%	299	99%
total	31	100%	250	100%	19	100%	3	100%	303	100%
TV										
yes	31	100%	3	1%	5	26%	3	100%	42	14%
no	0	0%	247	99%	14	74%	0	0%	261	86%
total	31	100%	250	100%	19	100%	3	100%	303	100%
radio										
yes	8	26%	172	69%	13	68%	1	33%	194	64%
no	23	74%	78	31%	6	32%	2	67%	109	36%
total	31	100%	250	100%	19	100%	3	100%	303	100%
means of transportation										
car										
yes	0	0%	0	0%	1	5%	0	0%	1	0%
no	31	100%	250	100%	18	95%	3	100%	302	100%
total	31	100%	250	100%	19	100%	3	100%	303	100%
motorcycle										
yes	0	0%	46	18%	13	68%	2	67%	61	20%
no	31	100%	204	82%	6	32%	1	33%	242	80%
total	31	100%	250	100%	19	100%	3	100%	303	100%
bicycle										
yes	2	6%	149	60%	11	58%	1	33%	163	54%
no	29	94%	101	40%	8	42%	2	67%	140	46%
total	31	100%	250	100%	19	100%	3	100%	303	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Non-Home Gardeners`	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
Households	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	28	9%	212	68%	49	16%	21	7%	310	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	3	1%	15	31%	19	90%	37	12%
hand-dug well	0	0%	26	12%	8	16%	1	5%	35	11%
water seller	8	29%	95	45%	20	41%	0	0%	123	40%
public well in a quarter	17	61%	82	39%	3	6%	1	5%	103	33%
no information	3	11%	6	3%	3	6%	0	0%	12	4%
total	28	100%	212	100%	49	100%	21	100%	310	100%
elctricity at home										
yes	0	0%	7	3%	24	49%	21	100%	52	17%
no	28	100%	205	97%	25	51%	0	0%	258	83%
total	28	100%	212	100%	49	100%	21	100%	310	100%
type of toilet										
water toilet	0	0%	0	0%	1	2%	5	24%	6	2%
cemented latrine	1	4%	33	16%	35	71%	16	76%	85	27%
simple latrine	19	68%	172	81%	13	27%	0	0%	204	66%
no toilet	6	21%	6	3%	0	0%	0	0%	12	4%
no information	2	7%	1	0%	0	0%	0	0%	3	1%
total	28	100%	212	100%	49	100%	21	100%	310	100%
fuel for cooking										
gas	0	0%	0	0%	14	29%	15	71%	29	9%
kerosene	0	0%	7	3%	4	8%	0	0%	11	4%
charcoal	0	0%	9	4%	4	8%	0	0%	13	4%
wood	7	25%	182	86%	25	51%	6	29%	220	71%
millet stalk	0	0%	1	0%	0	0%	0	0%	1	0%
no cooking	17	61%	10	5%	1	2%	0	0%	28	9%
no information	4	14%	3	1%	1	2%	0	0%	8	3%
total	28	100%	212	100%	49	100%	21	100%	310	100%
level of lodging										
cemented house	0	0%	13	6%	32	65%	21	100%	66	21%
mix form	0	0%	10	5%	3	6%	0	0%	13	4%
house with adobes	28	100%	189	89%	14	29%	0	0%	231	75%
no information	0	0%	0	0%	0	0%	0	0%	0	0%
total	28	100%	212	100%	49	100%	21	100%	310	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	8	16%	19	90%	27	9%
no	28	100%	212	100%	41	84%	2	10%	283	91%
total	28	100%	212	100%	49	100%	21	100%	310	100%
refrigerator										
yes	0	0%	0	0%	1	2%	11	52%	12	4%
no	28	100%	212	100%	48	98%	10	48%	298	96%
total	28	100%	212	100%	49	100%	21	100%	310	100%
TV										
yes	0	0%	1	0%	25	51%	21	100%	47	15%
no	28	100%	211	100%	24	49%	0	0%	263	85%
total	28	100%	212	100%	49	100%	21	100%	310	100%
radio										
yes	10	36%	155	73%	44	90%	13	62%	222	72%
no	18	64%	57	27%	5	10%	8	38%	88	28%
total	28	100%	212	100%	49	100%	21	100%	310	100%
means of transportation										
car										
yes	0	0%	1	0%	2	4%	4	19%	7	2%
no	28	100%	211	100%	47	96%	17	81%	303	98%
total	28	100%	212	100%	49	100%	21	100%	310	100%
motorcycle										
yes	0	0%	57	27%	29	59%	12	57%	98	32%
no	28	100%	155	73%	20	41%	9	43%	212	68%
total	28	100%	212	100%	49	100%	21	100%	310	100%
bicycle										
yes	6	21%	107	50%	26	53%	7	33%	146	47%
no	22	79%	105	50%	23	47%	14	67%	164	53%
total	28	100%	212	100%	49	100%	21	100%	310	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Boulmiougou	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	3	1%	142	67%	45	21%	23	11%	213	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	8	6%	21	47%	20	87%	49	23%
hand-dug well	0	0%	43	30%	10	22%	1	4%	54	25%
water seller	1	33%	35	25%	10	22%	0	0%	46	22%
public well in a quarter	2	67%	49	35%	2	4%	2	9%	55	26%
no information	0	0%	7	5%	2	4%	0	0%	9	4%
total	3	100%	142	100%	45	100%	23	100%	213	100%
elctricity at home										
yes	0	0%	4	3%	22	49%	23	100%	49	23%
no	3	100%	138	97%	23	51%	0	0%	164	77%
total	3	100%	142	100%	45	100%	23	100%	213	100%
type of toilet										
water toilet	0	0%	0	0%	1	2%	5	22%	6	3%
cemented latrine	0	0%	62	44%	40	89%	18	78%	120	56%
simple latrine	3	100%	78	55%	4	9%	0	0%	85	40%
no toilet	0	0%	2	1%	0	0%	0	0%	2	1%
no information	0	0%	0	0%	0	0%	0	0%	0	0%
total	3	100%	142	100%	45	100%	23	100%	213	100%
fuel for cooking										
gas	0	0%	1	1%	11	24%	17	74%	29	14%
kerosene	0	0%	10	7%	4	9%	0	0%	14	7%
charcoal	0	0%	7	5%	5	11%	0	0%	12	6%
wood	0	0%	117	82%	25	56%	6	26%	148	69%
millet stalk	0	0%	0	0%	0	0%	0	0%	0	0%
no cooking	0	0%	0	0%	0	0%	0	0%	0	0%
no information	3	100%	7	5%	0	0%	0	0%	10	5%
total	3	100%	142	100%	45	100%	23	100%	213	100%
level of lodging										
cemented house	0	0%	4	3%	29	64%	22	96%	55	26%
mix form	0	0%	0	0%	1	2%	0	0%	1	0%
house with adobes	3	100%	138	97%	15	33%	1	4%	157	74%
no information	0	0%	0	0%	0	0%	0	0%	0	0%
total	3	100%	142	100%	45	100%	23	100%	213	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	7	16%	21	91%	28	13%
no	3	100%	142	100%	38	84%	2	9%	185	87%
total	3	100%	142	100%	45	100%	23	100%	213	100%
refrigerator										
yes	0	0%	0	0%	2	4%	13	57%	15	7%
no	3	100%	142	100%	43	96%	10	43%	198	93%
total	3	100%	142	100%	45	100%	23	100%	213	100%
TV										
yes	0	0%	0	0%	17	38%	23	100%	40	19%
no	3	100%	142	100%	28	62%	0	0%	173	81%
total	3	100%	142	100%	45	100%	23	100%	213	100%
radio										
yes	2	67%	123	87%	36	80%	13	57%	174	82%
no	1	33%	19	13%	9	20%	10	43%	39	18%
total	3	100%	142	100%	45	100%	23	100%	213	100%
means of transportation										
car										
yes	0	0%	0	0%	2	4%	4	17%	6	3%
no	3	100%	142	100%	43	96%	19	83%	207	97%
total	3	100%	142	100%	45	100%	23	100%	213	100%
motorcycle										
yes	0	0%	53	37%	29	64%	13	57%	95	45%
no	3	100%	89	63%	16	36%	10	43%	118	55%
total	3	100%	142	100%	45	100%	23	100%	213	100%
bicycle										
yes	0	0%	106	75%	25	56%	7	30%	138	65%
no	3	100%	36	25%	20	44%	16	70%	75	35%
total	3	100%	142	100%	45	100%	23	100%	213	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Tanghin	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	26	12%	163	78%	19	9%	1	0%	209	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	0	0%	1	5%	1	100%	2	1%
hand-dug well	2	8%	12	7%	2	11%	0	0%	16	8%
water seller	5	19%	73	45%	13	68%	0	0%	91	44%
public well in a quarter	8	31%	64	39%	2	11%	0	0%	74	35%
no information	11	42%	14	9%	1	5%	0	0%	26	12%
total	26	100%	163	100%	19	100%	1	100%	209	100%
elctricity at home										
yes	1	4%	10	6%	7	37%	1	100%	19	9%
no	25	96%	153	94%	12	63%	0	0%	190	91%
total	26	100%	163	100%	19	100%	1	100%	209	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%	0	0%	0	0%
cemented latrine	0	0%	12	7%	7	37%	1	100%	20	10%
simple latrine	21	81%	147	90%	12	63%	0	0%	180	86%
no toilet	4	15%	4	2%	0	0%	0	0%	8	4%
no information	1	4%	0	0%	0	0%	0	0%	1	0%
total	26	100%	163	100%	19	100%	1	100%	209	100%
fuel for cooking										
gas	0	0%	0	0%	3	16%	0	0%	3	1%
kerosene	0	0%	0	0%	1	5%	0	0%	1	0%
charcoal	0	0%	0	0%	0	0%	0	0%	0	0%
wood	12	46%	137	84%	13	68%	1	100%	163	78%
millet stalk	1	4%	6	4%	0	0%	0	0%	7	3%
no cooking	12	46%	14	9%	1	5%	0	0%	27	13%
no information	1	4%	6	4%	1	5%	0	0%	8	4%
total	26	100%	163	100%	19	100%	1	100%	209	100%
level of lodging										
cemented house	0	0%	13	8%	8	42%	1	100%	22	11%
mix form	0	0%	6	4%	4	21%	0	0%	10	5%
house with adobes	26	100%	143	88%	7	37%	0	0%	176	84%
no information	0	0%	1	1%	0	0%	0	0%	1	0%
total	26	100%	163	100%	19	100%	1	100%	209	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	3	16%	1	100%	4	2%
no	26	100%	163	100%	16	84%	0	0%	205	98%
total	26	100%	163	100%	19	100%	1	100%	209	100%
refrigerator										
yes	0	0%	0	0%	0	0%	1	100%	1	0%
no	26	100%	163	100%	19	100%	0	0%	208	100%
total	26	100%	163	100%	19	100%	1	100%	209	100%
TV										
yes	0	0%	3	2%	11	58%	1	100%	15	7%
no	26	100%	160	98%	8	42%	0	0%	194	93%
total	26	100%	163	100%	19	100%	1	100%	209	100%
radio										
yes	11	42%	120	74%	18	95%	1	100%	150	72%
no	15	58%	43	26%	1	5%	0	0%	59	28%
total	26	100%	163	100%	19	100%	1	100%	209	100%
means of transportation										
car										
yes	0	0%	0	0%	1	5%	1	100%	2	1%
no	26	100%	163	100%	18	95%	0	0%	207	99%
total	26	100%	163	100%	19	100%	1	100%	209	100%
motorcycle										
yes	0	0%	34	21%	10	53%	1	100%	45	22%
no	26	100%	129	79%	9	47%	0	0%	164	78%
total	26	100%	163	100%	19	100%	1	100%	209	100%
bicycle										
yes	4	15%	75	46%	11	58%	1	100%	91	44%
no	22	85%	88	54%	8	42%	0	0%	118	56%
total	26	100%	163	100%	19	100%	1	100%	209	100%

Appendix VIII Socio-Economic Indicators

Dry Season 1998	**SOCIO-ECONOMIC STATUS**									
Kossodo	**class 1**		**class 2**		**class 3**		**class 4**		**total**	
	n	[%]	n	[%]	n	[%]	n	[%]	n	[%]
	30	16%	157	82%	4	2%	0	0%	191	100%
INDICATORS										
equipement of the house										
drinking water sources										
tap at home	0	0%	1	1%	1	25%			2	1%
hand-dug well	1	3%	4	3%	0	0%			5	3%
water seller	5	17%	55	35%	3	75%			63	33%
public well in a quarter	23	77%	96	61%	0	0%			119	62%
no information	1	3%	1	1%	0	0%			2	1%
total	30	100%	157	100%	4	100%			191	100%
elctricity at home										
yes	0	0%	0	0%	1	25%			1	1%
no	30	100%	157	100%	3	75%			190	99%
total	30	100%	157	100%	4	100%			191	100%
type of toilet										
water toilet	0	0%	0	0%	0	0%			0	0%
cemented latrine	1	3%	2	1%	4	100%			7	4%
simple latrine	14	47%	148	94%	0	0%			162	85%
no toilet	14	47%	6	4%	0	0%			20	10%
no information	1	3%	1	1%	0	0%			2	1%
total	30	100%	157	100%	4	100%			191	100%
fuel for cooking										
gas	0	0%	0	0%	0	0%			0	0%
kerosene	0	0%	2	1%	0	0%			2	1%
charcoal	0	0%	2	1%	0	0%			2	1%
wood	12	40%	148	94%	4	100%			164	86%
millet stalk	7	23%	3	2%	0	0%			10	5%
no cooking	11	37%	1	1%	0	0%			12	6%
no information	0	0%	1	1%	0	0%			1	1%
total	30	100%	157	100%	4	100%			191	100%
level of lodging										
cemented house	0	0%	2	1%	1	25%			3	2%
mix form	0	0%	11	7%	2	50%			13	7%
house with adobes	30	100%	144	92%	1	25%			175	92%
no information	0	0%	0	0%	0	0%			0	0%
total	30	100%	157	100%	4	100%			191	100%
electrical appliances										
ventilator										
yes	0	0%	0	0%	4	100%			4	2%
no	30	100%	157	100%	0	0%			187	98%
total	30	100%	157	100%	4	100%			191	100%
refrigerator										
yes	0	0%	0	0%	0	0%			0	0%
no	30	100%	157	100%	4	100%			191	100%
total	30	100%	157	100%	4	100%			191	100%
TV										
yes	0	0%	1	1%	2	50%			3	2%
no	30	100%	156	99%	2	50%			188	98%
total	30	100%	157	100%	4	100%			191	100%
radio										
yes	5	17%	84	54%	3	75%			92	48%
no	25	83%	73	46%	1	25%			99	52%
total	30	100%	157	100%	4	100%			191	100%
means of transportation										
car										
yes	0	0%	1	1%	0	0%			1	1%
no	30	100%	156	99%	4	100%			190	99%
total	30	100%	157	100%	4	100%			191	100%
motorcycle										
yes	0	0%	16	10%	3	75%			19	10%
no	30	100%	141	90%	1	25%			172	90%
total	30	100%	157	100%	4	100%			191	100%
bicycle										
yes	4	13%	75	48%	1	25%			80	42%
no	26	87%	82	52%	3	75%			111	58%
total	30	100%	157	100%	4	100%			191	100%

Appendix IX Definitions of poverty given by the study population

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"What does poverty mean for you?"

Question asked in several home gardeners' (HG) and non-home gardeners' households of all socio-economic classes in Boulmiougou, Tanghin and Kossodo in Ouagadougou, November 2000
Because the interviews were held in Morée (the local language of the Mossi people living in Ouagadougou) 'poverty' or 'ill-being' was explained with the Morée word *'talamdo'*.

Poverty is...

„...if I don't have enough to eat."
HG (male, aged 42, class 1/2) with three wives and 11 children in Boulmiougou
HG (male, aged 49, class 1/2) living with his two wives, his five children, his brother with wife and his nephew with wife and child in the same courtyard in Boulmiougou
HG (male, aged 21, class 3) in Boulmiougou
HG (male, aged 40, class 1/2) in Boulmiougou

„...the ignorance, the lack of financial means and the lack of health."
Trader (male, aged 40, class 1/2) in Tanghin

„...the lack of money and the lack of rain."
HG (male, aged 45, class 1/2) in Tanghin

„... not having a job, money and health."
Mechanic (male, aged 35, class 3) in Tanghin

„...the lack of potential and capacity to improve my current life."
Worker (male, aged 33, class 3) in Tanghin

„... the lack of money and health."
HG (male, aged 46, class 1/2) in Tanghin
HG (male, aged 43, class 1/2) in Tanghin

„...the lack of money and knowledge."
Trader (male, aged 46, class 4) in Tanghin
HG (male, aged 48, class 1/2) in Tanghin

„...the lack of money and knowledge to take care of oneself."
Wife (aged 36, class 4) of an animal breeder in Tanghin

„...the inability to cover my basic needs and the absence of enough food."
HG (male, aged 56, class 1/2) in Tanghin

Poverty is...

„...the absence of food, shelter and medicine.“
HG (female, aged 53, class 1/2) in Tanghin

„...if I don't have money.“
Trader (female, aged 46, class 1/2) in Tanghin
Trader (male, 52, class 4) in Tanghin
HG (male, aged 41, class 1/2) in Kossodo
Housewife (female, aged 29, class 3) in Kossodo
Part-time worker (male, aged 30, class 1/2) in Kossodo
Trader (male, aged 44, class 1/2) in Boulmiougou
HG (male, aged 24, class 1/2) in Boulmiougou

„...being illiterate and not healthy without having enough food.“
Night Guard (male, aged 47, class 1/2) in Tanghin

„...absence of food and money to look after myself.“
HG (female, aged 53, class 1/2) in Tanghin

“For me poverty means a lack of money. If you don't have money you can't buy clothes, shoes and food.”
HG (male, aged 37, class 1/2) in Kossodo

„...if you aren't able to look after your family having enough food and clothes.“
HG (female, aged 38, class 1/2) in Kossodo

„...is the lack of money to buy all you want.“
HG (female, aged 40, class 1/2) in Kossodo

„...if you don't have enough food, no clothes and you can't take care of yourself.“
HG (male, aged 24, class 1/2) in Kossodo

„...if you aren't able to feed yourself and your whole family, to give them clothes and to look after them.“
HG (male, aged 39, class 3) in Kossodo

„...the inability to have enough food, to take care of myself and my family and to send my children to school.“
Worker (male, aged 32, class 3) in Kossodo

„...if you don't have the money to feed your family and to send your children to school.“
Worker (male, aged 30, class 3) in Kossodo
Driver (male, aged 29, class 3) in Boulmiougou

Poverty is...

„...if you don't have the means to buy what you need."
Part-time Worker (male, aged 32, class 1/2) in Kossodo

„...if you don't have enough money to make sure to have enough food, to stay healthy and to achieve all the basic needs for your family."
Cultivator (male, aged 25, class 1/2) in Kossodo

„...if you don't have the financial means to take care of yourself and your whole family."
Night Guard (male, aged 33, class 1/2) in Boulmiougou

„...if you don't have the money to cover your basic needs."
Fireman (male, aged 27, class 1/2) in Boulmiougou
Trader (male, aged 33, class 3) in Boulmiougou

„...if you aren't able to feed yourself and your whole family, to give them clothes, to look after them and to sent your children to school."
Teacher (female, aged 28, class 3) in Boulmiougou
Dealer (female, aged 29, class 4) in Boulmiougou
Medicine (female, aged 32, class 4) in Kossodo
Trader (male, aged 37, class 4) in Kossodo

„...is the lack of money to satisfy your needs."
Mechanic (male, aged 38, class 4) in Boulmiougou

„...if you don't have at least enough money for food."
HG (male, aged 47, class 1/2) living with his two wives, his eight children, his mother and three cousins in the same courtyard in Boulmiougou

„...if I don't achieve to have food and to dress myself."
HG (male, aged 32, class 4) in Boulmiougou

Curriculum Vitae

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Languages German, English, French, Italian, Spanish, (Chinese/Mandarin)

Education, Qualification, Working Experience

09/79-05/88	Georgii Gymnasium, Esslingen, Germany Examination: Abitur (equivalent A-Level)
10/88-08/89	Study of Biology, University 'La Sapienza', Rome, Italy Subject: Biology
10/89-10/94	Study of Biology, Eberhard-Karls University, Tübingen, Germany Master in Biology Master's Dissertation (Diplom) titled 'Identification of Mosquitoes of *Anopheles gambiae s.l.* as Vectors of Malaria in Uganda and Mali by PCR and ELISA Techniques' Supervision: P.D. Dr. Jörg Grunewald, Institute for Tropical Medicine, Eberhard-Karls University, Tübingen, Germany
10/94-01/95	Course 'Master Internacional en Enfermedades Parasitarias Tropicales', University of Valencia, Spain Examination: Master Internacionales en Enfermedades Parasitarias Tropicales
03/95-02/97	Postgraduate Program 'International Marketing' (focal point: 'Asia/Pacific'), Export Academy, Reutlingen, Germany Examination: MBA
08/95-09/95	Internship at the World Health Organization, Division of Tropical Disease Research (TDR), Geneva, Switzerland Supervision: Steven Wayling, Dr. Howard Engers
02/96-05/96	MBA Dissertation (Diplom) titled 'The Economic Impact of Lymphatic Filariasis' Supervision: Dr. David Evans, Division of Tropical Disease Research (TDR), World Health Organization, Geneva, Switzerland
09/96-02/97	Study abroad at the Tongji University, Shanghai, PR China, in connection with the MBA study with focal point 'Asia/Pacific'

08/97–09/99	Marketing at the pharmaceutical company Madaus, Cologne, Germany as assistant of the marketing and sales member of the board and product manager for a prescription drug
since 03/00	Freelancer at the agency 'GVMS' (agency for seminars, training and marketing services) in Cologne, Germany
since 03/99	Swiss Tropical Institute, Bale, Switzerland and EIER (Ecole Inter-Etats d`Ingénieures de l`Equipement Rural), Ouagadougou, Burkina Faso PhD Thesis in Epidemiology titled 'The Economic Costs and Impact of Home Gardening in Ouagadougou, Burkina Faso' Supervision: Prof. Dr. Marcel Tanner

Congress Abstract:

International Conference 'Water & Health, Ouaga 2000', Ouagadougou, 2000: 'Estimate the Economic Costs of Home Gardening in Ouagadougou, Burkina Faso's Capital in the Dry and Rainy Season'

During my studies I attended lectures and courses given by the following lecturers:

A. Ammermann, R. Apfelbach, M.D. Bargues, C. Bigelow, D. Bunke, J.E. Buring, W. Büsen, S. Busch, R. Capineri, K. Detzer, J.G. Esteban, D. Fink, J. Fuß, M.T. Galan, N. Gaspardo, W. Glaser, J. Grunewald, C. Jönsson, E. Kulzer, W. Lehmacher, H. Lindner, W. Lutzenberger, S. Mas-Coma, W. Maier, C. Meier-Brook, G. Mickoleit, D. Müller, W. Niehoff, F. Oberwinkler, C. Pelling, R. Pfeiffer, W. Rähle, G. Reitz, A. Rieker, W.J. Schmidt, F. Schöffl, H.-U. Schnitzler, D. Sperlich, B. Schwemmle, M. Tanner, R. Trede, D. Varjú, G.J. Wagner, K. Wöhrmann, A. Wörz