

**COPING WITH HOUSEHOLD FOOD INSECURITY:  
A LONGITUDINAL AND SEASONAL STUDY AMONG THE  
OTAMMARI IN NORTH-WESTERN BENIN**

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NA02701, 1699

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Marti J. van Liere

Proefschrift  
ter verkrijging van de graad van doctor  
in de landbouw- en milieuwetenschappen,  
op gezag van de rector magnificus,  
dr. C.M. Karssen,  
in het openbaar te verdedigen  
op vrijdag 19 november 1993  
des namiddags om half twee in de Aula  
van de Landbouww Universiteit te Wageningen

isn 590195

*This study was financially supported by the Science and Technology for Development Programme of the European Community, contract no. TS2-0150-NL and no. TS3\*-CT91-0026.*

**BIBLIOTHEEK  
LANDBOUWUNIVERSITEIT  
WAGENINGEN**

CIP-DATA KONINKLIJKE BIBLIOTHEEK, DEN HAAG

Liere, Marti J. van

Coping with household food insecurity: a longitudinal and seasonal study among the Otammari in north-western Benin / Marti J. van Liere, - [S.l. : s.n.]

Thesis Wageningen. - With ref. - With summary in Dutch and French.

ISBN 90-5485-175-9

Subject headings: food insecurity ; Benin.

Cover design: Ernst van Cleef

Printing: Grafisch Service Centrum, LUW

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**STELLINGEN**

1. "Coping" strategieën die door huishoudens met een onvoldoende voedselvoorraad worden toegepast voorkomen dat mannen en vrouwen in deze groep meer gewicht verliezen, in perioden van voedselonzekeheid, dan mannen en vrouwen in huishoudens die wel een voldoende voedselvoorraad hebben.

*Dit proefschrift.*

2. Mannen zijn verantwoordelijk voor de productie van het basisvoedsel, maar wanneer deze productie onvoldoende is, is het de taak van de vrouwen om hiervoor oplossingen te vinden.

*Dit proefschrift.*

3. " The challenge of seasonality research demands a multi-disciplinary approach which implies that depth of treatment is sacrificed to breadth of coverage ".

*Gill G.J. (1991). Seasonality and agriculture in the developing world; a problem of the poor and the powerless. University Press, Cambridge.*

4. In tijden van stress vertonen AIO's hetzelfde "coping" gedrag als Noord-Beninese boeren; namelijk, steun zoeken bij hun sociale netwerken.

*Dit proefschrift.*

5. Kennis van het voedselsysteem en de voedingsgewoonten van een bevolkingsgroep is essentieel in het verkrijgen van inzicht in het ontstaan van voedingsproblemen en is met name van belang voor het implementeren van voedingsinterventies.

6. Strategieën die effectief zijn in het bestrijden van voedselonzekeheid op korte termijn kunnen, op lange termijn, een averechts effect hebben op de voedselzekerheid en zelfs op de bestaanszekerheid van een huishouden.

7. " Improvement of rural physical infrastructure contributes in many ways to the improvement of nutrition in a community ".

*Kumar S.K. (1988). Infrastructure and agriculture. Effects on nutrition in Bangladesh and Zambia. IFPRI Policy Briefs 3.*

8. De internationalisering van de Landbouwwuniversiteit mag op vele gebieden een verruiming heten maar op taalgebied betekent het een beperking tot het Engels.
9. De uitspraak van Alexander Pope : " Fools rush in where angels fear to tread ", is ook van toepassing op wetenschappelijk onderzoek.  
*Pope A., An essay on criticism, (1711).*
10. De geografische ruimte en het sociaal-economisch draagvlak in de wereld zijn te beperkt om tegemoet te komen aan de wensen van alle nationalistische groeperingen.
11. Het feit dat men overal ter wereld Nederlanders tegenkomt kan beter verklaard worden uit ruimtegebrek in eigen land dan uit een nationale reislust.
12. De zeeuwse interpretatie van " Luctor et emergo " (luk 't vandaeghe nie dan luk 't merrege) lijkt in tegenspraak met de realiteit van de zeeuwse calvinistische volksaard.
13. Promoveren is als motorrijden: in het begin voorzichtig en wankelend maar aan het eind "oerend hard".

*Stellingen behorend bij het proefschrift " Coping with household food insecurity: a longitudinal and seasonal study among the Otammari in north-western Benin " van Marti J. van Liere. Wageningen, 19 november 1993.*

## **Abstract**

### **COPING WITH HOUSEHOLD FOOD INSECURITY: A LONGITUDINAL AND SEASONAL STUDY AMONG THE OTAMMARI IN NORTH-WESTERN BENIN**

*Thesis by Marti J. van Liere, Department of Human Nutrition,  
Wageningen Agricultural University, Wageningen, The Netherlands,  
19th November 1993*

A longitudinal and seasonal study was designed to examine the relationships between, at one hand, coping with food insecurity and socio-economic characteristics at household level and, at the other hand, food consumption, time allocation and nutritional status at individual level in a unimodal climate in north-western Benin.

Body weight of men and women was frequently measured during two consecutive years. Body weight fluctuations of 5-6% occurred but variation in seasonal body weight fluctuation could not be explained by socio-economic household characteristics. Neither a relationship was found between household cereal stock, indicating the level of household food security, and individual seasonal body weight fluctuation. It appeared that households with sufficient and insufficient cereal stock differed in their coping behaviour pattern. However this was not reflected in differences in seasonal body weight loss. Households with insufficient cereal stock made more use of coping behaviour such as gathering wild foods, selling livestock, seasonal migration and reduction of number of meals or fasting. Dietary changes at individual level during the preharvest period were characterized by a decreased cereal intake, an increased consumption of pulses and tubers and an increased consumption of food gifts, purchased foods and wild foods. Children seemed to be protected in times of seasonal food insecurity by a more favourable food allocation. Gender differences in subsistence task distribution showed more working hours for women compared to men, combining home production with field production tasks. Men were mainly responsible for food production and assistance at work parties. In times of seasonal food insecurity women were more engaged in coping with this adverse situation than men.

It may be concluded that household food insecurity does not necessarily lead to food insecurity at individual level since it can be favourably counterbalanced by local coping behaviour. This conclusion confirms that development projects to promote household food security should take seriously into consideration an enforcement of existing local coping behaviour patterns rather than a replacement by innovations from outside.

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## Chapter 1

### GENERAL INTRODUCTION

Self-subsistent farmers in developing countries experience regularly periods of food shortage, the so-called "hungry seasons". Their food production is fully dependent on the distribution of rainfall and food shortage occurs during the rainy pre-harvest season, when the agricultural field work is most intensive. This unfortunate coincidence of opposite seasonal fluctuations in food security and heavy work load affects both nutritional and health status of individuals as well as their socio-economic life. This seasonality phenomenon is a recurrent problem in rural Africa and people adjust, consciously or unconsciously, to the demands of this adverse situation. These adaptations may occur at individual and at household level.

The majority of studies on the effects of seasonal variations at individual level comprise data on energy intake, energy expenditure and nutritional status (Leonard and Thomas,1989; Durnin,1990; Ferro-Luzzi,1990; Schultink,1991).

A number of other studies has focused on the adaptations to fluctuations in food availability at household level, often referred to as coping strategies (Annegers,1973; Campbell and Trechter,1982; Watts,1983; White,1986; de Garine,1988; Reardon *et al.*,1988; Pagézy,1988). The set of coping strategies reported by these descriptive studies is remarkably uniform and involves changes in cropping pattern, income diversification, sale of assets or livestock, migration, changes in food pattern and reliance on social networks. Only a limited number of these studies followed a quantitative approach when describing coping with seasonal food shortages.

In this chapter the concepts of food security, seasonality and coping are discussed, followed by a description of the larger research programme, the study objectives and study area. The presented study focuses on household food insecurity in a part of tropical Africa where the population is mainly self-subsistent in food production with little or no developed cultivation techniques.

### **Food security**

The growth of global food production has been faster than the population growth during the past forty years (FAO,1987). Yet in many developing countries, especially in rural Africa, food security at household level or even at higher levels does not exist. *Food security is defined as access by all people at all times to enough food for an active, healthy life* (UN ACC/SCN,1991). This definition has four characteristics: sufficiency, access, security and time (Maxwell and Frankenberger,1992). Food should be sufficient in terms of energy but also in protein and micro-nutrients. It should be adequate with regard to quality, quantity, safety and it should be culturally acceptable. Food should not only be available but also accessible to people. Access to food depends on an individual's entitlements, e.g. the initial resource bundle, which is transformed via production and trade into food or commodities which can be exchanged for food. The third characteristic concerns secure access to enough food. A risk of entitlement failure and the costs borne in the event of failure have to be taken into account when discussing household food security. Finally, with regard to the time dimension, two types of food insecurity can be distinguished: chronic and transitory food insecurity (World Bank,1986). Chronic food insecurity stands for a continuously insufficient diet caused by the inability of households to acquire food. Transitory food insecurity is a temporary decline in household's access to food, either through instability in food prices, food production or household incomes.

Conceptual issues concerning the above-mentioned definition of food security have been discussed by Maxwell and Frankenberger (1992). Some of these issues are: intra-household allocation, livelihood, sustainability, efficiency and cost-effectiveness.

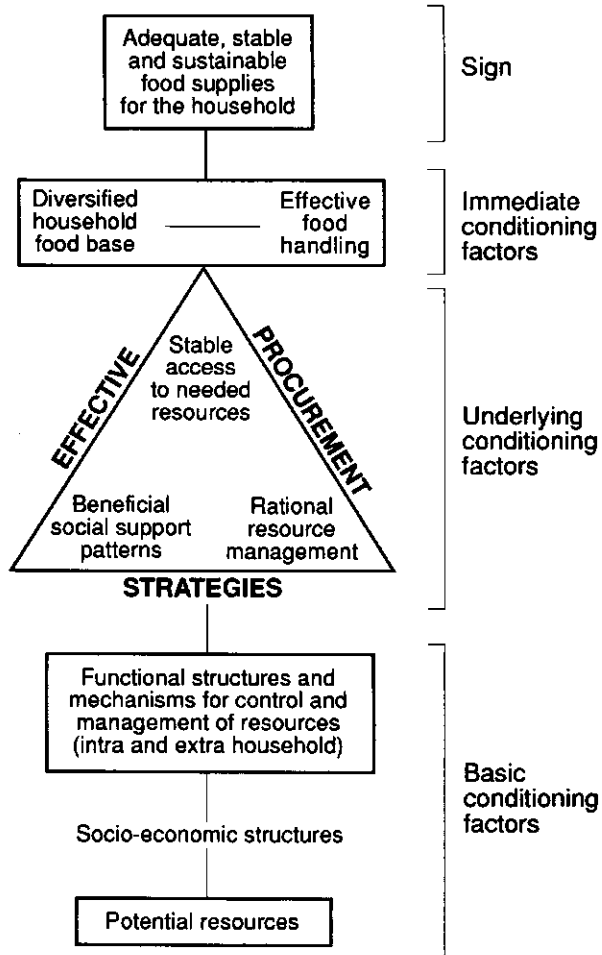
The intra-household issue is of importance, especially in sub-Saharan Africa because units of production, consumption or residence do often not overlap. Gender task distribution and intra-household food distribution are therefore important features in understanding how people deal with food insecurity.

A household's livelihood refers to adequate stocks and flows of food and cash to meet basic needs, in other words it refers to the household's resource base. Households are successful in coping with food insecurity when they can find a balance between meeting immediate food needs and longer term livelihood sustainability.

Sustainability of food security depends on resilience, which is the elasticity, and sensitivity of a household. Livelihood systems with a high resilience and low sensitivity are easily sustainable to degradation, whereas livelihoods with low resilience and high sensitivity degrade easily and do not respond to efforts at restoration.

Food security requires an efficient and equitable operation of the food system. However, sometimes inefficient production may have a higher priority than maximising expected incomes when it ensures secure access to food.

The International Fund for Agricultural Development (IFAD) has derived an analytical framework for household food security (Frankenberger *et al.*,1993) from the UNICEF model for causes of malnutrition (Figure 1). The model identifies the conditions of food supply which are adequacy, stability and sustainability, as the sign of the household food security situation. The state of household food supply can be characterized amongst others by the diversity of food types and the annual patterns of supply availability. The second level of immediate conditioning factors refers to access to and procurement of foods from different sources and to effectiveness of food handling, which is storage, conservation and processing. Together these factors may enhance or constrain prolonged access to and composition of food supply. Underlying conditioning factors are identified as stable access to needed resources, management of these resources and social support patterns. Resources comprise cash, labour, land, tools and public services. Household expenditure patterns, usage of household as well as wild resources are important features at the management level. Social support refers to social networks within and outside the household. Basic conditioning factors are found both at household level and at local or higher level. Important factors within the household are decision-making and resource-control structures. Furthermore, agro-ecological conditions and existing market systems determine the potential resource base of a household and the particular food systems.



**Figure 1** *Factors conditioning household food security*  
 (IFAD, Frankenberger et al., 1993)

The concept of household food security is a useful framework which improves the understanding of the opportunities, practices and constraints of households in attaining access to sufficient and adequate food to satisfy the dietary needs of their members under changing conditions. Furthermore it is also an useful development objective for efforts intended to promote sustained availability and access to adequate food for target groups in question (Maxwell and Frankenberger,1992). An understanding of household food security processes and coping behaviour is essential in guiding the design and implementation of interventions to increase household food security and foreseeing the impact development programmes may have (McCorkle,1987; Nabarro *et al.*,1989; Von Braun *et al.*,1992).

### **Seasonality**

Seasonality was essentially recognized as the existence of a certain period or periods during the year when food availability was scarce but the need for food was high. Climatic seasonality in the tropics is primarily defined by the rainfall distribution throughout the year. A distinction can be made between unimodal and bimodal climates. In general, people living in a bimodal climate experience two rainy seasons and two dry seasons a year and can therefore produce two harvests a year. People living in a unimodal climate are dependent on only one harvest a year following one rainy season (Foeken and Hoorweg,1988).

It is this seasonal pattern in rainfall which causes seasonal fluctuations in other aspects of life. Chambers *et al.* (1979) described an ideal scenario in which many seasonal dimensions of life were involved: seasonal agricultural labour needs, differences in food supply and food availability, fluctuations in prices of crop and food stuffs, variations in health and illnesses and changes in social life. Seasonal fluctuations in food production and in food prices are often important contributors to transitory food insecurity (Sahn,1989). In general, food insecurity and other adverse factors seem to operate concurrently during the wet seasons and tend to hit the poor people hardest.

Studies aiming at biological, metabolic and behavioral adaptation at individual

level (Leonard and Thomas,1989; Durnin,1990; Ferro-Luzzi,1990; Schultink,1991) provided evidence for biological adaptations (seasonal body weight loss) but not for metabolic or behavioral adaptations. When describing seasonal body weight fluctuation, seasonal fluctuation in energy intake or energy expenditure, the question which group suffers more from seasonal food stress than others, received little attention.

### **Coping**

People, affected by adverse seasonal conditions do not sit and wait for the problems to arrive but they have developed actions to cope with these problems. Many studies have looked into these actions, often referred to as coping strategies (Campbell and Trechter,1982; de Garine,1988; Pagézy,1988; Reardon *et al.*,1988). The term strategy is confusing in this respect because it implies a preventive measure which is carefully planned. However, coping does not consist of isolated actions but according to Campbell (1990) "Many actions taken are an integral part of the rural livelihood system. They are not unique measures resorted to only in times of stress but are elements that exist at all times and assume greater importance under difficult conditions".

It seems useful to distinguish between measures to prevent seasonal food stress and measures to meet actual food stress (Foeken and Hoorweg,1988). Throughout this thesis preventive measures will be called "coping strategies" and the term "response measures" will refer to measures to meet actual food stress. Together they will be referred to as "coping behaviour".

Categories of coping behaviour are (Longhurst,1986):

- adaptation of cropping pattern: diversification of crops, planting early crops, reliance on tree crops, mixed farming,
- gathering of bush foods or hunting wild animals,
- reliance on social networks through redistribution,
- cash income diversification: migration, sale of assets or livestock, handicraft, sale of processed foods,
- adaptation of food pattern: reduction of meals, hungry foods, abstinence of food, changes in intra-household food allocation.

The same measure may appear as coping strategy as well as response measure, depending on the moment of action.

Many studies on coping with seasonal food shortages have been published, starting back in the 1960s, with the study by Hunter (1967) in northern Ghana. Unfortunately, most of these studies did not go beyond the descriptive approach. Table 1 gives an overview of some studies discussing coping behaviour, and the level of data analysis.

**Table 1** *An overview of studies, presenting original data on coping behaviour of populations during times of seasonal food stress*

Author	Country	Level of data collection	
		Qualitative	Quantitative
Beck (1989),	India	*	
Campbell & Trechter (1982),	Cameroon		*
Campbell et al. (1991),	Zimbabwe		*
de Garine & Koppert (1988)	Cameroon/Chad		*
Hunter (1967)	Ghana	*	
McCorkle (1987)	Burkina Faso	*	
Okafor (1986)	Nigeria	*	
Pag��zy (1988)	Zaire		*
Reardon et al. (1988)	Burkina Faso		*
Taal (1989)	Gambia	*	
Torry (1986)	India	*	
Toulmin (1986)	Mali	*	
Webb & Reardon (1992)	Burkina Faso / Ethiopia		*
White (1986)	Niger	*	

In literature two theoretical approaches prevail when discussing coping with food deficits (Thomas *et al.*, 1989; Campbell, 1990). The first one is the adaptationist framework of cultural ecology which argues that coping strategies are a sub-set of activities within people-environment systems that reduce the risks associated with recurrent but unpredictable hazards. Emphasis is put on the characteristics of the environment and the determination of appropriate responses (normative behaviour) to these conditions. The

second framework is that of political ecology, which emphasizes the influence of national or international economy on the coping abilities at regional level or household level. Here emphasis is put on social differentiation and on differential access to resources and different capabilities of people to adjust to food supply constraints. The entitlement theory of Sen (1981) supports the last framework by arguing that coping depends on a set of entitlements, which are access to land, labour and capital or support. Although a lot of debate has been going on (Bowbrick,1986; De Waal,1990) about the political ecology approach, it is clear that coping behaviour is based upon a complex interaction between a society and its environment.

### **Indicators for the assessment of household food security**

It is clear that the concept of food security and coping with food insecurity is not a simplistic one referring to food supply alone. A multi-faceted model of household food security takes intra-household issues, gender issues, livelihood security, sustainability, cultural acceptability, efficiency and cost-effectiveness into account (Gill,1991; Maxwell and Frankenberger,1992; Frankenberger *et al.*,1993).

Studies beyond the descriptive level of research are needed for more empirical data in order to study the between and within group variations in coping behaviour. Questions on differences within and between groups in ability to cope with seasonal food shortages have only recently been addressed in research (Campbell *et al.*,1991; Webb and Reardon,1992). Questions on the consequences of coping with seasonal food insecurity for food consumption and activity pattern at the individual level have not yet been answered.

A multi-faceted model demands indicators at different levels to delineate household food security. Maxwell and Frankenberger (1992) gave an overview of such indicators. They distinguished process indicators which reflect food supply and food access and outcome indicators which are proxies for food consumption. Indicators reflecting food supply include input and measures of agricultural production, access to natural resources, market and institutional support structures and exposure to regional conflicts. Indicators reflecting food access are the various means used by households to



maintain food security. These actions will vary by region, social class, ethnic group, household, gender and season. Therefore information on socio-economic status, coping ability indicators such as assets, adjustment to production and resource use, community equalities and coping behaviour pattern are proper indicators. Outcome indicators may be direct, such as household budget and consumption surveys or indirect, such as storage estimates and nutritional status assessments (Maxwell and Frankenberger,1992).

### **Multi-centre research programme**

Between 1985 and 1987, a multi-centre research programme was carried out with the objective to determine seasonal influences on human energy balance. In this EC-funded study (STD-1) three European research institutes, namely the National Institute of Nutrition in Rome, the University of Glasgow and the Wageningen Agricultural University cooperated with three nutrition institutes in Ethiopia, India and Benin. These studies were all carried out in bimodal climates, where seasonal food stress was found to be moderate. This bimodal climatic situation might explain the moderate weight changes of 1-3% body weight and the failure in pointing out a behavioral or metabolic adaptation in response to seasonal food shortage (Durnin,1990; Ferro-Luzzi,1990; Schultink,1991).

Follow-up multi-centre studies, also funded by EC (STD-2 and STD-3) were designed for areas with more severe seasonal stress, such as occurs in unimodal climatic conditions. Studies were planned to be carried out for more than one agricultural cycle in order to study repeatability from year to year. The research programme consisted of both nutritional status and energy balance studies as well as socio-economic studies focusing on household food security systems. One of the selected study areas was the commune of Manta in the south-sahelian part of Benin. Results from the nutritional status and energy balance study in this part of Benin are reported in another thesis (Ategbo,1993).

**Research objectives of the Manta study**

The present study discusses results of a study, carried out from January 1990 till December 1991, that focuses on coping with seasonal food insecurity at household level. Issues which have received little attention in previous studies are taken into consideration in this study. The study is concerned with socio-economic determinants (a household's entitlements) of seasonal body weight fluctuation (an outcome indicator of household food insecurity) and coping behaviour (an indicator for access to food). It also looks into intra-household and gender issues with regard to food consumption and time allocation. This study can be called unique in the way that it makes use of both qualitative and quantitative data, which have been collected during a two-year stay in the commune of Manta. Furthermore it made an extra step to a comparative analysis of coping behaviour of household groups differing in food security. It deals with a number of issues from the multi-faceted concept of household food (in)security, such as intra-household distribution, livelihood security and efficiency of operation of the food system.

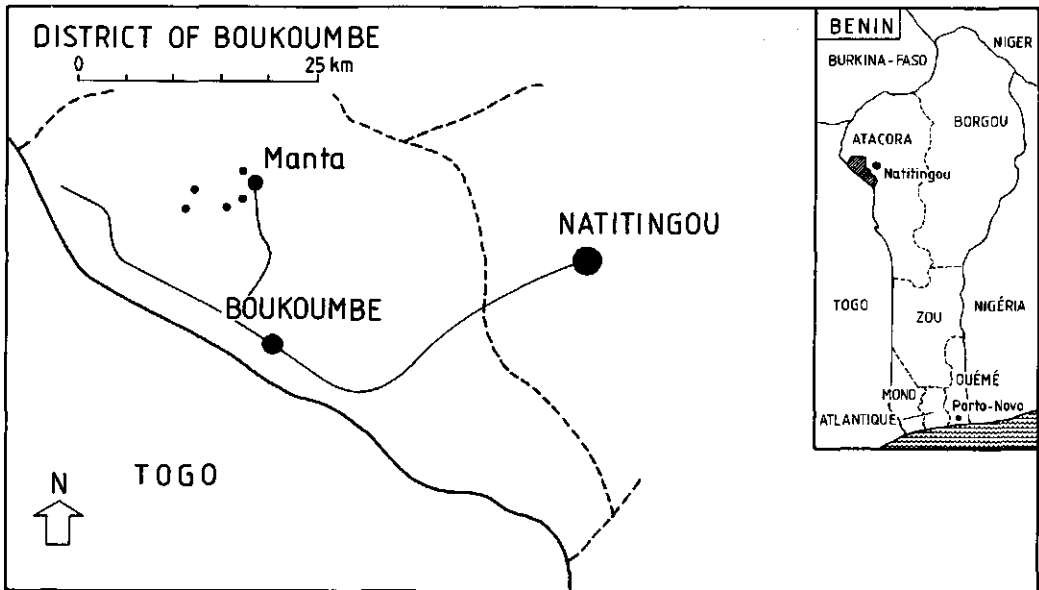
The aim of this study was to analyze the possible relationships between coping behaviour, evolved by rural households in order to cope with seasonal food insecurity, and socio-economic characteristics at household level at one hand and food consumption, activity pattern and fluctuation in nutritional status at individual level at the other hand.

The specific research questions derived from the main research objective were:

- Do socio-economic factors influence the magnitude of seasonal body weight fluctuations for men and women? (Chapter 3)
- Which strategy patterns exist for households of different food security levels? (Chapter 4)
- Are fluctuations in nutritional status related to coping behaviour patterns? (Chapter 4)
- What are the consequences of seasonal food insecurity for individual food consumption? (Chapter 5)
- Does gender task distribution with regard to subsistence activities and coping with food insecurity changes between the seasons? (Chapter 6)

**Study area**

The study site was the commune of Manta, located 650 km from the coastal main city of Cotonou, at an altitude of 240 m in the north-western part of the republic of Benin (Figure 2). This area was chosen because of its unimodal climate, existing seasonal fluctuations in body weight (Schultink,1991) and the absence of nutrition-related intervention programmes at the start of the study. The region lies between two mountain ranges with an altitude of 450 m. Annual rainfall ranges from 1000-1300 mm, with a concentration in the months May to September. Average daily temperature varies between 26°C (August) and 36°C (March). The vegetation can be characterized as savannah, open grassland with scattered trees and bushes.



*Figure 2 Map of the district of Boukoumbe and commune of Manta, with small display of Benin*

The study population belongs to the ethnic group of Otammari, a patrilineal society. Approximately 95% of the people in this population is animistic. Households live in widely scattered dwellings, castle-like houses which are called *tata-somba*, with parts of their fields directly surrounding the compounds. Land scarcity, due to population pressure and poor soil quality, causes many households to cultivate land at further distances of their homes, in the mountains.

### **Outline of thesis**

Little was known about the food habits of the Otammari. Some background information on the study population was needed for a useful interpretation of the results presented in this thesis. Therefore it was decided to carry out a food ethnographic study as part of the comprehensive research programme. This food ethnographic study, as described in Chapter 2, provides extensive information on the food system and food habits of the Otammari in north-western Benin. Chapter 3 reports on socio-economic household characteristics in order to explain the variation in seasonal body weight fluctuation of Beninese men and women. Chapter 4 discusses the different sets of coping behaviour of sub-groups from the study population which are characterized by differences in food availability from own production. Consequences of seasonal food insecurity for food consumption patterns at individual level are described in Chapter 5. In Chapter 6 gender differences in activity patterns are studied for two different seasons in order to obtain insight in who takes responsibility for subsistence production and coping with food insecurity. The main results and possible policy implications of this research project are discussed in Chapter 7.

## Chapter 2

### A FOOD ETHNOGRAPHY OF THE OTAMMARI IN NORTH-WESTERN BENIN: A SYSTEMATIC APPROACH

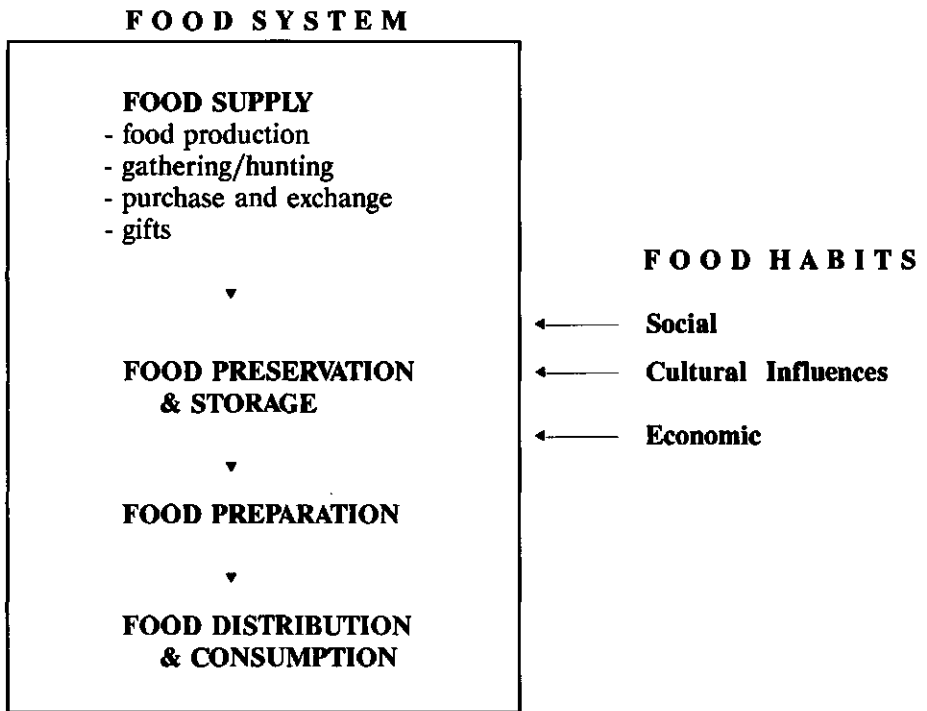
*Marti J. van Liere, Inge D. Brouwer, Adel P. den Hartog*

#### ABSTRACT

As part of a comprehensive study on coping with seasonal food insecurity, a food ethnographic study of the Otammari in the Atacora province in north-western Benin was carried out. This study comprises elements of the food system such as supply, preservation, storage, preparation, distribution and consumption. In addition cultural norms and values concerning food (food habits) are described and compared with other studies on this population, dating from the 1950s. Knowledge of the food system and food habits of a population provides essential information for a better understanding of the nature of nutritional problems. Therefore it is argued that nutrition research or interventions should be preceded by a food ethnography of the population concerned. This paper develops a systematic approach for food ethnographic studies, comprising both anthropological and nutritional methodologies.

#### INTRODUCTION

A food ethnography describes the food system and food habits of a population group (Pelto,1981). Schematically the food system of a household comprises food supply, food preservation and storage, food preparation and food distribution and consumption (Figure 1). Food habits are the ways in which individuals or groups choose, consume and make use of available foods, in response to social, economic and cultural pressure (den Hartog,1985).



*Figure 1 Food system and food habits at household level*

The material culture described by de Garine (1972) resembles the food system as defined above. He mentions also less measurable attitudes towards food in topics such as gastronomy, food prohibitions and taboos, classifications in e.g. "hot and cold" foods. Pelto and Vagas (1992) indicate this division of the study of food systems into a material and a cultural component as well. The food system, which is the material component, can be generalized for the entire study population where as food habits, the cultural component, are often only valid for a sub-group according to sexe, age or status. Although a distinction between food system and food habits is not always evident, it is a useful framework when comparing several food ethnographic studies.

The study described in this paper focuses on the Otammari of north-western Benin. So far, only two anthropological studies have been carried out among this

population group dating from the 1950s (Mercier,1968; Maurice,1986). Both give a limited description of agriculture (food supply), food pattern and the role of foods in religion. Froelich (1949) described a few elements of the food system of the Kabre in northern Togo, a region which is ecologically similar to the district where the present study was carried out.

A number of African ethnographies that include information on diet and food have been published. However they do not all contain similar information (Table 1) or present it in a systematic way.

Knowledge of food systems and food habits provides valuable insight into the origin and nature of nutritional problems (Guthe and Mead,1949; Wilson,1977). This comprehension is important for effective policy recommendations on development planning as well as for foreseeing intended and unintended consequences of nutrition interventions. Hence it is necessary to centre the ethnography on the main objective of nutrition research or intervention such as cash crops, vitamin A deficiency, migration or seasonality.

Nutritional anthropology as a new disciplinary approach to research on food and nutrition, needs a body of data and theory (Pelto,1981). Combinations of anthropological and nutritional methods such as observations, interviews and recordings of food consumption (Wilson,1977; Jerome *et al.*,1980) and different dimensions of data recording such as geographical, psychological, cultural and time dimensions (Thomas,1965) should be considered. Such an interdisciplinary approach is highly essential in order to carry out a food ethnographic study within the framework of the food system and food habits.

A food ethnographic study was carried out among the Otammari in Atacora Province, a savanna region of north-western Benin as part of a larger research programme on seasonality in food security and coping strategies at individual and household levels, carried out from June 1989 until May 1992. The objective of this ethnography was to describe the ways in which Otammari households acquire and use foods, with a special emphasis on seasonal food insecurity, and to develop a systematic

**Table 1** *Elements of food system and food habits discussed in ethnographies of African populations*

Authors	FOOD SYSTEM										FOOD HABITS
	Production	Hunting Gathering	Purchase Barter	Gifts	Preservation Storage	Preparation	Distribution	Consumption			
Bascom, (Nigeria, 1951)	+++	-	-	-	-	+++	+	-	-	-	-
Cuyppers, (Zaire, 1970)	++	++	-	-	+++	+++	+++	+++	+++	+++	+++
de Garine, (Senegal, 1962)	+++	+	+++	+	-	+	-	++	++	+++	+++
Dei, (Ghana, 1991)	-	-	-	-	-	+++	+++	+++	+++	-	-
(Ghana, 1990)	+++	-	-	-	+++	-	-	-	-	-	-
(Ghana, 1989)	-	+++	-	-	-	-	-	-	-	-	-
Froelich, (Togo, 1949)	+++	+	-	-	-	-	-	+	+	-	-
Gast, (Nigeria, 1968)	+++	+++	-	-	+++	+++	+++	+++	+++	+++	+++
Hoorweg, (Kenya, 1980)	-	-	-	-	-	++	-	+	+	+	+
Maurice, Benin (1930)	+++	+++	++	-	++	+++	+	+	+	++	++
Mercier, Benin (1947)	+++	++	+++	-	-	++	-	++	++	+++	+++
Richards, (Rhodesia, 1939)	+++	+++	+++	-	+++	+++	+++	+++	+++	+++	+++

+++ extensive description  
 ++ adequate description  
 + brief description  
 - no description



approach for food ethnographic studies. The results are to be used for hypothesis generation and interpretation of more quantitative sub-studies of a larger research programme.

## **STUDY AREA AND METHODOLOGY**

The present ethnographic study took place in the commune of Manta, located 650 km from the coastal main city of Cotonou at an altitude of 240 m. It was selected because of its unimodal climate, existing seasonal fluctuations in body weight (Schultink,1991) and the absence of nutrition-related intervention programmes at the start of the study. The vegetation can be characterized as savanna. The region lies between two mountain ranges with an altitude of 450 m. Annual rainfall is 1300 mm, most of it occurring during the months of May until September. This unimodal climate causes seasonal stress in many aspects of life such as food production, food consumption, activity and morbidity patterns and nutritional status (Hunter,1967; Lawrence and Whitehead,1988; Ategbo,1993). The pre-harvest period (May till September) is the period of food shortage and heavy field work.

The population is mainly Otammari, a patrilineal society, with almost no other ethnic groups living in the area. About 95% of the population is animistic. Households live in widely scattered dwellings, castle-like houses which are called *tata-somba*, with part of their fields directly surrounding the compounds. Land scarcity, due to population pressure and poor soil quality, causes many households to cultivate land which is more than 10 km distant in the mountains.

The research locations are five villages in the commune of Manta. A group of 214 households was selected according to the following criteria:

- main occupation is agriculture
- woman of reproductive age
- at least one child 2, 4, or 6 years of age.

Sub-studies in the comprehensive research programme comprise a continuous three-year body weight study on adults and children, a household survey on food coping strategies, a food consumption study among women, a time allocation study among men and women and a study on intra-household food distribution. These data are partially presented elsewhere (Ategbu,1993) or are in process of analysis.

Data for the food ethnography were collected using methodologies of both anthropological and nutritional sciences (de Garine,1972; Pelto,1981). Locally recruited assistants were trained in order to conduct interviews and to assist in data collection. For efficient data collection, three phases were executed (Table 2).

During the first phase, a census was made of all foods produced and consumed in the villages. Regular market visits, interviews with key-informants and observation in the fields provided the necessary information. Food products found in the market, crops cultivated on the fields, trees and bushes which provide wild foods and domestic and wild animals were listed with help of the local assistants. After completion of the list of foods, an inventory with English, French, scientific and local names was prepared (Platt,1962; Jardin,1970; De Souza,1988; Stevels,1990). The local language is not a written language and differs very much between villages of the same ethnic group. For most of the foods, information on nutrient composition was available, however for some wild foods or local dishes, there were no exact data.

Next, food-related activities were placed in a time-frame. Calendars of agricultural activities, gathering and hunting and food availability were determined and assembled. Interviews with knowledgeable men (village chief, rural extension worker) and women (midwife, wife of village chief) were held to obtain the necessary information.

In a third phase, detailed descriptions of how people use and consume their foods were obtained, including food supply activities such as cultivation, hunting, collecting bush foods, preparation of specific dishes and daily meals, and distribution and consumption of meals. In-depth interviews and group discussions with village women provided information on norms and values concerning food (food habits). Using repeated participant observation, information was obtained on the preparation of specific dishes and on eating habits (meal pattern, eating groups).

**Table 2** *A systematic approach to a food ethnography in three phases*

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<b>Phase I</b>	Census:	foods in market crops on fields bush foods domestic and wild animals
<b>Phase II</b>	Time: dimension	agricultural activities gathering/hunting food availability
<b>Phase III</b>	Observation:	food preparation distribution and consumption agricultural activities foraging norms and values concerning food

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During each phase, special attention was given to different aspects of seasonal food insecurity which will be discussed throughout the text.

## **FOOD SUPPLY**

### **Food production**

Agriculture of the Otammari is mainly subsistence and provides the bulk of their food supply. They produce chiefly for their own consumption although surpluses may be sold for cash to buy necessities such as salt or soap.

An Otammari household is made up of a man, his wife or wives, their children and possibly a parent or younger brother. Concerning cultivation of the staple foods the household can be regarded as one production unit. However each wife may also cultivate her own field with rice, beans and home garden crops. Each woman and her children constitute also a consumption unit which means that in a polygamous household the production unit is not the same as the consumption unit.

Staple foods are a variety of sorghum (*Sorghum spp.*) and finger millet (*Pennisetum spp.*). Other crops are rice (*Oryza sativa*), beans (*Vigna spp.*), bambara groundnuts (*Voandzeia subterranea*) and to a lesser extent also groundnuts (*Arachis hypogaea*). Early crops such as hungry rice (French: *fonio*, *Digitaria exilis*; Irvine, 1969), yams (*Dioscorea spp.*), sweet potatoes (*Ipomoea batatas*), and early varieties of beans and millet are harvested two to three months before the staple cereals. The harvest of hungry rice, end of September, ends the hungry season.

The agricultural season starts in April with clearing of the land. In May, when the first rains fall, the crops are sown. The agricultural calendar in Table 3 shows when fieldwork starts for each crop and when they are normally harvested.

Both men and women both cultivate the family fields using hoes as their only tool. Clearing the field is typically a male activity, but sowing, weeding and harvesting are carried out by both men and women. During the cereal harvest, men cut the stalks and women gather them and carry the load home.

Women have their own fields given by their husbands, on which they grow their own food crops such as beans, bambara groundnuts and rice. They are also mainly responsible for the production of vegetables such as okra (*Hibiscus esculentus*), pumpkin (*Cucurbita spp.*), red peppers (*Capsicum annum*), tomatoes (*Lycopersicon esculentum*) and green leafy vegetables. Okra and pumpkin are intercropped with sorghum or millet on the family fields but the other vegetables are grown in gardens inside or around the compound.

Groundnuts, the only cash crop available, are exclusively cultivated by men. Income from cash crop sales, like remittance from migration, is mainly used for the purchase of durable luxury goods such as bicycles, radio's or sheet iron for the roofs. The CARDER <sup>1</sup>, the government agricultural organization for rural development, stopped buying the groundnut harvest in 1989 because at the time the state was running out of funds and could not continue the purchase of groundnuts. Since then production has fallen dramatically because farmers could not themselves find a new market <sup>2</sup>. Groundnuts have not been replaced by another cash crop but some men grow tobacco in their gardens for their own consumption or sale at the local market.

**Table 3** *Agricultural calendar of the Otammari in the commune of Manta, north-western Benin*

Crops /	Months:	Dry season				Rainy season					Dry season			
		J	F	M	A	M	J	J	A	S	O	N	D	
EARLY BEANS <i>Phasecolus lunatus</i>						S		H	H					
YAM <i>Dioscorea spp.</i>			S	S						H	H	H	H	
MAIZE <i>Zea Mays</i>						S	S		H					
EARLY MILLET <i>Pennisetum spp.</i>							S		H					
FONIO <i>Digitaria exilis</i>						S	S			H	H			
RICE <i>Oryza sativa</i>						S	S				H	H		
BEANS <i>Vigna spp.</i>							S				H			
SWEET POTATO <i>Ipomoea batatas</i>							S				H	H		
BAMBARA GROUNDNUTS <i>Voandzeia subterreanea</i>							S				H	H		
GROUNDNUTS <i>Arachis hypogaea</i>						S	S				H	H		
SORGHUM <i>Sorghum spp.</i>						S	S					H	H	
MILLET <i>Pennisetum spp.</i>						S	S					H	H	

S = Sowing or planting

H = Harvest

Livestock is kept as an investment or assurance for periods when money is needed. It is used as bride wealth (two cows for one woman) and may be sold when cash money is needed. Fowl (chicken, duck, guinea-fowl), goats, sheep or pigs are the most common. Some men own cattle. Dogs are kept as watch dog, for sacrifices and consumption (only by men) during ceremonies. Other animals are also sacrificed in case of illness, initiation rites or funerals. Ceremonies are chiefly held during the dry season after the harvest of sorghum when food stocks are plentiful. This provides one of the rare occasions for consumption of meat. Almost all livestock is the property of the men. Few women own pigs, but the husband still decides what is to be done with the animal.

**Gathering and hunting**

Tree crops and other non-cultivated plants are important in the food system of the Otammari. They provide many ingredients for the meal relishes, and leaves, roots or other plant parts are also used for medication. Trees also provide firewood for cooking. Not all gathered foods come from spontaneously growing sources. Trees may be planted (such as mango (*Mangifera indica*) or citrus) or at least be maintained by the owner (shea tree, *Butyrospermum parkii*; Irvine,1969) and African locust tree (*Parkia biglobosa*).

The gathering calendar (Table 4) shows that gathering is complementary to agricultural activities. It takes place mainly during the dry season when availability of "wild" foods is high and there is no agricultural fieldwork to be done. There are almost no wild foods available during the rainy season, except for mushrooms and black prunes (*Vitex cienkowskii*) or they cannot be found because of the dense vegetation.

**Table 4** *Calendar of gathering activities among the Otammari in the commune of Manta, north-western Benin*

Crops / Months	Dry season				Rainy season				Dry season			
	J	F	M	A	M	J	J	A	S	O	N	D
BAOBAB FRUITS, LEAVES <i>Adansonia digitata</i>		*	*									
BORASSUS PALM FRUIT <i>Borassus aethiopicum</i>			*									
GREEN LEAVES such as <i>Amaranthus caudalis</i>		*	*	*	*							
WILD CUSTARD APPLE <i>Annona senegalensis</i>				*								
RED FLOWER SILK COTTON <i>Bombax buonopozense</i>		*										
MANGO <i>Mangifera indica</i>			*	*								
AFRICAN LOCUST PODS <i>Parkia biglobosa</i>				*	*							
SHEA TREE NUTS <i>Butyrospermum parkii</i>					*	*						
AFRICAN OAK FRUITS <i>Vitex cienkowskii</i>							*					
MUSHROOMS							*	*				

Furthermore people are occupied in their fields in the rainy season and do not have time to gather bush foods.

Mango production in the Atacora is high. When the mango season starts in March, the fruit becomes a main food in the daily diet and may substitute the cereal porridge and relish.

Seeds of the African locust tree are used to prepare a local condiment, *soumbala*, which is an indispensable ingredient of the relish. The yellow flour which covers the seeds is stored. It is diluted into a porridge in the hungry season (July-August) or used as food for pigs. Importance of this tree crop has also been described by Campbell-Platt (1980) and Nicol (1980). Another hungry food is the fruit from the African oak (*Vitex cienkowskii*), which can be gathered during the pre-harvest hungry season (July -August) and diluted into a porridge.

The shea tree is well-known throughout the savanna zone of West Africa and its nuts serve as an ingredient for shea butter, the main source of fat for the population. It is used for frying and to enrich the relish, and is appreciated when served with beans and bambara groundnuts. Its fruits are eaten as a snack.

Fruits of the baobab (*Adansonia digitata*) provide pulp used to prepare a sour porridge and its seeds are ingredients of the relish. The acid porridge is taken as a medication against diarrhoea. The Borassus palm (*Borassus aethiopicum*) provides large fruits which are eaten raw by children but are also used as an ingredient for the relish. There are two small plantations of cashew trees (*Anacardium occidentale*) in the study area. However neither the nut nor the fruit are part of the habitual diet of the population; the harvest is sold to traders from the city.

Leaves or other plant parts of the following plants are used as relish ingredients: wild custard (*Annona senegalensis*), red flower silk cotton tree (*Bombax buonopozense*), monkey guava (*Diospyros mespiliformis*), sesame seeds (*Sesamum radiatum*) and green leaves such as *Amaranthus candalis*.

Roots and bark of several indigenous plants are used for medication against diarrhoea, yellow fever and other illnesses. Papaya leaves (*Carica papaya*) are used to prepare a tea, which is taken as protection against attacks of malaria.

Gathering fruits and leaves is a task for women and their daughters, mostly during the dry season. Men help only in harvesting the pods of the African locust tree climbing the trees to pick the pods. The women collect them from the ground. Men receive benefits from the sale of locust seeds whereas women are beneficiaries of the sale of other gathered bush products.

Hunting and fishing are seasonal activities, their importance now diminished. Large game is no longer found in the region. When the first Otammari settled in the region (according to one of the old men about six generations ago) the land was covered with forest and housed many wild animals such as leopards. When more land was put into cultivation large game disappeared. Small game such as partridges, rats and doe are still available and hunted with bow and arrow or traps. Only a few men reported going hunting, but there are some professional hunters who sell their game. Fishing is done in August and September at the end of the rainy season. Both men and women fish, but only in villages located near a stream: other villages do not participate. Frogs are also 'fished' by adults and children. They are fried and added to the relish.

Children forage while walking around in the bush and between the compounds. They pick fruits and eat them out of hand. Birds, grasshoppers or mice are trapped, roasted and eaten. Only some older boys may take their catch of frogs or birds home where it is used as an ingredient of the relish.

A list of vegetable products consumed by the Otammari is given in Table 5, with the English, French, scientific and local names.

### **Purchase and barter**

Inadequate infrastructure has kept the commune of Manta relatively isolated. A money economy has not yet replaced the barter system to a full extent. Every fourth day is a market day in Manta, the central village. The villagers come to sell small quantities of food crops or processed foods such as shea butter and buy food and non-food items. It are mostly women who are involved in trade although men may sell some tobacco or handicrafts. Female Yoruba merchants from the district sell canned tomato paste, spaghetti, sugar, condensed milk, Maggi (commercial bouillon) cubes, cassava semolina



Table 5 List of vegetable products consumed by the Otammari in north-western Benin

English name	French name	Scientific name	Ditamari name
<b>Cereals</b>	<b>Céréales</b>		
Sorghum	Sorgho	<u>Sorghum spp.</u>	eyonou
Millet	Petit mil	<u>Pennisetum spp.</u>	eyomata, inati
Hungry rice	Fonio	<u>Digitaria exilis</u>	ipoiga
Maize	Mais	<u>Zea mays</u>	yemorio
Rice	Riz	<u>Oryza sativa</u>	imoua
<b>Tubers</b>	<b>Tubercules</b>		
Yam	Igname	<u>Dioscorea spp.</u>	yano
Sweet potato	Patate douce	<u>Ipomoea batatas</u>	yekyanyenra
Cassava	Manioc	<u>Manihot esculenta</u>	ifoga
Taro	Taro	<u>Colocasia esculenta</u>	yekonkwo
<b>Grain legumes</b>	<b>Légumineuses</b>		
Beans	Haricots	<u>Vigna spp.</u>	yetoupia, isatou
Bambara groundnuts	Voandzou	<u>Voandzeia subterranea</u>	yogma
Groundnuts	Arachide	<u>Arachis hypogaea</u>	yekampian
<b>Oil seeds and nuts</b>	<b>Noix oléagineux</b>		
Cashew nut	Acajou	<u>Anacardium occidentale</u>	acajou
Pumpkin seeds	Courge	<u>Cucurbita spp.</u>	ia
Sesame seeds	Sésame	<u>Sesamum radiatum</u>	muwadomu
Baobab seeds	Baobab	<u>Adansonia digitata</u>	batotjebie
Groundnut	Arachide	<u>Arachis hypogaea</u>	yekampian
Tiger nuts	Souchet	<u>Cyperus Esculentus</u>	esantetikwan
<b>Vegetables</b>	<b>Légumes</b>		
Tomatoes	Tomate	<u>Lycopersicon esculentum</u>	yaperko
Okra	Gombo	<u>Hibiscus esculentus</u>	yanoura
Onions	Oignons	<u>Allium spp.</u>	
Squash	Courge	<u>Cucurbita esculentum</u>	yeka
Green leaves	Feuilles vertes		
amaranth,	Amaranthe	<u>Amaranthus candalis</u>	
okra	Gombo	<u>Hibiscus esculentus</u>	tinoufanti
baobab	Baobab	<u>Adansonia digitata</u>	titenakanti
squash	Courge	<u>Cucurbita esculentum</u>	beyambie
bitter leaves	Feuilles amères	<u>Vernonia amygdalina</u>	tikounteti
African eggplant	Aubergine	<u>Solanum macrocarpon</u>	tikanfati
Wild custard apple	Pomme cannelle	<u>Annona senegalensis</u>	imouti
Red flower silk cotton tree	Kapokier	<u>Bombax buonopozense</u>	yafoga
Monkey guave	Ebène de marais	<u>Diospyros mespiliformis</u>	yapi
<b>Fruits</b>	<b>Fruits</b>		
Mango	Mangue	<u>Mangifera indica</u>	yapeta
Citruses	Citrus	<u>Citrus spp.</u>	diemla
Shea fruit	Karité	<u>Butyrospermum parkii</u>	ditani
Borassus palm fruit	Fruits de rônier	<u>Borassus aethiopicum</u>	dityeteri
African oak fruit	Prunier noir	<u>Vitex cienkowskii</u>	dimantoni
<b>Fats</b>	<b>Graisse</b>		
Shea butter	Karité	<u>Butyrospermum parkii</u>	fakouafa
Groundnut oil	Arachide	<u>Arachis hypogaea</u>	yekampian
<b>Condiments</b>	<b>Condiments</b>		
African locust (mustard)	Néré	<u>Parkia biglobosa</u>	ii-jou
red peppers	Piment	<u>Capsicum annum</u>	ikoudani

and sardines. These industrially processed products are well-known and appreciated as gifts by villagers. However, they are seldom bought except by wage-employed inhabitants of the central village at times of feasts such as baptism or Christmas. Onions, dried small fish and salt are not local products but are used and bought by everyone.

Barter is still common in this society, but transactions take place only for certain items. *Fonio* can be exchanged for water jars. Locust seeds are exchanged for sorghum, beans and *fonio*, especially during the hungry season when merchants come from outside the district. At harvest times Dendi (Muslim) women pass through the villages in order to exchange such products as nail polish, scarfs, salt or sugar for beans and rice.

### Gifts

Gift-giving is a way to emphasize social networks existing between households and individuals. When ceremonies for birth or funerals are held in the dry season, meat is sent from one household to another. In the hungry season, women visit their relatives or neighbours and ask for food-aid if their own stock is depleted. During the harvest season, social relationships are accentuated by shares of the new harvest. When women have prepared shea butter or locust mustard they usually give something to their in-laws or friends.

This gift-giving process is reciprocal, which means that households receive gifts from others as well as sharing their own goods within their social network. Mutual assistance through work parties (inviting others to work on the fields) also involves food and beer. However this sharing is not seen as a gift but as payment for the work done. There are also groups of women who assist each other without subsequent need to prepare beer or food as payment (*entre-aide*).

## **FOOD PRESERVATION AND STORAGE**

### **Preservation**

After harvesting, cereals, pulses or other appropriate foods are dried for a certain period in the sun. Sorghum and millet are spread out on specially built platforms for several weeks. Beans, peppers or okra are spread on the roofs of houses. Vegetables are sun-dried to conserve ingredients for the relish in the dry period when no fresh okra or leaves are available in the fields. Shea nuts are dried at the top of an oven in order to crack the nuts more easily. Meat is dried in the dry season and sometimes smoked during the rainy season. Fish is smoked and dried. Salting of products is not common practice in this region.

### **Storage**

Food stocks are kept in granaries made of dried mud and built on four feet or a pedestal. In this way they are protected against rodents or termites. They are covered with thatch as a protection against rainfall. A hood made of thatch covers the opening at the top. Inside are two to four compartments which may contain different products. Men and women each have one or more granaries. Cereals are stored in the granary of the husband. He sometimes gives part of it to his wife who can manage it as she likes. The husband distributes daily the necessary quantity of grain for that day's preparation among his wives. Pulses are always stored in the granary of the wife since they are her own crop.

After drying, sorghum (in ears) and threshed millet are deposited in the granary of the male head of the household. Beans and bambara groundnuts are mixed with ashes or hungry rice and the compartment is closed with a layer of clay in order to better conserve them. In general, pulses are stored until the pre-harvest season (June-August) when cereal stocks are running low and shea butter, which is usually eaten with the pulses, becomes available. Tubers such as yams or cassava are sometimes stored underground. A hole of one meter deep is dug at a shady place and covered with earth with the tubers inside.

## FOOD PREPARATION

### Main dishes

Food is cooked in metal pots on a three-stone fire by the woman or her daughter. The main fuel is firewood collected in the bush. However, during the post-harvest season stalks of millet replace firewood, as a time-saving strategy.

The staple food is sorghum or millet, prepared as a stiff porridge also called *pâte* from flour boiled in water. The porridge is always served with a relish. Preparation of *pâte* includes grinding the meal, which is an arduous task. Only a few women make use of mills in the central village. *Pâte* is often prepared and eaten in the evening. Leftovers are warmed up and served the next morning or afternoon. The relish accompanying *pâte* always consists of locust mustard, salt, red peppers, leaves or okra. Everything is ground and then mixed with water. In addition, other ingredients to enrich the sauce may include groundnuts, sesame, shea butter, small dried fish or meat. Alternative dishes, if there is no time or flour to prepare the *pâte*, can be:

- rice and beans,
- beans or bambara groundnuts cooked and served with shea butter,
- beans or bambara groundnuts grounded and fried as dumplings,
- tubers cooked or grilled.

However, if women prepare beans or rice instead of *pâte*, they say that they did not prepare a meal. They do not regard dishes other than cereal *pâte* with relish as a complete meal.

The diet reflects the agricultural and gathering calendars. As soon as a product is harvested it appears in the diet of the people. The first early crops harvested are beans (July) and maize or early millet (August). To dig yams, the villagers wait until the *chef de terre* (land chief) holds a special ceremony (end of August). Ceremonies are also held before the harvest of *fonio* and millet. The harvest of the *fonio*, in September, announces the end of the hungry season. Consumption of tubers is chiefly found in October and November when they are harvested but as soon as sorghum and millet come from the field, *pâte* returns as main dish.

### **Fermented products**

Two very important fermented products are prepared: local mustard and beer. Locust mustard (*soumbala*) is based on seeds of the African locust tree. The seeds are boiled, threshed and mixed with ashes and fermented this way. Afterwards the seeds are grounded and formed into balls. Locust seeds are an important part of the existing trade between the population and merchants, mostly female, from outside the district. The African locust tree is not found in the southern part of the country, but the mustard is bought by the many northerners living there.

Local beer, *tchoukoutou*, is produced from sprouted sorghum, which is grounded and diluted in water. After fermentation the sprouts are filtered out, the beer is put in special jars already inoculated with the bacteria necessary for fermentation. These jars are never cleaned in order to keep the fermentation process going. *Tchoukoutou* has an important social function in Otammari society. A market day without beer is impossible, many people just visit the market in order to drink beer with their friends. Beer also "*donne la force*," gives the energy to work in the fields. It is an indispensable ingredient for working parties when neighbours and friends are invited to work in someone's fields or for ceremonies. Households need the assistance of working parties as they cannot cultivate enough land with their own labour. Even during periods of seasonal food shortage, people do not seem to economize on the consumption of beer.

### **Meal pattern**

A typical daily eating pattern is as follows: breakfast consists of warmed-up *pâte* (leftover from the evening before), which may be a mixture of hungry rice and finger millet with a relish of green leaves, mustard, pepper and salt. If this is not sufficient for everybody, the parents will abstain from eating and the food is given to the children. At noon women start preparing fresh *pâte* from sorghum and make a relish with okra (dried during the dry season or fresh in the rainy season), pepper, salt, mustard and shea butter. This *pâte* and relish will be warmed up again in the evening or a new *pâte* prepared. If the relish is not sufficient, more okra will be added and some water and perhaps dried small fish. Between meals, bambara groundnuts are roasted and eaten by the children.

Beverages such as coffee or tea are not consumed, water and beer being the only liquids taken.

### **INTRA-HOUSEHOLD FOOD DISTRIBUTION AND CONSUMPTION**

The main dish, *pâte*, is served in hollow calabashes. The relish is served separately in a clay bowl. Usually there are several eating groups within the household. Each eating group shares a calabash for *pâte* and one bowl for the relish. Mothers and grandmothers often eat together with the younger children (under five years), fathers and sons eat together. If there are more children in the same age group they eat together, but older boys and girls (of about 8 years) eat separately. According to custom one extra calabash is reserved for a possible guest, as hospitality rules describe. When no one passes by at meal-time this portion and the leftovers will be warmed up and consumed during the next meal.

Since women are responsible for preparation of the food, they also distribute it to the household members. Everyone gets his share of the main dish and relish. Concerning meat or fish, however, the husband and other adult males receive the best part; little is given to young children. During the hungry season when food availability is low, parents may skip a meal in favour of their children.

Meal frequency varies from two to three times a day in the dry season, when food availability is sufficient, to once or twice a day in the agricultural season, when food stocks are almost exhausted and time to prepare is limited. Fasting becomes more frequent during this season.

## FOOD HABITS

Cultural norms and values determine which foods are avoided and which foods have a special significance in the society. These food habits concern food avoidances and special foods for specific groups. For a better understanding of the importance of food avoidances, a distinction should be made between permanent and temporary food avoidances (de Garine, 1972). Permanent food avoidances exist in relationship to gender or family totems. A totem is an object to which a protective power is attributed. Many totems are represented by animals. Temporary food avoidances exist for age groups and are related to different stages of the life cycle. Not only foods but also food-related activities are forbidden under certain circumstances.

Culture not only forbids consumption of certain foods but also prescribes or recommends special foods for specific groups. These are described in this section.

### Permanent food avoidances

Some animals will never be eaten by any individual belonging to the Otammari clan. Snakes are not eaten because they are poisonous. Snails "cause ear problems" and house mice "eat the eyes of the dead" who are laid down in the house before burial. But children have been observed roasting mice which have been trapped in the field.

Gender-based avoidances reflect the position of men and women in the society. Otammari women are not allowed to eat meat of cats or wild animals such as caiman and gorilla. The explanation given refers to the "spirit" of women which is not strong enough to fight the "spirit" of these animals.

Permanent avoidances are also those of food products or animals which represent a family's or individual's totem. Every person carries the totem of his family as well as an individual totem of the relative whose reincarnation he or she represents. For example, the family *Banépouba* has the dog as their totem. A story is told that a dog saved a child's life from a burning house and since then dogs are not eaten by members of the child's family. Such stories are also known among other ethnic groups in other parts of the country.

### Temporary food avoidances

Young children did not receive eggs or meat in the past because parents feared that they would get used to the taste of these products, and would become thieves to steal these foods. Nowadays, parents often give eggs or meat to their children.

Some food avoidances for women are linked to the stages of life. Entrance into a new stage of the life cycle is marked by an initiation ceremony. *Difif-fitri* (11-16 yrs) serves to guarantee virginity of the girls, *Dikountri* (14-18 yrs) is the preparation for marriage and *Koumpo* is the ceremony held when the altar of the ancestor, reincarnated in the woman, is moved to her husband's house. In certain families, women are not allowed to eat pork, chicken, dog's meat or eggs until an age when they are too old to assist at these ceremonies. Initiation ceremonies are always held during the dry season when food availability is good. Young men are not allowed to eat meat of wild animals for the same reason as women until they have reached the age of being strong enough to fight the spirits of these animals.

Food-related activities are also subject to temporary prohibitions. Menstruating women are not allowed to touch the *pâte* of their husbands. They get around this problem by inviting a neighbour or co-wife to serve the food to the husband. During the wife's pregnancy, for reasons which are not clear to us, the husband is not allowed to serve beer from one jar into another or cut the throat of an animal.

### Special foods

Newborn children are breast-fed and given an herbal tea mixed with shea butter "to help digestion" up to the moment they are weaned. Possible ingredients of this tea are strong spices like ginger, garlic or red peppers or spicy roots and bark from local plants (for example, *Kaya Senegalensis*). From the day of birth until weaning is completed a sour porridge of sorghum is given. Acidity is the result of fermentation or of addition of flour from the baobab fruit to the porridge. Weaning starts with a little *pâte* at the age of about 7 months or when the child starts to move around on hands and knees.



After delivery, women consume a special relish made of spicy roots, for a period of approximately three months. The roots are said to relieve stomach aches.

## **DISCUSSION**

This study describes the nature of the food system and food habits of Otammari households in north-western Benin. A comparison with studies carried out in the same region in the 1950s (Froelich, 1949; Mercier, 1968; Maurice, 1986) reveals that little has changed since then. With regard to agriculture the same crops are cultivated using the same local techniques whereas in 1949, Froelich described how the Kabre in northern Togo uses fertilizer, manure, and controlled the water flow. In the 1990s these techniques are not yet used by the Otammari who live just across the border. The cultivation of groundnuts had been stimulated already under French administration but it was only in 1985 that the local agricultural organisation, the CARDER, took interest in this cash crop.

The four-day market cycle was described by Mercier (1968) and Maurice (1986) although the market villages mentioned by these authors are not the same villages that exist today. Contact with external markets has remained limited due to relative inaccessibility of the area and absence of cash crops. Although money is used nowadays, barter of foodstuffs is still common practice. Storage in granaries is still the most common way of storing cereals and pulses. Maurice's (1986) description of the construction of a granary applies to the present time as well.

Preparation of dishes has not changed, although the importance of yams has diminished in comparison with the 1950s. Mercier (1968) pointed to the importance of *fonio* within the Otammari food culture in ceremonies; this study accentuates its present importance in ending the hungry season. The role of sorghum beer as described by all three authors cited, continues to be important for working parties and other social activities.

Gathering of wild fruits and leaves has the same importance nowadays as before, especially African locust seeds and shea nuts. Grivetti *et al.* (1987) and others (Doughty,1979; Campbell,1986; Bergeret and Ribot,1990; Herzog,1992) documented the importance of dietary use of bush foods in rural Africa. For the Otammari wild foods are a general part of their diet, but they are not especially important during the hungry season. Nevertheless, the question remains: what is the contribution of wild foods to nutrient intake? Some products such as shea butter are an integral part of the daily diet. Importance of hunting has diminished considerably, although according to Mercier (1968) hunting was not important in the 1950s either. It may be concluded that during the last forty years the food pattern of the Otammari has changed remarkably little.

The principal objective of the food ethnographies cited earlier was to give a description of the food system of a population group. However, an additionally important role of food ethnographies exists in providing insight into the nature of nutritional problems. It is strongly recommended that nutritional studies or nutrition intervention programmes start with a food ethnography that focuses on the local situation. A good example of the integration of an ethnographic approach is the study by Jackson and Jackson (1987) on contributors to anaemia during pregnancy. Not only biological contributors such as parasite prevalence and haemoglobin phenotype but also behavioral contributors such as attitudes towards pregnancy and food avoidances were considered.

Limitations in time and money do not always allow an extensive study of food system and food habits. When this is the case, a limited food ethnography may be carried out, including some essential elements (Figure 1). Data collection should take place in three phases (Table 2). The first two provide an inventory of the local food system. The third phase deals with local food habits. This study suggests that the essential items examined should be:

- list of foods in market and shops.
- list of crops cultivated.
- observations of principal meals, preparation, distribution and consumption.
- food habits concerning pregnancy, weaning, religion.

Three to four weeks should be sufficient to collect the basic necessary information when this systematic approach is followed.

A food ethnographic study needs to be fit to the needs of the specific research or intervention. In a study on vitamin A, the emphasis will be on vitamin A and carotene sources such as palm oil, fruits and vegetables. In the present study the main research objective was seasonality and coping strategies. Therefore a description of one season only did not suffice. Some aspects which seem important for coping with seasonal food insecurity are pointed out in this ethnography:

- importance of wild foods such as African locust beans, shea nuts and mangoes during the hungry season or in the general food pattern,
- *fonio* as first crop to be harvested, thus ending the hungry season,
- other early crops varieties, such as early beans and sweet potatoes,
- locust beans as an important commodity in trade and barter with southern sales women, especially during the hungry season,
- reduction of the number of meals, fasting and a possible change in intra-household food distribution.

Sub-studies in the same research programme will investigate more thoroughly the possible coping strategies with seasonal food insecurity in relation to socio-economic characteristics, individual food intake and activity pattern.

**Notes**

<sup>1</sup> **CARDER:** Centre d'Action Régionale pour le Développement Rural

<sup>2</sup> **Production figures in kg for groundnuts in the community of Manta (personal communication, CARDER):**

1985-86: 97,300

1989-90: 144,600

1986-87: 182,100

1990-91: 75,200

1987-88: 314,400

1991-92: 42,900

1988-89: 228,700

## Chapter 3

### THE SIGNIFICANCE OF SOCIO-ECONOMIC CHARACTERISTICS FOR ADULT SEASONAL BODY WEIGHT FLUCTUATIONS: A STUDY IN NORTH-WESTERN BENIN

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#### ABSTRACT

Large variations in seasonal body weight fluctuations have been described for individuals from different households living and working under comparable circumstances. In this study, the relationship between socio-economic household characteristics and seasonal body weight fluctuations of individual members of rural Beninese households were studied. No significant correlation was found for body weight fluctuation between the two study years, nor for body weight fluctuation of men and women belonging to the same household. When comparing dichotomized socio-economic classes for relative body weight fluctuation of men and women in both study years, no consistent trends were observed for both years nor for both sexes. The distribution of subjects with a consistent high weight fluctuation over the two study years did not differ between socio-economic groups. Concluding it may be said that there were no indications that socio-economic characteristics play a determining role in the magnitude of body weight fluctuation of this study population, despite the large variations observed in the latter. Therefore it is most likely that other factors determine the weight fluctuations of individuals such as health and sanitation.

## INTRODUCTION

Seasonal food shortages are an annual recurring event in many developing countries (Annegers,1973; Longhurst,1986; Sahn,1989). The shortages can be of such a magnitude that body weight losses occur of 2 to 6% of total body weight (Rosetta,1986; Dugdale and Payne,1987; Durnin *et al.*,1990; Ferro-Luzzi *et al.*,1990; Schultink *et al.*,1990). It has been noticed that large variations in body weight losses between households occur, even when these households live and work in comparable situations.

Socio-economic variables have often been studied as determinants of child's and adult's nutritional status but conclusions from these studies were not consistent. Some studies have reported a relationship between land size, cropping pattern, family income, age, birth interval or mother's nutritional knowledge and the extent of chronic malnutrition (Valverde *et al.*,1977; Nabarro,1984; Haaga,1986; Christian *et al.*,1989). Other studies did not find evidence for an interaction between socio-economic and seasonal influences on child nutrition (McNeill *et al.*,1988; Kennedy and Oniang'o,1990). So far, most studies on adults use only one body weight measurement as a reference for studying the relation between social environment and nutritional status. This may be questioned as body weight variations often occur in adult people, both in the western world ("slimming exercises") and in the developing world ("seasonal food shortages").

Studies looking at seasonal changes in food supply and physical activities and adaptations of individuals to these seasonal fluctuations have so far given little or no attention to the relationship with socio-economic variables (Ferro-Luzzi *et al.*,1990; Schultink,1991; Ategbo,1993). An exception are Niemeyer *et al.* (1991), who reported that body weight for women in poorer households showed the smallest seasonal fluctuations, probably due to overall low food intake. Women from middle income groups, who depend mostly on farming, showed important weight fluctuation.

The objective of the present paper is to look into the relationship between

socio-economic household characteristics and seasonal body weight fluctuations of individual members of rural Beninese households.

## **SUBJECTS AND METHODS**

### **Study area**

The research was conducted in five villages of the commune of Manta, in the north-western part of Benin. This area was chosen mainly because of its unimodal climate, the existing seasonal fluctuations in body weight (Schultink,1991), absence of intervention programmes and reasonable accessibility of the area. Annual rainfall ranges from 1000-1300 mm, with a concentration in the months May to September. Average daily temperature varies between 26°C (August) and 36°C (March). The region is part of the Guinean savanna zone, open area with scattered trees. Trees such as the African locust (*néré, Parkia biglobosa*) and the shea tree (*karité, Butyrospermum parkii*) provide valuable tree crops for the population. The African locust provides seeds which are used to prepare a condiment which is an important ingredient for the sauce. These seeds can be exchanged for sorghum during the hungry season and flour from the locust pods can be consumed as a hungry food. Nuts from the shea tree are processed in order to get shea butter which is the main fat source in the diet. The population are mainly subsistence farmers and about 65% of the energy intake comes from own food production. Main food crops are sorghum (*Sorghum spp.*), millet (*Pennisetum spp.*) and hungry rice, also called *fonio* (*Digitaria exilis*), a grass-like cereal. The only cash crop is groundnuts. The harvest season is from October till December, except for *fonio* which often can be harvested as early as half September. The period of food shortage, the so-called hungry period, starts end July or beginning of August and ends with the harvest of *fonio* in September. Income generating activities for men mainly consist of handicraft and construction works whereas women are mostly occupied with trade of processed foods. Livestock is kept as capital investment and serves as bride price or for ceremonial purposes.

### **Subjects**

A group of 214 households was selected from the population of 5 villages (about 4000 inhabitants) meeting criteria concerning subsistence farming and permanent residence in the study area. Full data sets on socio-economic household characteristics were obtained for 214 households in 1990 and 210 households in 1991.

After selection of the study population, mid 1989, 198 men and 214 women participated in the research. They were all involved in the longitudinal body weight study carried out over a period of two years between January 1990 and December 1991. When women became pregnant during the observation period data collection was continued but the results of these women were excluded from analysis. Drop-out of men occurred mainly due to seasonal migration. Complete data sets on body weights for both years were obtained for 114 women and 135 men.

For 104 households in 1990 and 74 households in 1991 anthropometric information on both husband and wife was available.

### **Design and methods**

Men and women were weighed two-weekly in 1990; in 1991 weighing frequency was reduced to once a month. Weighing was carried out at a central place in each village between 6.30 and 8.00 am, using Seca platform spring balances attached to a wooden board. The balances were calibrated at every weighing session using test weights of 40, 50 or 60 kg. The subjects wore a minimum of clothing and body weight was measured to the nearest 0.5 kg (no correction was made for the clothing which was virtually the same throughout all weighing sessions).

At the beginning of each year a general questionnaire on socio-economic household characteristics was administered to each household. Questions concerned demographic characteristics (household composition, educational level), farm characteristics (livestock ownership, ownership of trees, cash crop cultivation) and off-farm income level of men and women in dry and rainy season (Table 1).



**Table 1 Socio-economic characteristics of total study population in 1990 and 1991**

	1990 (n = 214)	1991 (n = 210)
<b>Demographic characteristics</b>		
Age head household (years)	41	42
Education level head (% no school)	.95 years (77%)	.93 year (77%)
Household size (no. members)	7.2	7.4
Infant ratio <6 years / ≥6 years	.28	.31
<b>Farm characteristics</b>		
Cereal stock (median in kg) <sup>a</sup>	605	500
Groundnut cultivation (%)	49%	51 %
No. African locust trees <sup>a</sup>		
0	28%	28%
1-5	28%	28%
6-10	20%	20%
> 10	24%	24%
Livestock:		
only poultry	7%	3%
sheep / goat	43%	43%
1-5 cows	40%	43%
> 5 cows	10%	11%
<b>Off-farm characteristics</b>		
Income level man wet season:		
none	81%	83%
1-10,000 Fcfa	7%	6%
10,000 - 50,000 Fcfa	8%	9%
50,000 - 100,000 Fcfa	2%	1%
> 100,000 Fcfa	1%	1%
Income level man dry season:		
none	68%	74%
1-10,000 Fcfa	13%	8%
10,000 - 50,000 Fcfa	15%	16%
50,000 - 100,000 Fcfa	2%	3%
> 100,000 Fcfa	1%	0%
Income level woman wet season:		
none	79%	80%
1-10,000 Fcfa	8%	12%
10,000 - 50,000 Fcfa	11%	8%
50,000 - 100,000 Fcfa	2%	0%
> 100,000 Fcfa	1%	0%
Income level woman dry season:		
none	59%	62%
1-10,000 Fcfa	22%	28%
10,000 - 50,000 Fcfa	16%	10%
50,000 - 100,000 Fcfa	2%	1%
> 100,000 Fcfa	1%	0%

<sup>a</sup> For cereal stock, data were available on 193 households and for African locust tree on 103 households

Cereal stocks in granaries were assessed in February as an estimate of the post-harvest stock. Cereals are dried for a couple of weeks after the harvest and are stocked in the granaries by the end of January or in February. At that time stocks are generally at their maximum. A photograph of each granary provided the necessary sizes on scale in order to calculate volume. The assumption was made that the form of the granary resembles two cones with their bases against each other. Inside the granary, height of the empty part was measured and the empty volume thus calculated was subtracted from the total in order to obtain the volume of the filled part. Only compartments containing cereals (sorghum, millet, *fonio* and rice) were measured.

#### DATA ANALYSES AND STATISTICS

Group averages for body weight per measurement round were used to define the maximum and minimum values of individual body weight. Maximum and minimum periods were defined in 1990 as the periods with the three highest and lowest group averages and in 1991 as the two highest and lowest values.<sup>1</sup> For individuals, absolute seasonal body weight fluctuation was calculated as the difference between the lowest value within the defined minimum period and the highest value within the defined maximum period. Body weight fluctuation was also expressed as a percentage of the average annual body weight. Individuals with two or more missing values in one of the periods were excluded from analysis.

Pair-wise comparison of anthropometric variables between the two years was done with the paired samples t-test for average body weight and relative body weight fluctuation and with Wilcoxon matched-pairs signed-ranks test for absolute body weight fluctuation. Correlations of percentage body weight fluctuation between the two respective study years as well as between men and women belonging to the same household were determined by Pearson's correlation coefficient  $r_p$ .

Dichotomized classifications were enforced on off-farm and farm characteristics as follows: cows: yes/no; income: yes/no; cash crop: yes/no; African locust trees:  $\leq 5$  /  $> 5$

infant ratio:  $\leq .25 / > .25$ ; age head of household:  $\leq 30 / > 30$  years; household size:  $\leq 7 / > 7$ ; education head: yes/no; cereal stock:  $\leq 500 \text{ kg} / > 500 \text{ kg}^2$ ). The resulting sub-groups were compared with regard to relative body weight fluctuations in 1990 and 1991 and for incidence of subjects with a high weight fluctuation (above the group average) in both years. Differences were tested with help of the Student's t-test and the Chi-square test for non-parametric data.

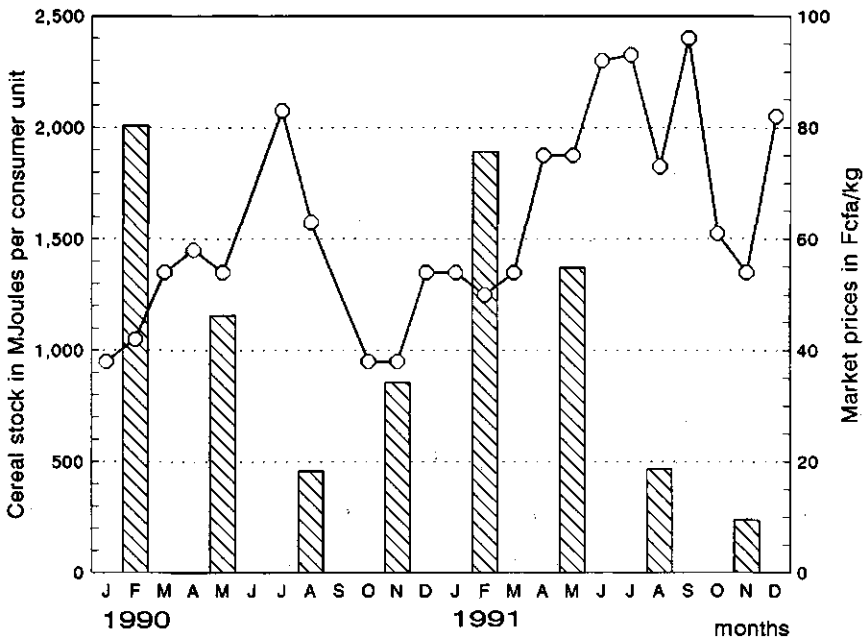


Figure 1 Seasonal changes in household cereal stock\* (■) and cereal market prices (○) in Manta north-western Benin during the years 1990 and 1991

\* median values for cereal stock

## RESULTS

Evidence on seasonality in food availability is shown in Figure 1. This figure presents cereal prices and cereal stocks during the two study years 1990 and 1991, and shows low stocks and high prices in the hungry seasons (August).

The seasonal fluctuations in body weight are shown in Table 2. Average absolute fluctuations are 3.9 kg for men and 2.8 kg for women in 1990 and 2.9 kg for men and 2.5 kg for women in 1991. Individual fluctuation ranges from a weight gain of 1.5 kg to a loss of 10.0 kg for men and a weight gain of 4.5 kg to a loss of 9.0 kg for women, corresponding with a range for relative fluctuation of 9 % weight gain and 16% weight loss. Comparison between the two years shows that for women there was no significant difference for either of the anthropometric indicators, but for men both indicators showed significantly lower values in 1991 than in 1990 (Table 2). Since relative and absolute body weight changes give similar results, the further analyses is mostly concerned with relative body weight fluctuation (%) because of its normal distribution. Looking at rank correlation of anthropometric indicators between the two years, no significant correlation exists between relative body weight fluctuations in 1990 and 1991 (for men  $r_p = .11$ , for women  $r_p = .06$ ).

Relative body weight fluctuations of men and women belonging to the same household who may be assumed to have the same socio-economic characteristics, are not related. Correlations are not significant:  $r_p = 0.03$  ( $n=104$ ) for 1990 and  $r_p = 0.24$  ( $n=74$ ) for 1991 values.

The breakdown by various socio-economic characteristics reveals only few significant differences in relative weight fluctuation (respectively for high infant ratio, income in the dry season, possession of tree crops; Table 3). Moreover there is no systematic pattern of relations to be discerned, while results happen to differ for men and women as well as for separate years. Similarly, combined results for 1990 and 1991, i.e. the percentage of subjects with high fluctuation in both years, shows only a relation with infant ratio and weight fluctuation of men.

**Table 2** Seasonal, absolute and relative, body weight fluctuation for men and women in 1990 and 1991, in north-western Benin

	MEN (n = 135)		WOMEN (n = 114)	
	1990 (mean ± sd)	1991 (mean ± sd)	1990 (mean ± sd)	1991 (mean ± sd)
Average body weight (kg)	60.5 ± 7.2	60.1 ± 7.0 †	51.6 ± 4.7	51.7 ± 4.7
Body weight fluctuation (kg)	3.9 ± 2.2	2.9 ± 1.8 †	2.8 ± 2.4	2.5 ± 2.2
Range of weight fluctuation (kg) *	-1.5, +10.0	-1.5, +9.0	+4.5, -7.5	+1.5, -9.0
Relative weight fluctuation (%)	6.4 ± 3.4	4.8 ± 3.0 †	5.4 ± 4.6	4.9 ± 4.1
Range of relative weight fluctuation (%) *	-2.6, +15.7	-2.5, +13.1	+9.0, -15.8	+3.0, -16.1

\* Due to the definition of body weight fluctuation (maximum minus minimum values), does weight gain have a minus sign and weight loss a plus sign.

† Significant difference between years, p < 0.001

**Table 3** *Relative body weight fluctuations and % of subjects with a body weight fluctuation higher than group average in both study years, for groups of men and women with different socio-economic characteristics in Manua, north-western Benin*

	MEN				WOMEN			
	Weight fluctuation (%) 1990	Weight fluctuation (%) 1991	% High fluctuation in 1990 and 1991	Weight fluctuation (%) 1990	Weight fluctuation (%) 1991	% High fluctuation in 1990 and 1991	Weight fluctuation (%) 1990	Weight fluctuation (%) 1991
Age head ht								
≤ 30	5.5	3.9	19%	4.2	4.5	24%	4.5	24%
> 30	6.5	4.9	32%	5.6	5.0	28%	5.0	28%
Household size								
≤ 7	6.0	4.7	24%	5.2	4.8	24%	4.8	24%
> 7	6.9	4.9	38%	5.7	5.0	30%	5.0	30%
Education								
0 year	6.6	5.0	34%	5.2	4.8	24%	4.8	24%
≥ 1 yr	6.5	4.0	16%	6.1	5.5	43%	5.5	43%
Infant ratio								
≤ 0.25	7.5	5.1	39%	5.6	5.6	26%	5.6	26%
> 0.25	5.5*	4.6	22%*	5.2	4.5	28%	4.5	28%
Cash crop								
no	6.0	4.7	27%	5.3	5.1	31%	5.1	31%
yes	6.7	4.9	32%	5.5	4.7	24%	4.7	24%
Tree crop (locust)								
≤ 5	7.0	4.0	22%	3.6	6.3	27%	6.3	27%
> 5	6.2	5.0	32%	5.9*	4.5*	27%	4.5*	27%
Cereal stock								
≤ 500kg	6.5	4.8	26%	6.0	4.8	22%	4.8	22%
> 500 kg	6.3	4.7	32%	5.1	5.0	30%	5.0	30%
Livestock								
no cows	5.8	4.2	26%	5.6	4.7	26%	4.7	26%
yes cows	6.9	5.2	32%	5.2	5.1	29%	5.1	29%
Income men								
dry season	6.6	4.2	30%	2.5	4.4	30%	4.4	30%
wet season	6.3	4.9	27%	6.0*	5.0	16%	5.0	16%
Income men								
dry season	7.2	4.2	28%	3.5	4.3	31%	4.3	31%
wet season	6.3	4.9	44%	5.7	5.0	0%	5.0	0%
Income women								
dry season	6.1	5.1	28%	5.2	3.7	27%	3.7	27%
wet season	6.4	4.7	35%	5.5	5.0	28%	5.0	28%
Income women								
dry season	6.0	4.8	28%	3.5	4.3	28%	4.3	28%
wet season	6.4	4.8	39%	5.7	4.9	21%	4.9	21%

\* Significant difference between socio-economic groups,  $p < 0.05$

## DISCUSSION

The trends in food prices and food availability (Figure 1) indicate that seasonality in food availability was more pronounced during the second year of our study. Cereal prices rose higher during the hungry season of 1991 whereas the cereal stocks fell 15-20% lower than in 1990.<sup>3</sup> Depletion of stocks continued in 1991 until November whereas in November 1990 cereal stocks had already increased because of the harvest of *fonio*.

The magnitude of body weight fluctuations of men and women in the present study are generally in line with the existing literature (Teokul *et al.*,1986; Rosetta,1986; Ferro-Luzzi *et al.*,1990). The present study attempted to take the subject one step further by looking at possible relationships between socio-economic household characteristics and seasonal weight fluctuations. This effort met with little success: results show a lack of consistency of findings and an absence of relations.

Firstly, seasonality in food availability in stock and market being more pronounced in the second year, a larger weight fluctuation was expected in 1991. However, men showed a smaller weight fluctuation in 1991, the year with more seasonal stress, than in 1990, and for women there was no significant difference between the two years. Ategbo (1993) suggested that the lower body weight fluctuation of men in 1991 should be attributed to a change in activity pattern from year to year. In 1991 the *fonio* crop failed and men spent one to two weeks less on energy-demanding harvest tasks than in 1990.

Secondly, it turns out that individual body weight fluctuations show little consistency over the two years. Neither for men nor for women there was a significant correlation between weight fluctuation in the two years. This means that a large body weight fluctuation in one year says little or nothing about the fluctuation that an individual will experience the next year.

Thirdly, body weight fluctuations of men and women within the same household did not show a significant correlation either. This in itself is not surprising because of the different gender roles in rural African households which often function only partly as one economic unit (Guyer,1986). Labour demands on men and women differ per season, income earned does not necessarily add up to one communal household resource base,

while intra-household food distribution is often uneven (Kennedy,1983).

The results of the above analyses make the chance of finding relations between body weight fluctuation and socio-economic characteristics minimal. Indeed no consistent relations were found with variables representing productive resources such as food production, commercial cropping and livestock (farm characteristics), income (off-farm characteristics) as well as non-productive factors such as household size (demographic characteristics). Although there were significant relations with incidental variables (infant score, income and tree crops) this is no more than could be expected by chance when testing a large number of relations (Table 3). Moreover these relations were not consistent over the two study years or over the two sexes. Further analysis with help of a combination variable of farm and off-farm characteristics did not reveal any relation with weight fluctuation either.

The question that needs to be addressed therefore is what this lack of evidence for relations between socio-economic characteristics and body weight fluctuation means. Two scenarios are possible. Firstly, that the study was not sensitive enough and failed to prove relationships that nevertheless exist. Secondly, that relationships were indeed absent or too weak to be of importance.

In case of the first scenario one could still expect to find certain weak trends, which however did not happen. Still, it is true that the study population consisted of a rather homogeneous group of subsistence farmers with only limited socio-economic differentiation. However, the variables that did show sufficient differentiation (cereal stock; livestock) were also not related to fluctuation in body weight. The first scenario is the more questionable because insufficient socio-economic differentiation can not explain why no relation was found between weight fluctuation of individuals in one year and in the other.

In case of the second scenario, the relations were weak and inconsistent or indeed absent. It is possible that the two years were drastically different with regard to livelihood possibilities or natural processes and therefore incomparable. This was not observed by



the first researcher who lived in the study area during the years of field work. Although there was a difference of degree in food availability between the two years, they highly correlated ( $r_s = 0.74$ ).

The most plausible explanations for the variation in weight fluctuations of individuals therefore appear to lie in factors outside the household resources. One alternative consists of incidental household events, such as funerals or economic backsets which are not systematically recorded. This would still make it hard to understand why no relationship patterns were found for individual years. Alternatively it might be that serious changes occur in activity patterns from one year to another. This is unlikely since food cultivation is the main activity and the food harvests in different years showed a high correlation. However as said before, the *fonio* harvest failed in the second year which must have affected the activity pattern of men in September. Another sub-study carried out within the same research programme showed that subjects with an insufficient cereal stock did not lose more body weight than subjects with sufficient cereal stock, but that they had different coping behaviour patterns.

The most probable factors, however, are health and disease patterns in as far as they occur independent of the socio-economic household situation. Kennedy and Oniang'o (1990) have reported that socio-economic characteristics were not the principal determinants of child nutritional status in West Kenya and also suggest that health and sanitary aspects are more important.

In summary, it can be concluded that in the remote rural conditions studied here, with households mostly dependent on subsistence farming and with limited socio-economic differentiation, the magnitude of body weight fluctuation has no relation with household characteristics. Most likely, variation in body weight fluctuation occurs under influence of factors such as health and sanitation characteristics. It remains further to be established what happens in communities that are more economically developed, with the larger differentiation in incomes that accompanies this.

Notes

<sup>1</sup> Periods with maximum and minimum body weight values :

	1990		1991	
	Men	Women	Men	Women
Maximum	March	15 Feb-15 Mar	15 Apr-15 May	15Apr-15 May
Minimum	15 Sep-15 Oct	October	15 Sep-15 Oct	15Aug-15 Sep

<sup>2</sup> Cereal availability for each household was estimated with help of calculations of the volume of the filled part of the granary. Calculations were carried out with help of Lotus-123. Conversion factors from volume into weight were determined for each cereal and filled volume could be converted into total cereal quantity in kg.

Conversion factors were determined for each cereal for conversion of volume into weight (by experiment) :

	kg/l
sorghum (ears)	.17
millet (threshed)	.81
hungry rice	.37
rice	.42

<sup>3</sup> Price fluctuation can not be due to inflation since the Fcfa is related to the French franc (1 FF = 50 Fcfa) and economic reports show that there was no question of inflation during the study period (UNB,1992).

## Chapter 4

### COPING WITH SEASONAL FOOD INSECURITY: A LONGITUDINAL AND QUANTITATIVE ANALYSIS IN NORTH-WESTERN BENIN

*Marti J. van Liere , Inge D. Brouwer*

#### ABSTRACT

This paper studies the relationship between socio-economic household characteristics, seasonal food insecurity and coping behaviour in Benin. Cash crop cultivation, off-farm income, livestock, tree crops, age of head household and household size are related to cereal stock. Households with insufficient cereal stock (ISH, n=41) were compared with 23 households with sufficient cereal stock (SSH). The ISH group took more preventive coping measures and more acute coping strategies during two consecutive years. Despite a lower cereal stock, nutritional status of men and women in the ISH group is not worse than that of men and women in the SSH group.

#### INTRODUCTION

Seasonal fluctuations in food availability, and its consequences in energy intake and body weight are well documented (Rosetta,1986; Dugdale,1987; McNeill,1988; Schultink,1990; Ferro-Luzzi *et al.*,1990, Ategbo,1993). Self-subsistent households rely mainly on their own production for their food supply, which may be insufficient, especially in a unimodal climate. The problem of household food insecurity is addressed in many development programs, which aim at an increase of food production. Often it are not the most food insecure households which benefit from these interventions.

Households do not passively wait for food problems to arrive. They will plan strategically how to minimize the risks of a threatening food shortage; they will adapt a

so-called coping behaviour. The concept of coping is complex and has been defined in different ways (Corbett,1988; Foeken,1988; Webb,1991). In this paper coping behaviour is defined as all efforts, within the means of a household, aiming at improvement of the food availability situation of a household. A distinction can be made between coping strategies, as preventive risk minimalization, and response measures, at moments of actual food shortage.

Several studies have described a similar pattern of coping behaviour (Colson,1979; Chambers *et al.*,1979; Longhurst,1986; White,1986; de Garine and Koppert,1988; Pagézy, 1988; Reardon *et al.*,1988; Leonard,1989; Thomas and Leatherman,1990). Coping behaviour includes mostly the following: adaptation of cropping pattern, management of food stocks, diversification of income sources, exploitation of social networks, reliance on wild foods and adaptation of food patterns.

Options for coping behaviour depend on a set of entitlements, which are the access to land, labour and capital in good years as well as the ability to obtain support in poor years (De Waal,1990; Sen,1990). Campbell (1990) emphasized the need to study differences within and between groups in ability to cope. Issues of economic class, social status, gender and age have not yet received any attention in studies on coping behaviour. Separating cause and effect (resp. household entitlements and coping behaviour) is often difficult and one year's outcome (set of coping behaviour) may have an impact on next year's starting point (socio-economic status and food stock). Furthermore, most studies lack a quantitative or longitudinal approach with respect to prevalence or sequence of coping behaviour.

The present study examines the relation between socio-economic household characteristics, seasonal food insecurity and coping behaviour for sub-groups of households with sufficient and insufficient cereal stock over a period of two years.

## STUDY AREA

The research was conducted in the commune of Manta, in the north-western province of the republic of Benin. This area was chosen mainly because of its unimodal climate, relatively large seasonal fluctuations in body weight (Schultink,1991) and absence of nutrition intervention programmes. Annual precipitation ranges from 1000-1300 mm, concentrated in May to September. The vegetation can be characterized as savannah, open grassland with scattered trees and bushes. Mango trees (*Mangifera indica*), baobabs (*Adansonia digitata*), shea trees (*Butyrospermum parkii*) and the African locust trees (*Parkia biglobosa*) provide the main tree crops. The flour of the locust pods is used as pig's fodder but also eaten by the population in times of shortage.

The study population belongs to the ethnic group of Otammari and are mainly subsistence farmers. They cultivate sorghum (*Sorghum spp.*), millet (*Pennisetum spp.*) and hungry rice, also called *fonio* (a grass-like cereal, *Digitaria exilis*), as main food crops. Other crops are yam (*Discorea spp.*), beans (*Vigna spp.*), bambara groundnuts (*Voandzeia subterreana*) and rice (*Oryza sativa*). Groundnuts (*Arachis hypogaea*) are the only cash crop. The harvest season is from October till December with an exception for *fonio* which often can be harvested as early as half September. The period of food shortage, the so-called hungry season, starts end July and ends with the harvest of *fonio*. Crops, such as maize or early beans, which are harvested before the hungry rice or at the same time, are called early crops. Crops are stored in mud granaries. The husband's granaries contain sorghum, millet, *fonio* and groundnuts whereas the wife's granary contains rice, beans and bambara groundnuts.

## SUBJECTS AND STUDY DESIGN

A sample of 214 households was selected from the total population of five villages (about 4000 inhabitants) in the commune of Manta, following criteria concerning subsistence farming and permanent residence in the study area. All households

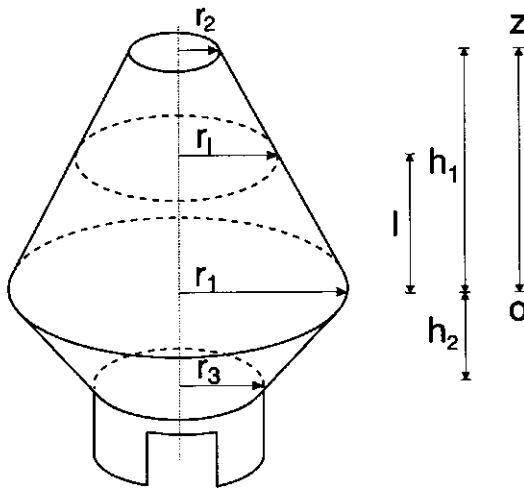
participated in a longitudinal body weight study for which methods and analyses are described elsewhere (Ategbo,1993). For all households data on socio-economic characteristics were available (demographic, farm and off-farm characteristics).

From these 214 households, a group of 104 was selected at random. Interviews with these households (mostly with the woman concerned) on possible coping behaviour were carried out during four periods in 1990 and only two periods in 1991 because of practical reasons. These periods were February 1990 (post-harvest), May 1990 (intermediate), August 1990 (pre-harvest, hungry period), November 1990 (harvest), May 1991 (intermediate), August 1991 (hungry period). Questions were asked on food trade, livestock trade, off-farm income sources, gathering and hunting activities, sales of assets, social events, gifts received and food pattern. During the same visit the contents of the granaries of the male head and the woman concerned were measured in order to estimate fluctuations of cereal stock throughout the year. Additional measures were taken in February 1991 and November 1991 in order to get a full picture of stock management for two consecutive years. A photograph of each granary provided the necessary sizes on scale in order to calculate its volume. The assumption was made that the form of the granary is like two cones with their bases against each other. Inside the granary, height of the empty part was measured and the empty volume thus calculated was subtracted from the total in order to obtain the volume of the filled part (Figure 1). Compartments containing the cereals sorghum, millet, *fonio* and rice were measured. A full data set for both the interviews and stock measurements was obtained on 85 households.

## DATA ANALYSES

In order to enable comparison between households concerning their cereal stocks, stocks were calculated as energy available from cereals per consumer unit. Cereal availability was estimated by calculations of the volume of the filled part of the granary. Calculations were carried out with help of Lotus-123. Conversion factors for volume into

weight were determined for each cereal and filled volume could be converted into total cereal quantity in kg<sup>1</sup>. Cereal availability in own stock was expressed as energy (MJ) available from cereals in own stock. One consumer unit is equal to one reference adult male<sup>2</sup> and daily energy requirement per c.u. was calculated as 11.8 MJ<sup>3</sup>. From the moment of the first stock measurement (beginning of February) until the next harvest becomes available for consumption (end December), energy requirement was estimated at 3880 MJ per consumer unit.



volume of 1 cone:

$$V_1 = (\pi \cdot l) / 3 * (r_1^2 + r_2^2 + r_1 r_2)$$

$$(r_1 = r_2 - (r_1 - r_2) \cdot \frac{l}{h})$$

**Figure 1** *Schematic model of an Otammari granary*

A dichotomized classification for socio-economic characteristics was made as follows: yes/no cows, yes/no off-farm income, yes/no cash crop,  $\leq 5$  /  $> 5$  African locust trees, infant score  $\leq .25$  /  $> .25$ , child score  $\leq .5$  /  $> .5$ , age head household  $\leq 30$  /  $> 30$ , household size  $\leq 7$  /  $> 7$ , yes or no education. The resulting groups were compared for cereal stock with the Mann-Whitney test for non-parametric data (Siegel and Castellan, 1988).

A food consumption study among the same study population (Ategbro, 1993) has shown that on average 60% of total energy intake is provided by cereals. Households were therefore classified as having February cereal stocks lower (insufficient stock households (ISH),  $n=41$ ) or higher (sufficient stock households (SSH),  $n=23$ ) than 60% of the energy requirement of one consumer unit, which is 2330 MJ. Households which were not classified the same in each study year were excluded from analysis ( $n=21$ ) in order to preserve homogeneity of the sub-groups. It was expected that a factor other than socio-economic status influenced their cereal stock and that they would show different patterns of coping behaviour during the two study years. ISH and SSH sub-groups were compared for their anthropometric characteristics using Student's t-test. All statistical tests have been performed with help of SPSS-4.0.

Scores in activity performance were dichotomized. Frequency and level at which an activity was carried were therefore not taken into account. Coping behaviour patterns for households with sufficient and with insufficient cereal stocks were compared.

## **RESULTS AND DISCUSSION**

### **Socio-economic characteristics**

The baseline data on socio-economic household characteristics in 1990 were used to examine the relationship with cereal stock (Table 1).

Households cultivating cash crops ( $Z=-2.1$ ,  $p=.036$ ) with younger household heads ( $Z=-2.3$ ,  $p=.019$ ) or of smaller household size ( $Z=-2.2$ ,  $p=.025$ ) had higher cereal stocks. Households with men earning off-farm income during the dry season ( $Z=-2.17$ ,  $p=.030$ ) or in possession of more tree crops ( $Z=-2.13$ ,  $p=.033$ ) had lower cereal stocks.



**Table 1** *Characteristics of households with sufficient and insufficient cereal stock in Manta, north-western Benin at the start of the study, February 1990*

	Sufficient stock n = 23	Insufficient stock n = 41
<b>DEMOGRAPHY</b>		
Age head household	39 (11)	45 (9.6)
Household size	7.0 (2.3)	8.1 (2.7)
Education level head household	65% 0 years	76% 0 years
Infant ratio	.30 (.11)	.27 (.13)
Child ratio	.52 (.14)	.51 (.14)
<b>ANTHROPOMETRY §</b>		
Average body weight men	62.9 kg (6.2)	58.6 kg (7.8)
women	51.5 kg (6.4)	49.8 kg (4.3)
Seasonal body weight fluctuation men	6.1 % (2.3)	6.2 % (3.7)
women	4.4 % (4.7)	5.2 % (5.8)
<b>FARM</b>		
Sorghum and millet stock	3459 kJ/cu (1641)	874 kJ/cu (498) *
Hungry rice stock	544 kJ/cu (603)	93 kJ/cu (190) *
Cash crop cultivation	48% yes	37% yes
Number of African locust trees owned	0 = 46%, 1-5 = 27% 6-10 = 5%, >10 = 23%	0 = 27%, 1-5 = 17% 6-10 = 32%, >10 = 24%
Livestock	only poultry 9% goat/sheep 26% 1-5 cows 44% >5 cows 22%	only poultry 4% goat/sheep 46% 1-5 cows 37% >5 cows 12%
<b>OFF-FARM #</b>		
Off-farm income men, dry season	1 = 83%, 2 = 4% 3 = 9%, 5 = 4%	1 = 59%, 2 = 15% 3 = 22%, 4 = 5%
Off-farm income men, rainy season	1 = 83%, 2 = 9%, 3 = 4%, 5 = 4%	1 = 88%, 2 = 2% 3 = 10%
Off-farm income women, dry season	1 = 70%, 2 = 22% 3 = 9%	1 = 49%, 2 = 32% 3 = 20%
Off-farm income women, rainy season	1 = 83%, 2 = 4% 3 = 9%, 5 = 4%	1 = 83%, 2 = 5% 3 = 7%, 4 = 5%

\* Difference between the two groups is statistically significant  $p < .005$

§ For households with sufficient stock: men n = 14, women n = 16

§ For households with insufficient stock: men n = 32, women n = 28

# Income level: 1 = no income, 2 = <10,000 Fcfa, 3 = 10,000 - 50,000 Fcfa  
4 = 50,000 - 100,000 Fcfa, 5 = > 100,000 fcfa

Examining the socio-economic characteristics of 1991 showed an additional positive relationship between the presence of livestock and cereal stocks ( $Z=-2.6$ ,  $p=.009$ ). Cereal stock was next used as an independent variable for the classification of households in two groups (insufficient and sufficient stock households). The difference in sorghum, millet and hungry rice stock between the two groups is shown in Figure 2 and 3. These figures show also that cereal availability in 1991 was less than in 1990, but correlation between total cereal stock for the two study years was high ( $r_s = .74$ ,  $p<.001$ ). The ISH group showed a lower average body weight than the SSH group for both men and women but this difference was not significant (Table 1). Seasonal fluctuation in body weight did not differ either between the two groups.

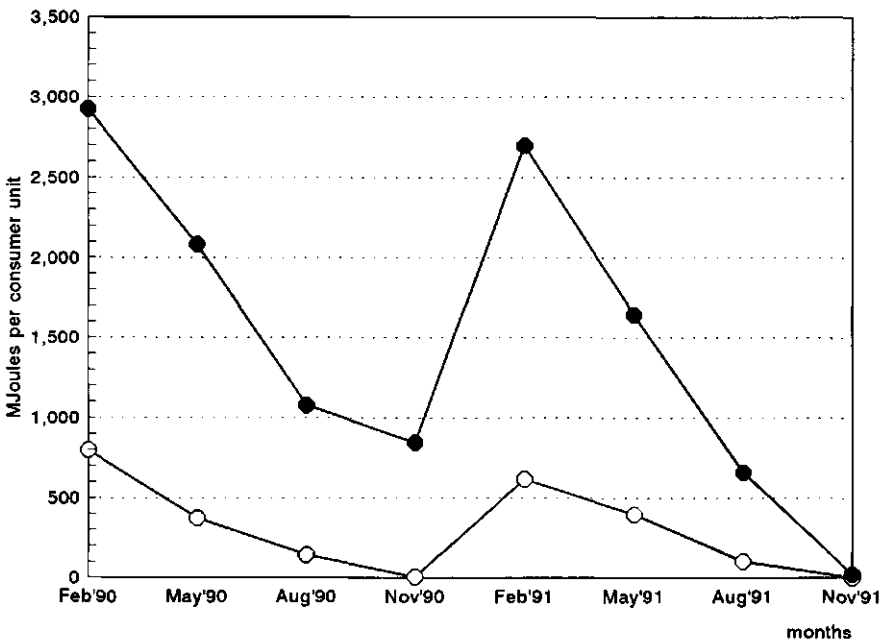
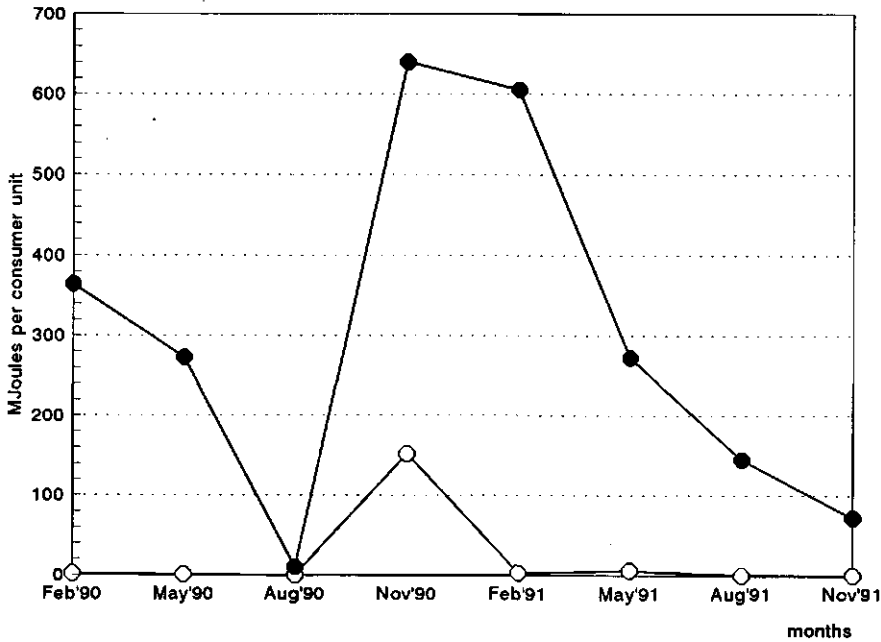


Figure 2 Sorghum and millet stock of households with sufficient ( ● ) and insufficient ( ○ ) total cereal stock in Manta, north-western Benin



**Figure 3** Hungry rice (fonio) stock of households with sufficient (●) and insufficient (○) total cereal stock in Manta, north-western Benin

### Coping behaviour patterns

Table 2 and 3 show the prevalence of coping behaviour for the ISH and SSH sub-groups. The following case study of a household with insufficient stock illustrates the entire coping behaviour package, before each strategy will be discussed separately.

*NToua (40 years) has one wife, NWonga and 4 children (between 1 and 12 years). His father's fields had been divided among the sons and the small part received by NToua does not produce enough food for his family. A few years ago NToua asked more land to cultivate from a relative. This piece of land is far away (10 km) in the mountains. The production of the first years was very low because of the rocky soil and the monkeys eating the harvest. In February 1991, NToua had left in search of wage labour to the South.*

*In April he sent his wife some money to buy medications for their youngest child who was ill. In June he came back to do the agricultural field work. End of June there were no cereals left in the granary and the family started to buy cereals at the market with the money earned on migration. In July, NWonga gathered black prunes which she diluted with water. Since there were no more cereals to prepare pâte, she and her children ate this porridge. They also continued to buy cereals in the market. The oldest son went fishing and thus supplied them with ingredients for the relish. In August the family could not organize work parties for the field work because they could not afford to spend money or cereals for the beer and food offered to the labourers. In this month NToua left on migration for a second time. Participation of NWonga in the food consumption survey showed two days of fasting out of the four observation days. She visited her own relatives in a neighbouring village to ask them for food. At the end of August and beginning of September, some of the early crops they had planted (maize, early millet and sweet potatoes) could be harvested and their hungry period was over.*

### ***Early crops***

On average a high percentage of households cultivated early crops. The SSH group had a slightly higher percentage (80%) of early crop cultivation in both years than the ISH group (69%). For the SSH group, the hungry rice and early millet cultivation decreased from 1990 to 1991 (respectively 50% and 12%), early beans and maize cultivation remained the same (91% and 96%) and yam cultivation increased (23%). In the ISH group, cultivation of hungry rice, early millet and maize diminished (resp. 27%, 14% and 15%) in 1991 and cultivation of early beans and yam increased (resp. 15% and 5%). Notwithstanding the high prevalence of early crop cultivation, it is known from observations that quantities produced are often limited. Heavy early rainfall in 1991 washed the sown hungry rice away and many households failed to harvest. Maize does

**Table 2** Occurrence of coping behaviour in households with insufficient cereal stock (ISH) in 1990 and 1991 in Manta, north-western Benin (% households<sup>\*</sup>), n = 41

	Feb 1990	May 1990	Aug 1990	Nov 1990	May 1991	Aug 1991
<b>EARLY CROPS</b>						
Hungry rice			90			63
Early beans			68			83
Early millet			68			54
Maize			98			83
Yam			37			42
<b>WILD RESOURCES</b>						
Hunting/fishing	34	0	5	7	2	27
Gathering	73	100	27	10	100	46
<b>INCOME GENERATION</b>						
Sale animal	15	10	7	10	15	20
Off-farm income man	29	27	27	22	39	24
Migration	0	7	2	12	10	22
Off-farm income woman	27	29	22	29	66	29
<b>SOCIAL NETWORKS</b>						
Gifts	66	76	22	46	34	39
Ceremonies	29	51	37	22	44	22
Work parties	22	51	90	81	61	93
<b>MANAGEMENT STOCK</b>						
Sales food	2	7	24	10	17	24
Purchases food	29	10	49	17	39	51
<b>FOOD CONSUMPTION</b>						
Locust flour consumption	2	27	24	0	0	5
Number meals < 2 (per day)	18	15	20	7	24	29
Pâte preparation = 0 (per day)	22	39	37	37	24	34
Fasting (last 15 days)	10	10	44	2	29	51

\* For reasons of clear tabulation, scores in activity performance have been dichotomized.

An activity was considered prevalent when performed at least by one individual in the household at the lowest possible level.

**Table 3** Occurrence of coping behaviour in households with sufficient cereal stock (SSH) in 1990 and 1991 in Manta, north-western Benin (% households<sup>a</sup>), n = 23

	Feb 1990	May 1990	Aug 1990	Nov 1990	May 1991	Aug 1991
<b>EARLY CROPS</b>						
Hungry rice			100			48
Early beans			91			91
Early millet			86			74
Maize			96			96
Yam			41			74
<b>WILD RESOURCES</b>						
Hunting/fishing	9	9	4	9	0	17
Gathering	70	100	13	9	100	39
<b>INCOME GENERATION</b>						
Sale animal	17	4	9	0	13	4
Off-farm income man	9	13	4	13	13	30
Migration	4	0	0	4	4	9
Off-farm income woman	17	22	22	44	61	26
<b>SOCIAL NETWORKS</b>						
Gifts	44	70	26	52	35	48
Ceremonies	70	74	57	30	61	35
Work parties	52	65	100	91	61	100
<b>MANAGEMENT STOCK</b>						
Sales food	4	9	26	35	26	39
Purchases food	4	13	39	4	17	13
<b>FOOD CONSUMPTION</b>						
Locust flour consumption	0	17	17	0	4	13
Number meals < 2 (per day)	4	9	9	9	13	22
Pâte preparation = 0 (per day)	26	39	35	26	30	26
Fasting (last 15 days)	13	9	4	0	0	30

<sup>a</sup> For reasons of clear tabulation, scores in activity performance have been dichotomized. An activity was considered prevalent when performed at least by one individual in the household at the lowest possible level.

not grow on the poor soils of the region and is cultivated only around the houses where cow's dung has fertilized the soil. Production of early millet and maize was hardly sufficient for a few meals. Cultivation of yam asks for investment in the preparation of the fields (heaping up soil) and fences to protect the field from roaming cattle. This explains the lower percentage of yam cultivation by the ISH group since low food stocks seemed to be related to farm characteristics (less cash crop and livestock with low food stocks).

#### *Wild resources*

Hunting or fishing were not frequent activities of men (on average 12% for ISH and 8% for SSH). We noticed, however, an increased activity in February 1990 and August 1991 for the ISH (resp. 34% and 27%). Gathering of wild foods seemed an activity in which both groups were fully engaged during the period of availability (May). No difference was observed between the two groups. Although wild foods can hardly be found in the rainy (hungry) season, it appeared that the percentage of households gathering wild foods in August 1991 was twice as high as in August 1990 for both groups. This is in concordance with the idea that the food availability situation in 1991 was worse and households had to rely on other food sources. The ISH group did collect more wild foods in the hungry seasons compared to the SSH. In August it were mostly black prunes which were collected, diluted with water until a porridge and consumed by the whole family.

#### *Income generation*

Possibilities for earning money in order to buy food depend on the sale of assets or livestock, handicraft, small trade or migration in search of wage labour. Sales of assets did not occur in this study population. Sales of livestock were more prevalent in the ISH than in the SSH group, especially in August 1991 when 20% of the ISH group sold livestock versus only 4% of the SSH group. In 1991, households with lower food stocks were also the ones who possessed less livestock. Still the ISH group was selling more livestock.

For income-generating activities, the ISH group had a higher percentage of men involved throughout 1990 and in May 1991 than the SSH group. In August 1991, however, no differences were seen between the two groups. This can be explained by the agricultural labour demand in this period, which gets priority over income earning. For women there was no difference in the percentage engaged in income activities between both groups. More women had off-farm income generating activities than men, but their income was marginal. It originated mostly from small trade of raw or processed foods. However the income of women is mostly spent on food for household members. Off-farm income of men is often used for luxury products, construction materials or livestock. Further, migration was found more in the ISH group as compared to the SSH group, especially in August 1991 (22% vs 9%), however effectiveness depends on remittances from migration and these are not always used to buy food. Women who are left behind are solely responsible for the agricultural work. A reduced human input might have a negative impact on food production. As a consequence of the failure of the hungry rice crop, men did not have to be home in August or September for the harvest which explained the high percentage of migration in August 1991.

### *Social networks*

Social networks play a role in gift-giving or in mutual assistance at cultivation of a field. There was hardly any difference in prevalence for gifts received by the SSH or ISH groups. Less households received gifts during the hungry season than in the other months. Gifts were mainly given in times of ceremonies and other festivities. However in the periods of food shortage in 1990 and 1991 on average resp. 24% and 44% of the households received gifts for help. It seemed that the households who were better off received slightly more gifts than those who actually needed some assistance. In times of hardship people tend to be less generous especially when they cannot expect something back in return.

Ceremonies and work parties are social events which need investments such as food and local beer. In almost all seasons it is clearly seen that the ISH group was less involved in these social happenings than the SSH group (average for all periods: 34%



ceremonies and 56% invitations for the ISH group versus 55% and 78% for the SSH group). They economized on expenses for ceremonies and work parties except in the months of fieldwork since inviting others to cultivate a field assures the next year's food supply.

### ***Management stock***

Sales of food were less prevalent in the ISH group, although still considerable in both hungry seasons of 1990 and 1991 (24%). Purchase of foods was two to four times as high for the ISH group as for the SSH group in most periods. It seemed contradictory that the ISH group sold food in periods of shortages however dichotomization of the variables did not take into account the type or quantity of food purchased or sold. Data from the same study, which are not presented here, showed that the type of food sold was mostly pulses (70-75%) and food bought was mostly cereals (85-95%). Even households with food (or cereal) shortage did not want to consume only beans and will buy cereals by selling beans.

### ***Food consumption***

Consumption of locust pod flour, as a hungry food, occurred more in 1990, especially for the ISH group. In 1991, hardly any flour was consumed because the harvest failed due to heavy early rains causing the pods to rotten on the trees. The percentage of households consuming locust flour in August was highest in the SSH group. The number of daily meals was less in the ISH group compared to the SSH group. The ISH group started earlier with fasting than the SSH group (in May 1991 resp 29% and 0%). In August 1990 only 4% of the SSH group abstained from eating against 44 % of the ISH group. In August 1991, however, it was 30% and 51% respectively for the SSH and ISH groups. A reduced number of meals and frequency of fasting suggested that the quantity of food was reduced. However, daily frequency of *pâte* (a thick porridge, the main dish) preparation was not reduced. Another possible strategy which has not been regarded in this study is the dilution of *pâte* with water.

## CONCLUSIONS

Conclusions can not be generalized for the study population because households with sufficient cereal stock in year and insufficient cereal stock in the other year were excluded from analyses. However comparison of socio-economic characteristics of the excluded group with those of the ISH and SSH sub-groups showed that there were no significant differences, except for stock (the classifying variable).

Households that cultivated more often cash crop, owned more livestock, earned less off-farm income, owned less tree crops, had younger heads of households and were of smaller household size also had a higher cereal stock. For sorghum and millet the depletion of stock followed the same pattern for both groups although at a lower level for the ISH group (Figure 2). For *fonio*, the most important early crop, the pattern was quite different. It was found that the ISH group harvested a quantity just large enough to last for a period of three months whereas the SSH group had a stock which lasted almost until the next harvest of hungry rice (Figure 3). Albeit the significant differences in stock after harvest, both sub-groups ended up with almost no stock left in November 1991. A comparison of the two sub-groups on anthropometric characteristics (Table 1) did not reveal significant differences for average body weight or for seasonal body weight fluctuation of men and women in the ISH or SSH groups.

The ISH group indeed showed another pattern of coping behaviour than the SSH group. They took more preventive measures when the SSH group did not, such as off-farm income of men in the dry seasons, migration, less ceremonies or work parties in the dry seasons, purchases of food and a reduction of meals. During the rainy seasons they undertook more acute coping strategies such as hunting and gathering, sale of livestock, migration, more purchase of food, consumption of locust bean pulp (in 1990), less meals a day and more fasting. However they did not grow more early crops than the SSH group. This may be related to land size or other socio-economic factors. It was shown that socio-economic factors and cereal stock were related and likewise the cultivation of early crops might depend on certain entitlements such as labour force and land size.

These data showed that an apparent difference in food availability (cereal stock) was not directly related to seasonal body weight fluctuations of individuals. This suggests that the coping behaviour adopted by the ISH group was effective in supplementing the gap in food availability which existed between the two groups at the beginning of the year. At the same time some questions can be put with development programs which aim at improvement of household food security by augmenting food production. In this study nutritional status of those with a relatively sufficient food production was not better than of those with a relatively insufficient food production. It might be more useful to aim at improvement of infrastructure and the effectiveness of existing coping behaviour, for example by enlarging possibilities for income generation, as was also suggested by Nabarro (1989).

**Notes**

<sup>1</sup> Factors were determined for each cereal for conversion of volume into weight (by experiment) and of weight into energy quantity (with help of food consumption table):

	<u>kg/l</u>	<u>MJ/kg</u>
sorghum (ears)	.17	14.4
millet (threshed)	.81	15.8
hungry rice	.37	14.4
rice	.42	15.4

<sup>2</sup> The reference adult male of 20-29 years of age was estimated to need 11.8 MJ per day. All other individuals were expressed as a ratio of this unit on the basis of their estimated nutritional energy requirements. For the calculation of total number of c.u. per household the following ratios were used (WHO,1985):

<u>children:</u>	<u>male:</u>	<u>female:</u>
1 year, 0.35	11-16, 0.8	11-17, 0.7
2-4, 0.5	17, 0.9	18-59, 0.8
5-7, 0.6	18-59, 1.0	> 59, 0.6
8-10, 0.7	> 59, 0.7	

<sup>3</sup> Energy requirement for one adult male was estimated using average body weight (60.5 kg in the present study), BMR and energy requirements (for moderate activity level), according to WHO recommendations (1985).  
 $BMR = (\text{body weight} * 11.6) + 879$ ;  $\text{Energy requirement} = 1.78 * BMR$ .

## Chapter 5

### THE CONSEQUENCES OF SEASONAL FOOD INSECURITY FOR INDIVIDUAL FOOD CONSUMPTION PATTERNS IN NORTH-WESTERN BENIN

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Joseph G.A.J. Hautvast*

#### ABSTRACT

Qualitative and quantitative dietary patterns are studied as indicators of seasonal changes in household food security in north-western Benin. These studies were carried out both at the individual level (women) and at intra-household level (husbands, wives and their 2-5 year old children). Dietary changes between the intermediate (April) and pre-harvest (August) period included an increased consumption of pulses and tubers which compensated for a decrease in cereal consumption and an increased consumption of food gifts, purchased foods and wild foods as opposed to foods from own production. Energy and protein requirement fulfilments of children seemed to increase in the pre-harvest season whereas those of the parents seemed to decrease. Children and adults have exactly the same dietary patterns with regard to the contribution of different food groups, except that children eat more pulses and less tubers than their parents in the pre-harvest season.

#### INTRODUCTION

In many developing countries, especially in Africa, farmers depend mainly on own production for their food supply. In unimodal climates this means that one short rainy season is responsible for the yearly food production. As a consequence food availability is not constant throughout the year and farmers often experience a food insecure period

just before the new harvest. Seasonal fluctuations in food availability and household responses to seasonal food insecurity can influence the food consumption pattern of the individual. In studies on household food insecurity, qualitative and quantitative dietary changes are useful indicators (Maxwell and Frankenberger,1992). Qualitative dietary changes look at shifts in use of different food sources such as wild foods or unconventional foods instead of home-produced foods. Quantitative dietary changes consider actual contributions to energy and protein intake. Shifts from preferred foods to lower status foods and unconventional foods are a normal occurrence in food deficit areas but may also indicate anticipated stress (Corbett,1988). Most studies that report on seasonal adaptations of the food pattern present data at household level, whether qualitative or quantitative (Asibey,1974; Rosetta,1986; de Garine and Koppert,1988; Pagézy,1988; Dei,1989; Neumann *et al.*,1989; Wandel,1989; Zinyama *et al.*,1990), and only some provide individual quantitative data on seasonal adaptations in food consumption patterns (Gittelsohn,1991; Kaiser and Dewey,1991).

Seasonal reductions in food availability may not influence all members of the households equally. Results from studies concerned with intra-household food distribution are not conclusive. Cross-sectional studies reveal an advantageous food allocation for male adults or boys over females (Gopaldas *et al.*,1983; Hassan and Ahmad,1984; Gittelsohn,1991) or show no difference in nutrient adequacy for different age groups (Van Steenberghe *et al.*,1984). Some studies find that children are protected from seasonal food shortages (Kaiser and Dewey,1991; Leonard,1991), others do not (Abdullah and Wheeler,1985).

The aim of this paper is to analyze how seasonal food insecurity and responses to it, influence individual food consumption patterns. Therefore seasonal changes in contributions of different food groups and food sources to energy and protein intake of women as well as seasonal changes in intra-household food distribution between husband, wife and 2-5 year old children were studied.

## STUDY AREA

The present study was conducted in the commune of Manta in north-western Benin. A unimodal climate assures seasonal fluctuations in food availability. Annual rainfall is 1300 mm concentrated during the months May till September. The region is part of the Guinean-Sudanian savannah with scattered trees. Tree crops with an economical or nutritional value are provided by the baobab (*Adansonia digitata*), the shea tree (*Butyrospermum parkii*), the African locust tree (*Parkia biglobosa*) and mango trees (*Mangifera indica*). The main ethnic group, the Otammari, are chiefly subsistence farmers. Main food crops are sorghum (*Sorgho spp.*), millet (*Pennisetum spp.*) and fonio (*Digitata exilis*), but beans (*Vigna spp.*), bambara groundnuts (*Voanzeria subterranea*) and rice (*Oryza sativa*) are cultivated as well. Groundnuts (*Arachis hypogea*) are cultivated as only cash crop. Home garden products are, among others, okra (*Hibiscus esculentus*), red peppers and pumpkins. At the end of the rainy season (August) stocks may become depleted and this "hungry" pre-harvest season will end with the harvest of fonio, end September. Early varieties of maize, millet and beans may be harvested in small quantities already in July and August. The other crops are harvested between October and December. January till April is the season with limited agricultural activities, festivities and a relatively high food availability. Staple food production is a task of both men and women but women take care of processing, preparation and distribution of foods as well as gathering wild foods. Crops are dried and stored in mud granaries.

The average daily diet provides two or three meals consisting of a thick porridge (*pâte*) of sorghum or millet flour served with a relish of green leafy vegetables or okra and condiments. Eating groups are formed of individuals sharing one calabash of *pâte* and one bowl of relish. Women eat with their younger children and men eat together with their older sons.

## **SUBJECTS AND STUDY DESIGN**

A sample of 214 households was selected from the total population (about 4,000 inhabitants) of five villages in the commune of Manta, following criteria concerning subsistence farming and permanent residence in the study area. These households participated in a longitudinal body weight study described elsewhere (Ategbo,1993).

### **Food consumption of women**

From the study population of 214 households, a sample of 45 women was randomly selected to participate in the food consumption study. The selection criteria were: aged 18 to 45 years, non-pregnant and non-lactating. Data have been collected at four occasions: pre-harvest season 1990 (July-August), harvest season 1990 (mid November-December), intermediate season 1991 (March-April) and pre-harvest season 1991 (July-August). A full data-set for 4 seasons was available on 27 of these women. Reasons for drop-out were pregnancy and low compliance on the food source records in the first season.

### **Intra-household food distribution**

In addition, an intra-household food distribution study was carried out on 26 households, also randomly selected from the above-mentioned study population of 214 households. The characteristics of these households were: monogamy and at least one child between 2 and 5 years of age. Food consumption was recorded during two different seasons: the intermediate season 1991 (March-April), when food was still sufficiently available and the pre-harvest season 1991 (July-August), when food stocks were getting depleted. One household dropped out and a full data-set was available on 25 households.

## **METHODS**

### **Food consumption of women**

The observed weighed record method (Cameron and Van Staveren, 1988) was used to measure food consumption on four consecutive days, which reflected the local market cycle. All raw ingredients, prepared dishes, portions served to the woman and left-overs were weighed. Women were asked to serve individual portions for themselves instead of sharing the portion of their eating group. Weighing scales up to 2 kg were used for ingredients, portions and left-overs and scales up to 10 kg for the prepared dishes. Source of each ingredient was recorded, namely whether it was provided by own production (stock or field), purchased, a gift or came from wild resources. Ingredients were classified after recording in food groups: cereals and tubers, meat and fish, pulses, vegetables and fruits, fats and oils, nuts, beer (mentioned apart because of a presumed high intake), locust pod flour (mentioned apart because it was expected to be important as a hungry food) and condiments. Tubers were not considered as a separate food group because data from another sub-study of the same research programme showed that tubers were consumed only during the harvest season by 7% of the households and hardly during the other seasons. Energy and protein contributions<sup>1</sup> of different food groups and food sources to total intake were calculated using food composition tables (Woot Tsuen, 1968; Platt, 1962).

### **Intra-household food distribution**

For the intra-household food distribution study only the meals which were prepared and consumed at home were considered. For these meals all raw ingredients and dishes prepared were measured. The women were asked to serve each participant his or her individual portion instead of sharing the portion with his or her eating group. Portions distributed to the husband, his wife and child were weighed as well as the left-overs. Snacks or foods prepared and consumed outside the household were not considered since the interest of this study was in distribution patterns at household level and contribution of household resources. Energy and protein intake as well as contributions of different food groups to measured intake were calculated with help of



food consumption tables. Tubers were considered as a separate food group here.

## **DATA ANALYSIS AND STATISTICS**

All data were analyzed by means of SPSS-PC 4.0 software (Norusis,1988).

### **Food consumption of women**

Food intake was averaged over the four measurement days. For five women, an average of three measurement days was used for the first period because records of one of the measurement days were not valid due to mistakes on the forms. Relative contributions of certain food groups and food sources to total energy and protein intake are compared between the seasons using Friedman two-way analysis of variance for non-parametric data (Siegel and Castellan,1988). When the Chi square value was significant, the Wilcoxon signed test was performed for the concerned variable in order to determine which periods differed significantly.

### **Intra-household food distribution**

Energy and protein intake provided by principal meals eaten at home were expressed as a ratio of the individual requirements<sup>2</sup> (WHO,1985). Requirement fulfilments were compared between seasons using the Student's paired t-test. For each season requirement fulfilments between groups were compared using one-way analysis of variance. Seasonal changes in requirement fulfilment between men, women and children were also compared with one-way analysis of variance.

## RESULTS

### Food consumption of women

Total energy intake for women ranged between 10.9 and 12.6 MJ, and total protein intake between 73 and 84 g.

Contributions of the different food groups are shown in Table 1. Cereals and tubers are the main stay of the diet. They provided 52 to 65% of the total energy intake and 46 to 57% of total protein intake. The highest contribution was found during the harvest season and the lowest during the pre-harvest season. Pulses gave the second highest contribution, supplying 11-20% of energy and 18-34% of protein intake, of which the highest contribution was found in the pre-harvest season. Fats and oils contributed only 5-10% to total energy intake, about the same amount as was provided by local sorghum beer. Contributions of vegetables and fruits, meat or fish and condiments were negligible. Locust bean pulp (a tree crop from the *Parkia biglobosa*) is a hungry food eaten in periods of food shortage but its contribution was negligible (1%).

Of the different sources supplying foods, the highest contribution came from own production, i.e. stock and field contributions (Table 2). About 53-65% of energy and 55-70% of protein intake was provided by own stocks and in addition another 2-11% of energy intake came directly from the field. Contributions of own production were highest in the harvest and intermediate periods. Foods gathered in the bush had a contribution of 6-9% to energy intake but contributed only 1-2% to protein intake. Foods received as gifts showed the highest contribution in the pre-harvest season (15-20% to energy, 14-21% to protein) and a somewhat lower contribution in the other two seasons (13% to energy and 12% to protein). Purchase of foods was more important in 1991 seasons (11-12% contribution to energy, 12-14% to protein) than in the 1990 seasons (5-7% and 8-9% respectively for energy and protein intake).

**Table 1** *Relative contribution of different food groups to energy and protein intake (%) of 27 women in four seasons in Marita, north-western Benin*

	ENERGY						PROTEIN						
	pre-harvest Aug '90	harvest Dec '90	intermediate Apr '91	pre-harvest Aug '91	g (sd)	pre-harvest Aug '90	harvest Dec '90	intermediate Apr '91	pre-harvest Aug '91	pre-harvest Aug '90	harvest Dec '90	intermediate Apr '91	pre-harvest Aug '91
	%	%	%	%		%	%	%	%	%	%	%	%
Total intake	11.5 (2.2)	12.6 (3.0)	10.9 (2.4)	11.0 (2.2)		82 (21)	84 (27)	73 (20)	77 (19)				
Cereals/tubers	52	65*	62*	60*		46	56*	57*	53*				
Meat/fish	2	1	2	2		6	5	7	7				
Pulses	20	16*	11*	15*		34	27*	18*	28*				
Vegetables/Fruits	1	1	7††	1*		2	2	5†	2*				
Fat	10	6*	5*	10††		-	-	-	-				
Nuts	1	2	1	-		1	3	1	1††				
Beer	10	6	10	8		8	5	8	6				
Locust pod flour	1	-	-	1		-	-	-	-				
Condiments	2	2	2	2		3	3	3	4				

\* different from August'90, p < .05

† different from December'90, p < .05

‡ different from April'91, p < .05

**Table 2** *Relative contribution of different food sources to energy and protein intake (%) of 27 women in four seasons in Marita, north-western Benin*

	ENERGY				PROTEIN			
	pre-harvest Aug '90	harvest Dec '90	intermediate Apr '91	pre-harvest Aug '91	pre-harvest Aug '90	harvest Dec '90	intermediate Apr '91	pre-harvest Aug '91
Total intake								
MJ (sd)	11.5 (2.2)	12.6 (3.0)	10.9 (2.4)	11.0 (2.2)	g (sd)	82 (21)	73 (20)	77 (19)
	%	%	%	%	%	%	%	%
Own stock	61	63	65	53	68	65	70	55 †
Own field	6	11	2 †	5	7	12	1 †	7 ‡
Wild resources	9	7 *	6 *	8 †	2	2	2 *	1 ‡
Gifts	15	13	13	20	14	12	12	21 †
Purchase	7	5	11	12	9	8	12	14
Other sources	2	2	3	2	1	2	2	2

\* different from August'90, p < .05

† different from December'90, p < .05

‡ different from April '91, p < .05

### **Intra-household food distribution**

Total energy intake provided by the meals, served at home, was 8.0-8.6 MJ for men, 7.7-7.3 MJ for women and 3.7-4.3 MJ for children aged 2-5 years (Table 3). Comparison of requirement fulfilments between the two seasons did not show a significant difference for either group. However, the trend seemed to exist that requirement fulfilments of adults decreased during the pre-harvest season whereas the fulfilments of children increased in the pre-harvest season. Energy requirement fulfilments of children were significantly higher than those of men in August.

No differences were found in contributions to total energy and protein intake from the different food groups between men, women and children. Cereals supplied the largest part (about 80% in April and about 67% in August), pulses came next with a contribution of 9% in April and about 14% for adults and 20% for children in August. Tubers did not contribute in April but made a contribution of about 6% to energy intake of adults in August. Children got only 2% of their energy from tubers. Contributions by fats and oils were low: about 4% in April and about 7% in August. Meat or fish, vegetables and fruits, nuts and condiments did not contribute more than 1-3% per group.

Protein intake in April and August ranged from 57 to 60 g for men, 55-51 g for women and 27 to 32 g for children. Requirement fulfilments exceeded the 100% for men and children in both seasons, only women stayed below their requirements with 7-8%. Requirement fulfilments of children were significantly higher than those of men and women in both seasons. Contributions to protein intake came mostly from cereals (68-71% in April, 59-62% in August) but secondly from pulses (about 16% in April and about 25% for adults and 32% for children in August). Contributions by meat or fish were low (7% in April, 3-5% in August). Vegetables, fruits, nuts or condiments hardly contributed to protein intake (2% per food group).

**Table 3** *Relative contribution of different food groups to energy intake (%) out of principal meals for 25 households in two seasons in Manta, north-western Benin*

	April 1991 (intermediate season)			August 1991 (pre-harvest season)		
	MEN (n=25)	WOMEN (n=25)	CHILDREN (n=31)	MEN (n=25)	WOMEN (n=25)	CHILDREN (n=31)
Total intake MJ (sd)	8.0 (2.8)	7.7 (2.6)	3.7 (0.3)	8.6 (3.6)	7.3 (2.4)	4.3 (0.3) †
Requirement fulfilment	66%	74%	71%	61%	67%	79%
	%	%	%	%	%	%
Cereals	80	81	78	67 †	68 †	66 †
Tubers	0	0	1	6	6	2
Meat/fish	2	2	2	2	2	1
Pulses	9	9	9	13	14	20 †
Vegetables/Fruits	1	1	1	1	1	2
Fat	4	4	5	7 †	7 †	7
Nuts	1	2	2	1	0 †	1 †
Condiments	2	2	3	2	2	2 †

• different from men p < .05

† different from April 1991 p < .01

‡ different from April 1991 p < .05

**Table 4** *Relative contribution of different food groups to protein intake (%) out of principal meals for 25 households in two seasons in Manta, north-western Benin*

	April 1991 (intermediate season)			August 1991 (pre-harvest season)		
	MEN (n=25)	WOMEN (n=25)	CHILDREN (n=31)	MEN (n=25)	WOMEN (n=25)	CHILDREN (n=31)
Total intake g (sd)	57 (23)	55 (20)	27 (11)	60 (27)	51 (18)	32 (12)
Requirement fulfilment	105%	92%	163% <sup>†</sup>	113%	93%	186% <sup>‡</sup>
	%	%	%	%	%	%
Cereals	71	71	68	62	61 <sup>§</sup>	59
Tubers	0	0	1	5	5	1
Meat/fish	7	6	7	5	3 <sup>§</sup>	3 <sup>§</sup>
Pulses	16	16	17	24	25	32 <sup>§</sup>
Vegetables/Fruits	2	2	2 <sup>*</sup>	2	3	3
Nuts	2	2	2	1	1 <sup>§</sup>	1 <sup>§</sup>
Condiments	2	3	3	2	2	2 <sup>§</sup>

\* different from men p < .001

† different from women p < .001

‡ different from men p < .05

§ different from April 1991, p < .05

## DISCUSSION

The aim of this study was to get more insight in the effects of household food insecurity on individual food consumption. This was done both by using qualitative and quantitative indicators (Maxwell and Frankenberger, 1992). Since food insecurity may not affect each household member equally, an intra-household analysis was carried out, making a quantitative and qualitative comparison between food consumption of husbands, wives and their 2-5 year old children.

Caution should be taken when interpreting these data because of methodological difficulties with food consumption studies, especially in developing countries. Bias occurs when subjects are forced to serve themselves separately when normally they share one bowl with other family members. Subjects may change their usual dietary pattern when an observer is present. Food composition tables contribute to errors in calculations, especially with respect to indigenous foods for which food composition data hardly exist. Observation of more subjects at the same time, as is the case in the intra-household food distribution survey, carries additional difficulties. Children who are used to eat from one bowl with their mother, have to eat separately to be able to weigh their consumption. Children that are not participating in the study may come and want to eat with the study participants.

The total energy intake for the food consumption study of women was higher than the energy intake of women as measured in the intra-household food distribution study (in April 1991 respectively 10.9 MJ and 7.7 MJ, in August 1991 respectively 11.0 MJ and 7.3 MJ). However, the first-mentioned study was concerned with total daily food intake while the second study only considered food intake during meals consumed at home. Snacks or meals consumed elsewhere were not recorded, which means that the consumption of beer, fruits, roasted groundnuts or bambara groundnuts was not taken into account during the intra-household distribution study. The food consumption survey on women showed that in April 1991 beer contributed 10% of total energy intake, fruits and vegetables an extra 6% and pulses an extra 2% compared with the intra-household distribution study. Still, this study is mainly interested in relative contributions of food



groups and food sources and not in absolute levels of intake. Therefore conclusions are drawn cautiously and do not regard absolute intake levels.

Assumptions with regard to adequate intakes and requirement levels of individuals were made in the intra-household food distribution study<sup>2</sup>. Energy requirements for adults were estimated with regard to the work load for each season (WHO,1985). Ategbo (1993) studied the physical activity level (PAL) in the same study population of Beninese women and found an average PAL of 1.63\*RMR for intermediate seasons and 1.77\*RMR for pre-harvest seasons. These values hardly differ from the values given by the WHO (1985) for moderate and heavy workloads respectively. Since no data were available on requirements of Beninese men, the WHO values were used for estimating requirement levels of both men and women in this study. Protein requirement fulfilments are over 100% and even up to 186% for children in the pre-harvest season of 1991. Although high, they are in line with other literature. Rosetta (1986) mentioned 135-158% and van Steenbergen *et al.* (1984) 125-195% for protein requirement fulfilments of adults and children. Nevertheless, care is taken not to interpret the requirement levels as such but just make comparisons between seasons and groups.

#### **Dietary changes due to seasonal food insecurity**

In periods of food insecurity a shift to less preferred foods is expected. The dominant contribution of cereals to energy and protein intake as reported in this study has also been mentioned by Rosetta (1986). But when cereal stocks became depleted, the first change in consumption patterns was a shift to the consumption of pulses. For children this change was even more drastic than for adults: they got an additional 11% of energy from pulses consumption. Adults, however, consumed more tubers during the pre-harvest season which provided 6% of their energy intake whereas children got only 2% of their energy from tubers. An increase in the consumption of pulses coincided with an increase in the consumption of fats. Beans are preferably consumed with shea butter.

In periods of food stress, not only a change in food groups but also a change in food sources may take place. In this study food gifts and purchased foods constituted a larger part of energy and protein intake in the pre-harvest season when own cereal stocks

were running low. Wild foods contributed a little more to energy intake during the pre-harvest seasons than in the other seasons but their contribution to protein was negligible. Gathered foods are mostly leafy vegetables, fruits and shea nuts. Dei (1989) compared energy intake from wild foods between the post-harvest and the lean season in a rain forest community in Ghana. He found that a decrease in consumption of farm products (from 80 to 65%) in the lean season corresponded to an increase in consumption of bush foods by 10% and food gifts by 4% and that consumption of purchased foods did not increase. Neumann *et al.* (1989) showed in Kenya that a decrease in availability of own production was mainly compensated by the purchase of foods and by food gifts received from others.

#### **Intra-household food distribution**

Energy requirement fulfilment of the parents seemed to decrease with 5 and 7% respectively in August, whereas that of children seemed to increase with 8%. Requirement fulfilments of children were therefore significantly larger than those of men in August, the pre-harvest season. However, within each group no differences were found in requirement fulfilments between seasons. Ategbo (1993) reported that growth rate of Beninese children was higher in the intermediate season and lowest in the pre-harvest period. Unfortunately, he did not statistically compare growth rates of these two seasons. Concerning growth rate of children, infectious diseases also play a role (Rowland *et al.*, 1977). Prevalence of some diseases such as malaria and gastro-enteritis is highest in the rainy pre-harvest season and may counteract the effect of a privileged food distribution.

No indications were found for a difference between groups (men, women and children) in contribution of food groups to energy intake. Men were not privileged in meat or fish consumption in this study, in contrast with what is reported in some Asian studies (Gittlesohn, 1991; Senauer *et al.*, 1988). Children consumed slightly more pulses and less tubers than their parents during the pre-harvest season.

In summary, the consequences of seasonal food insecurity (i.e. shortage of cereals) for the food consumption patterns of individuals are to be found in a higher consumption of pulses and tubers, a higher contribution of food gifts, purchased foods and wild foods to total food intake in the pre-harvest season. These dietary changes correspond to coping behaviour at household level, as determined in another study in this population. Coping behaviour of Beninese households with seasonal food insecurity included cultivation of early crops such as yams, sweet potatoes and early bean varieties; gathering of wild foods such as shea nuts, leafy vegetables or fruits; reliance on social networks; seasonal migration or other income-generating activities, such as handicrafts and sale of processed foods.

This study did not provide clear evidence for gender differences in food allocation between and within seasons. Food distribution between different groups within the family seemed to favour children over their parents.

**Notes**

- <sup>1</sup> Protein quality of the habitual diet was estimated at 85% digestibility. Protein intake adequacy was therefore determined as 85% of calculated protein intake/protein requirement.
- <sup>2</sup> Requirements were calculated according to WHO/FAO recommendations (WHO,1985). BMR was calculated with equations using body weight, energy requirements were calculated as 2.10 \* BMR for men and 1.82 \* BMR for women in the pre-harvest season and 1.78 \* BMR for men and 1.64 \* BMR for women in the intermediate season. Protein needs of adults were estimated as 0.75 g/kg/day. A correction was made for lactating women (there were no pregnant women in this sub-group) of +480 kcal/day and +13 g protein/day. For children no individual data on body weight were available but average body weight was calculated with the data set of the longitudinal anthropometry study (Ategbo,1993) for the two periods. Energy and protein requirements were calculated accordingly.

Age	Body weight APR'91 (kg)	Body weight AUG'91 (kg)	Energy req. (kJ/kg)	Protein req. (g/kg)
2-3	11.2	12.0	419	1.13
3-4	13.1	13.7	406	1.09
4-5	14.2	14.7	391	1.06

**TIME ALLOCATION IN RELATION TO SEASONAL FOOD INSECURITY:  
A GENDER ANALYSIS IN NORTH-WESTERN BENIN**

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**ABSTRACT**

The present study compares seasonal activity patterns of both women and men in a mainly subsistence society which is characterized by considerable food stress and seasonal weight loss. The activity pattern of Beninese women was more loaded than that of men in both seasons. Women had less idle time than men, they especially spent more time on housekeeping and food preparation. Men contributed more to subsistence production: they spent more time on cultivation of food crops, participated more in work parties (maintaining social networks) than women and were engaged in non-agricultural productive activities, which can generate income. In the period of food stress, however, it were women who took care of coping with food insecurity. They cultivated early food crops, gathered wild foods, processed these products into foods for own consumption or sale and were involved in other income generating activities. This study did not find evidence for a redistribution of tasks in the way that men took over some domestic chores of women when she was in time stress. But comparison of the activity patterns did show a clear task distribution in subsistence production, domestic chores and in coping with food insecurity.

## INTRODUCTION

In the 1970's attention was drawn to the fact that women's work was underestimated, especially at national level, because of inadequate definitions of economic labour (Boserup,1970). Men constituted the larger part of the economic labour force but subsistence production, informal paid work, domestic production and volunteer work were neglected in these statistics (Beneria,1992). Especially in food self-subsistent societies, subsistence and domestic production constitute a large part of the time allocation, not only of women but also of men (Bério,1984). Since the 1970's attention has been given primarily to time allocation of women and their role in subsistence activities, particularly in rural areas. Literature describes many studies on activity patterns of women which emphasize the heavy production tasks of women in both subsistence and domestic production (Cain,1979; Ho,1979; Rahman,1986; Engberg *et al.*,1988; Jiggins,1989; Kaur and Sharma,1991). Less frequent are studies comparing men and women's time allocation (Bleiberg *et al.*,1981; Mueller,1984; Engberg *et al.*,1988; Holmboe-Ottesen and Wandel,1991) which all suggest that the work load of women is heavier than that of men. Presently there is a lack of data on men's time allocation, especially for West Africa.

Activity patterns are heavily dependent on seasons. Some studies took seasonality into account and presented an average of time allocation over a longer time period (Mueller,1984; Holmboe-Ottesen and Wandel,1991). Only Engberg *et al.* (1988) presented data for two seasons separately and showed that women spent more time on household and subsistence production (e.g. food crop cultivation, gathering wild foods, food preparation and cleaning) and men spent more time on market production (tobacco production and other income-earning activities).

Time-activity patterns can be useful analytical instruments for understanding how people meet their needs in times of seasonal food stress (Wollenberg,1980; Gross,1984). "The priorities people set in expending time, the urgency with which people complete tasks, and the ways in which people perceive their seasonal cycles of production and consumption are all features of their strategies of survival" (Messer,1989). Coping with

seasonal food insecurity as described in various studies (Chambers *et al.*,1979; Longhurst,1986; Corbett,1988), acts at the level of food supply, food storage, preparation and distribution. For their food supply people may adapt the cropping pattern by cultivating early crops, earning cash income in order to purchase foods, gathering wild foods or asking help from social networks.

A combination of gender and seasonal analysis of time allocation patterns can provide more insight in the task distribution between men and women when dealing with seasonal food insecurity. Questions should be answered on who is responsible within the household for subsistence production and especially for coping with seasonal food insecurity. Coping behaviour consists of activities such as cultivation of early crops, gathering wild foods, earning cash income or maintaining social networks. Are there any shifts in the task distribution between men and women in periods of food stress?

The aim of the present study is to provide an answer on these questions through the analysis of seasonal activity patterns of both women and men in a mainly subsistence society which is characterized by considerable food stress and seasonal weight loss.

## **STUDY AREA**

The study was carried out in the commune of Manta, in north-western Benin. This area was chosen because of its unimodal climate, evidence of seasonal food stress and body weight fluctuations (Schultink,1991; Ategbo,1993) and absence of nutrition intervention programmes. In this sudanian-guinean climate annual precipitation ranges from 1000-1300 mm, concentrated during the months May till October. The study population belongs to the ethnic group of the Otammari and are mainly subsistence farmers. They cultivate sorghum (*Sorghum spp.*) and millet (*Pennisetum spp.*) as main food crops, which can be harvested in November and December. Early crops such as hungry rice, also called *fonio* (*Digitaria exilis*), early bean varieties and maize (*Zea mays*) are cultivated to shorten the period of food shortage (August-September) before the main harvest. Staple food production is a task of both men and women. Men usually

prepare the fields (February-April) and together men and women do the sowing (May-June), weeding (July-August) and harvesting (September-December). Work parties are organized in order to cultivate a larger surface with help of neighbours and friends. The invited are "paid" with food and beer. Gathered wild foods such as shea nuts (*Butyrospermum parkii*), locust beans (*Parkia biglobosa*) or green leafy vegetables contribute for an important part to the food supply. Hunting wild animals occurs less frequently.

An ethnographic study carried out within the framework of the same research programme provided some background information. Women take care of processing, preparation and distribution of food as well as gathering wild foods. Off-farm income generating activities for men are handicrafts or construction work whereas women are mostly occupied with trade of raw or processed foods such as shea butter from shea nuts gathered in the bush, local sorghum beer or locust bean mustard from the African locust tree. Cash income from such activities can be used to buy food in the market when own stores become depleted.

## SUBJECTS

A group of 214 households was selected from the total population of 5 villages (about 4000 inhabitants) fulfilling criteria concerning subsistence farming and permanent residence in the study area. A sub-sample of 45 women was randomly selected according to the following criteria for an in-depth energy balance study of which the activity pattern study was part (Ategbo,1993):

- reproductive age group (18-45 years)
- non-pregnant and non-lactating women.

Another sub-sample of 26 men, between 18 and 45 years of age was randomly selected, but they belonged to other households than the women, in order to avoid too much pressure on the same households. A full data-set was available on 37 women and 25 men because of drop-out due to pregnancy for women and migration for men.



## **DESIGN AND METHODS**

Subjects were observed during a period of sufficient food availability and moderate field work (intermediate season, April 1991) and a period of food shortages and hard field work (pre-harvest season, August 1991). Women were observed for four consecutive days (coinciding with a full market cycle) and men for three consecutive days. Practical reasons (time constraints) allowed only a three-day observation for men. However, averages of three days or four days did not differ significantly for time allocation of women. Care was taken that market days were evenly represented and consisted about one-fourth of the total observation days. Observations were carried out by well-trained local female and male assistants under close supervision of the principal investigator. An observation day started at 7:00 am until in general 9:20 pm (total of 860 minutes), which is 60% of the day. Activities were recorded using the minute-to-minute registration technique (Durnin and Passmore, 1967) following a prefixed categorization. A short description of the activity was given on the form as well. Out of sight activities were recorded by recall.

## **DATA ANALYSIS AND STATISTICS**

For purpose of the energy balance study among women, activities had been categorized according to the level of energy expenditure. Because our interest was in the function of activities and not in energy expenditure, another categorization was made with help of the short descriptions recorded by the assistants. This categorization is given in Table 1. To enable comparison between men and women, only the first three observation days of women were analyzed. Although time spent per activity category is not normally distributed, mean daily time allocation is given to facilitate data presentation. The 25th and 75th percentiles were also calculated for each activity category as a measure for distribution. Because not all subjects were engaged in all activities, the percentage of the total group which actually was engaged in this activity is given as well. Statistical analysis was performed on the entire data set. The

**Table 1**      *Classification of activities*

---

1. Idle time
  2. Agriculture
    - 2.1 Cultivation
      - 2.1.1 Food crops
      - 2.1.2 Early food crops
      - 2.1.3 Cash crop
      - 2.1.4 Home garden crop
      - 2.1.5 Unknown
    - 2.2 Animal Husbandry
  3. Gathering and hunting
    - 3.1 Gathering wild foods
    - 3.2 Hunting
  4. Food processing / storage
  5. Food preparation
    - 5.1 Grinding / pounding
    - 5.2 Beer brewing
    - 5.3 Shea butter preparation
    - 5.4 Locust mustard preparation
    - 5.5 Other preparation
  6. Consumption
  7. Non-agricultural productive activities
    - 7.1 Home manufacturing
    - 7.2 Construction work
    - 7.3 Trade
  8. Work parties
  9. Housekeeping / care
    - 9.1 Fetching water
    - 9.2 Collecting fuelwood
    - 9.3 Cleaning
    - 9.4 Child care
    - 9.5 Personal care
  10. Walking and cycling
    - 10.1 Walking with water
    - 10.2 Walking with fuelwood
    - 10.3 Other walking and cycling
  11. Miscellaneous <sup>1</sup>
- 

<sup>1</sup> Miscellaneous activities include ceremonies, celebration, shelling of groundnuts when its purpose was unknown (sale or consumption), church visits etc.

Mann-Whitney test (Siegel and Castellan,1988) for non-parametric data, was used to compare sub-groups of men and women. For each sub-group, the two seasons were compared using the Wilcoxon signed rank test for matched pairs (Siegel and Castellan,1988).

## **RESULTS**

A general activity pattern for both men and women is described with 11 main activity categories (Table 2). Comparing idle time for men and women it becomes clear that women had daily about 2 hours less idle time than men in both seasons. Women had significantly less idle time in August, the pre-harvest season, in comparison with April, the intermediate season. This difference was not found for men.

Main activity for women in both seasons was food preparation taking about 3½ hours, followed by housekeeping and personal care for 2 hours in the intermediate season and about the same time spent on agricultural work in the pre-harvest season. For men, the intermediate season (April) was a leisure season with about 6½ hours idle time. However, productive non-agricultural activities took about 1½ hours a day. The pre-harvest season (August) was clearly the main season for agriculture for men, who spent about 3 hours per day working in the field.

Time spent on work parties was significantly less for women than for men in April (resp. 4 and 48 min). This difference disappeared in August since more women (41%) spent more time (39 min) on work parties than in April. For men time spent on work parties did not change (45 min in August).

Women spent significantly less time to move around than men (about 100 min difference in both seasons). Activities on which significantly less time was spent in the pre-harvest season were other productive off-farm activities for men and housekeeping and care for women.

A further breakdown of time allocation in several sub-categories offers a more complete view of the division of tasks concerning food security.

Time spent on agriculture in the pre-harvest season was spent for about 90% on cultivation of food crops (Table 3). Men were significantly more engaged in cultivation of food crops than women. Only very little time was spent on cultivation of early crops. Home garden crops were of importance only during the pre-harvest season and did not ask a lot of time. Due to reclassification after data collection it was not always possible to determine on which crop subjects had been working. This explains the relatively large part of cultivation time of women which was classified as unknown crop. When compared with the agricultural calendar it could be suspected that these crops were food crops. But even an analysis of food crops and unknown crops together showed that men spent significantly more time on crop cultivation than women in the pre-harvest season. Only 12% of the men spent little time on cash crop cultivation. Hardly any time was spent on animal husbandry (1-10 min).

In the intermediate season, 78% of the women and 48% of the men spent about 10 minutes per day on gathering wild foods (Table 3). Hunting was hardly done.

Food preparation and housekeeping are clearly a woman's tasks (Table 4). Time spent on all preparatory activities by women did not differ significantly between the seasons. However it can be seen that time spent on grinding diminished and time spent on preparation of shea butter increased during the pre-harvest season. Men spent only some minutes per day on food preparation but the number of men engaged in food preparation increased during the pre-harvest season. They roasted bambara groundnuts or warmed up some porridge. Table 4 also shows that women spent more time on fetching water and on child care than men but that time spent on these categories diminished significantly during the pre-harvest season for women.

Table 5 shows the time allocation to other non-agricultural productive activities. Men spent more time on home manufacturing and construction works than women. Both activity categories can be carried out for the benefit of the own household or in order to earn cash income. Men were not involved in trade during the intermediate season whereas women spent about 20 minutes per day on this activity. In the pre-harvest season, however, men were also involved in trade, mainly selling of tobacco.

**Table 2** Average daily time allocation of 37 women and 25 men in two seasons in north-western Benin

	April (intermediate season)				August (pre-harvest season)			
	WOMEN		MEN		WOMEN		MEN	
	minutes <sup>a</sup>	% <sup>b</sup>	minutes <sup>a</sup>	% <sup>b</sup>	minutes <sup>a</sup>	% <sup>b</sup>	minutes <sup>a</sup>	% <sup>b</sup>
Idle time	273 (193-336)	100	397 (336-460)*	100	215 (159-246)†	100	357 (294-394)*	100
Agriculture	31 (0-45)	57	52 (5-87)	88	116 (61-169)†	97	191 (141-243)†	100
Gathering and hunting	11 (2-17)	78	9 (0-7)	48	1 (0-0)†	19	0†	0
Food processing / storage	18 (0-13)	49	5 (0-2)	32	6 (0-8)	59	0*	0
Food preparation	200 (140-239)	100	3 (0-3)*	56	219 (163-261)	100	6 (1-8)*	76
Consumption	46 (33-62)	100	55 (47-64)	100	39 (30-45)	100	59 (47-65)*	100
Non-agricultural productive activities	28 (5-51)	86	98 (12-155)*	92	21 (0-15)	68	21 (1-27)†	76
Work parties	4 (0-0)	14	48 (5-67)*	76	39 (0-62)†	41	45 (0-73)	56
Housekeeping / care	122 (80-149)	100	26 (16-32)*	100	83 (52-98)†	100	22 (8-31)*	100
Walking and cycling	126 (89-154)	100	160 (120-203)	100	117 (93-136)	100	154 (105-200)*	100
Miscellaneous	2 (0-0)	8	5 (0-8)	28	4 (0-0)	16	6 (0-0)	12

<sup>a</sup> Mean (25th-75th percentiles) of total group

<sup>b</sup> Sub-group, that is actually engaged in activity

\* Difference between sexes for season is significant at  $p < .01$

† Difference between seasons for sex is significant at  $p < .01$

**Table 3** *Average daily time allocation in food production, gathering and hunting for 37 women and 25 men in two seasons in north-western Benin*

	April (intermediate season)				August (pre-harvest season)			
	WOMEN		MEN		WOMEN		MEN	
	minutes <sup>a</sup>	% <sup>b</sup>	minutes,	% <sup>b</sup>	minutes,	% <sup>b</sup>	minutes,	% <sup>b</sup>
<b>Agriculture</b>								
Cultivation of Food crops	9 (0-0)	19	33 (0-74)	36	40 (0-80)	43	172 (124-234) †	96
Early food crops	1 (0-0)	3	6 (0-0)	12	8 (0-0)	19	2 (0-0)	8
Cash crop	0	0	0	0	0	0	7 (0-0)	12
Home garden crop	1 (0-0)	5	0	0	3 (0-3) †	62	1 (0-0) *	8
Unknown crop	21 (0-28)	33	6 (0-0) *	4	60 (0-102) †	62	1 (0-0) *	8
Animal husbandry	1 (0-1)	30	7 (0-8) *	76	5 (0-8) †	62	9 (0-15)	76
<b>Gathering and hunting</b>								
Gathering wild foods	11 (2-17)	78	9 (0-7)	48	1 (0-0) †	19	0	0
Hunting	0	0	0	0	0	0	1 (0-0) †	4

<sup>a</sup> Mean (25th-75th percentiles) of total group

<sup>b</sup> Sub-group, that is actually engaged in activity

\* Difference between sexes for season is significant at  $p < .01$

† Difference between seasons for sex is significant at  $p < .01$

**Table 4** Average daily time allocation on different domestic tasks for 37 women and 25 men in two seasons in north-western Benin

	April (intermediate season)				August (pre-harvest season)			
	WOMEN		MEN		WOMEN		MEN	
	minutes <sup>a</sup>	% <sup>b</sup>	minutes	% <sup>b</sup>	minutes	% <sup>b</sup>	minutes	% <sup>b</sup>
<b>Food preparation</b>								
Grinding	43 (10-63)	95	0	0	28 (6-46)	84	0*	0
Beer brewing	6 (0-0)	19	0	0	4 (0-0)	16	0	0
Shea butter preparation	10 (0-0)	16	0	0	25 (0-57)	27	0*	0
Locust mustard preparation	4 (0-0)	11	0	0	3 (0-0)	14	0	0
Other preparatory activities	137 (94-175)	100	3 (0-3)*	52	158 (122-180)	100	6 (1-8)*	76
<b>Housekeeping</b>								
Fetching water <sup>1</sup>	14 (6-19)	95	0*	0	4 (1-6)†	78	0	0
Collecting fuelwood <sup>1</sup>	3 (0-5)	41	2 (0-1)	24	3 (0-6)	38	1 (0-0)	20
Cleaning	41 (29-53)	100	4 (0-5)*	60	40 (26-52)	100	2 (0-4)*	36
<b>Care</b>								
Child care	52 (18-65)	92	8 (0-12)*	76	27 (2-50)†	76	10 (0-17)	72
Personal care	13 (7-17)	97	12 (9-14)	92	10 (6-13)	100	9 (3-14)†	80

<sup>a</sup> Mean (25th-75th percentiles) of total group

<sup>b</sup> Sub-group, that is actually engaged in activity

\* Difference between sexes for season is significant at  $p < .01$

† Difference between seasons for sex is significant at  $p < .01$

<sup>1</sup> Time spent on collecting fuelwood or water does not take into account walking to and from the collection place.

**Table 5** *Average daily time allocation on non-agricultural productive activities and on walking and cycling by 37 women and 25 men in two seasons in north-western Benin*

	April (intermediate season)				August (pre-harvest season)			
	WOMEN		MEN		WOMEN		MEN	
	minutes <sup>a</sup>	% <sup>b</sup>	minutes	% <sup>b</sup>	minutes	% <sup>b</sup>	minutes	% <sup>b</sup>
<b>Non-agricultural productive activities</b>								
Home manufacturing	5 (0-7)	49	34 (0-26)	52	8 (0-4)	43	13 (0-22)*	68
Construction	4 (0-5)	41	64 (1-99)*	76	1 (0-0)†	11	1 (0-0)†	20
Trade	19 (0-26)	27	0	0	13 (0-1)	24	7 (0-0)	16
<b>Walking and cycling</b>								
Walking with water	17 (10-23)	100	0*	0	11 (6-15)†	95	0*	0
Walking with fuelwood	1 (0-0)	11	1 (0-0)	8	3 (0-0)	16	1 (0-0)	12
Other walking and cycling	126 (75-127)	100	160 (120-203)*	100	103 (85-120)	100	153 (105-200)*	100

<sup>a</sup> Mean (25th-75th percentiles) of total group

<sup>b</sup> Sub-group, that is actually engaged in activity

\* Difference between sexes for season is significant at  $p < .01$

† Difference between seasons for sex is significant at  $p < .01$



Table 5 shows that time spent on walking with water was significantly less during the pre-harvest season, but for walking with fuel wood no significant differences were found. Men spent significantly more time walking or cycling around than women.

## DISCUSSION

In literature many different classifications for activities have been used (Cain,1979; Ho,1979; King and Evenson,1983; Mueller,1984; Engberg *et al.*,1988), all referring to productive and non-productive activities. The classification made in this study satisfies the needs for identification of subsistence activities and activities dealing with coping with seasonal food stress. It can also easily be compared with other classifications. Because of reclassification after the initial data collection and because of the limitation of only two observation periods of 4-5 weeks, results do not include every possible activity of Beninese men and women. The absence of a complete year picture is compensated by a comparison of two 'extreme' periods (extreme in food availability and activity pattern), providing data on seasonal changes in the activity pattern. Data from other sub-studies carried out within the same research program supplied additional information for a careful interpretation of the time allocation data.

Another limitation is the presentation of time allocation data as a daily activity pattern because time spent on non-daily activities is therefore heavily diluted. A "typical" daily activity pattern does not account for activities such as fuelwood collection, preparation of shea butter or construction works, which occur only once every week or even less frequently. Time spent on these activities may seem very limited in the daily activity pattern (e.g.10 minutes), but they demand more time than 10 minutes when actually performed. Therefore the data as presented should be interpreted with care.

Other time allocation studies evaluated the labour task of women as very heavy in time expenditure (Bério,1984: 8 to 10 hours total labour time) or showed that men spend less time on subsistence farming (Engberg *et al.*,1988; Holmboe-Otessen and Wandel,1991) and have equal leisure time as women (Mueller,1984). The present study

showed that the Beninese women had less idle time than men and are much more involved in housekeeping and food preparation tasks. On the other hand, it showed that men contributed more to total cultivation (food production), participated more in work parties (maintaining social networks) and were more engaged in other non-agricultural productive activities than women. During the pre-harvest season women spent a large part of their time on agricultural work and at the same time, time spent on child care diminished significantly. Although some studies suggested a negative effect of women's work on child nutrition, a review of 50 studies on this topic by Leslie (1988) showed little evidence for this hypothesis. In the present study data on nutritional status of children have not been analyzed in relation to presence of the mother and no conclusions can be drawn regarding this problem. It is, however, assumed that other members of the household take over these tasks. For example, older girls are responsible for child care, water fetching or food preparation. In polygamous households (30% of this study population) co-wives may share domestic tasks.

In periods of seasonal food stress certain activities, dealing with food insecurity, get more emphasis. This coping behavior as identified in another sub-study of this research programme, consists amongst others of cultivation of early food crops, gathering wild foods in the intermediate season, processing of shea butter and locust bean mustard (possibly for sale) and non-agricultural productive activities such as construction work and trade. Processing of foods and home manufacture are activities that can be done for own use or which may provide cash income in order to buy food.

Each activity on itself seems to take little time in an average time allocation pattern, but for those subjects that perform a specific coping activity, actual time spent on this may be much more than the average of the entire group. Women seem to be responsible for the early food crops, gathering wild foods, processing of food products and trade of these processed foods. In the pre-harvest season these activities ask on average nearly one hour per day. Men's role in coping with seasonal food insecurity acts mainly through income generating activities such as home manufacturing for sale and construction works and assisting at work parties. This system of mutual assistance assures a household of labour force to cultivate their own fields.

This study agrees with Boserup (1970) that women's work load is underestimated, especially since women's idle time is less than men's. On the other hand the results are in contrast with studies showing a heavier workload in subsistence production for women because men contribute more to food production than women in northern Benin. Time expenditure, however, does not necessarily reflect energy expenditure. Without information on the intensity with which activities were performed, no conclusions can be drawn about this. Anthropometric data on the same study population (Ategbo,1993) show that men and women lose about the same percentage of their body weight during the hungry period. This suggests that in the longer run there is no difference in energy expenditure between the two sexes. Still, even when a difference in time expenditure does not have different physiological consequences, social consequences may be different for the two sexes. There was no evidence in this study that men took over tasks of women in times of stress when she has to combine both domestic and production tasks. This means that women have little time left for social activities and little flexibility in their activity pattern when it comes to implementation of nutrition or agricultural interventions.

## GENERAL DISCUSSION

The present study on seasonal food insecurity in north-western Benin focused on coping with food insecurity at household and individual level. The study benefited from a unique opportunity to combine quantitative data on nutritional status, food intake and time expenditure at individual level with quantitative and qualitative data on livelihood (socio-economic status), food security and coping behaviour at household level, all collected over a two-year period. It deals with a number of issues from the multi-faceted concept of household food security, such as intra-household food distribution, livelihood security and efficiency of coping behaviour.

In the following paragraphs several issues will be reviewed. First, the main findings of all sub-studies will be given briefly. Secondly, the indicators used to delineate household food security will be discussed with special emphasis on the use of cereal stocks. Next, the advantages and limitations of the choice of the population studied and the duration of the study will be discussed. Finally, suggestions will be made which are relevant to policies related to household food security in general and for the study population in particular.

### **Main findings**

One of the main conclusions of the study is that no relation was found between socio-economic household characteristics and individual body weight fluctuation due to seasonal food shortage (Chapter 3). In this population of mainly self-subsistent farmers not even a relation existed between household cereal stock, the sign for household food security, and individual body weight fluctuation. Yet it was found that coping behaviour of households with an insufficient cereal stock was distinctly different from that of households with sufficient cereal stock (Chapter 4). The insufficient cereal stock group relied on coping behaviour such as off-farm income, migration, wild foods and sales of livestock. Altogether these results suggest that coping behaviour in this study population seems to be effective, as individuals belonging to less food secure households did not lose

more body weight during the pre-harvest season than individuals belonging to more food secure households.

There were no gender differences in food allocation between men and women, but there was a trend that children were protected in terms of a more favourable requirement fulfilment in times of seasonal food insecurity (Chapter 5). Seasonal dietary changes involved a shift from consumption of home-produced foods to the consumption of food gifts, purchased foods and wild foods. The decreasing consumption of cereals is mainly compensated by an increased consumption of pulses by adults and children. Adults also consumed more tubers.

Gender differences in subsistence task distribution showed more working hours for women compared to men, combining home and field production tasks (Chapter 6). Men were mainly responsible for food production and assistance at work parties. Furthermore, in times of seasonal food insecurity also women were more engaged in coping behaviour than men.

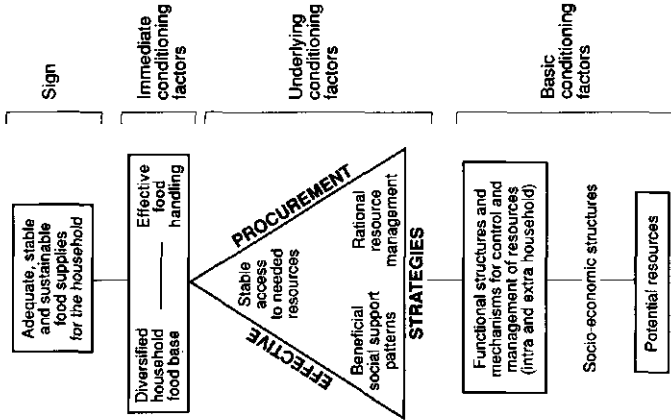
## **Household food security**

### ***Indicators***

Although we do not pretend to have studied each aspect of the multi-faceted concept of household food security, indicators as used in our study can be linked to the IFAD-model as discussed in Chapter 1 (Figure 1). Since household food security does not necessarily provides information on food security at individual level, the present study collected data at both levels.

As sign of food insecurity at individual level, nutritional status and food consumption were taken. Cereal stock was used as a sign of food security at household level. The choice for this indicator will be further discussed below. Indicators for immediate conditioning factors at household level were management of cereal stock (i.e. effectiveness of food handling) and coping behaviour. Coping behaviour comprises resource management and procurement of foods from different sources such as the cultivation of early crops, gathering of wild foods, reliance on social networks or usage of resources for cash income. This was translated into contributions of different

**IFAD-model**



**Indicators used in present study**

household level	individual level
Post-harvest cereal stock	Body weight, food consumption
Management cereal stock Coping behaviour	Use of food groups and sources
Socio-economic household characteristics	Intra-household food distribution Gender time allocation

**Figure 1** Factors conditioning household food security (IFAD, Frankenberger et al., 1993) and indicators as used in the present study

food groups and food sources to total food consumption at individual level. Socio-economic household characteristics were studied as being underlying conditioning factors at household level. Basic conditioning factors refer to power structures within the household and in the society. In order to understand who is in control of resources and which decisions are made, factors such as intra-household food distribution and gender differences in time allocation were studied at individual level. Although this study was carried out at household and individual level, also elements of national politics may also influence household's decisions and possibilities. There was, however, relatively little state interference in this remote study area and at the time of the field work no development interventions were going on.

### *Cereal stock*

An important sign indicator for food security at household level in the present study was cereal stock. In many studies, land size or cereal harvest (calculated by number of sacs) are used as indicator for food production (McNeill,1988; Christian *et al.*,1989; Foeken *et al.*,1989). In this particular area in north-western Benin however, households possess many different dispersed fields of irregular sizes. Some of those fields are not cultivated by the owner but by someone else with permission. For these land uses no payment is asked, although a courtesy gift to the landowner may contribute to a friendly relationship. Furthermore, people are not familiar with estimating their harvest in sacs or kg. The harvest is carried home in buckets of different sizes, which are not counted. Although farmers are able to estimate how long their stock will last once it is put in the granary, their estimations may already take their coping strategies into account.

Since 65% of total food consumption is provided by the household's own production and all produced food is stored in granaries, cereal stock seemed to be a good indicator for household food security. Therefore it was decided to measure the contents of the granaries. This could take place only with the full trust and consent of the farmers. Normally the cereal granaries are only accessible to the head of the household or one of his wives who has been given permission. Errors in the measurements of granaries and in the use of conversion factors are unavoidable because of irregularities in the form of

granaries and in case of mixing different cereals. We assume that these systematic errors did not interfere much with the classification of sufficient and insufficient cereal stock households.

### **Choice of study population**

The choice for the study area in north-western Benin was made mainly because of its unimodal climate, which assured a more severe seasonal stress than under bimodal conditions. Seasonal stress was found in rainfall and temperature, food prices at the local market, cereal availability at household level and body weight fluctuations at individual level. The choice of a combination of nutritional status and energy balance studies at individual level (Ategbo,1993) with the more socio-economic studies at household level (this thesis) was considered as advantageous. However, we must now conclude that the study population probably was a too homogenous group with limited socio-economic differentiation. This may partly explain why we could not study a relation between socio-economic household characteristics and fluctuations in nutritional status as observed by Valverde *et al.* (1977), Nabarro (1984) and Haaga (1986).

Despite a limited socio-economic differentiation, still a large variation in body weight fluctuation between individuals was observed which needs explanation. Therefore, we recommend that, in future studies, intervening factors such as individual health status (Kennedy and O'niango,1990) and individual activity pattern (Ategbo,1993) in relation to weight fluctuations will receive more attention.

### **Duration of the study**

The two-year field work period has permitted the collection of longitudinal data at individual and household level. This did not only provide an opportunity to compare indicators of household food security between the seasons but also between the study years.

Still this two-year period did not suffice in order to examine the effects of coping behaviour on the entitlements of a household. The choice for and use of certain coping strategies may have an exhausting effect on a household's livelihood (i.e. entitlements)



and it may therefore not be possible to maintain such behaviour in the long run. A two-year study period is in general not long enough to make statements on either the sustainability of household food security nor on the cost-effectiveness of coping behaviour of households.

### **Policy implication of household food security**

The concept of household food security should not only serve as an analytical but also as an organizing framework for project design. Information on local factors conditioning household food security is essential to policy makers and development programmes in order to direct their actions more efficiently and as much as possible in line with strategies already undertaken by the population itself.

At the International Conference on Nutrition in Rome, December 1992 (FAO/WHO,1992), several actions to improve household food security were proposed which can all be related to the different levels of the IFAD-model.

Improving household food security should start at the bottom of the model with the basic conditioning factors of household food security. Therefore the author agrees with Gill (1991) who insists that the minimum role interventions have to play is to create possibilities for farmers to access the market and so to permit them to play a competitive role. This may be by government intervention in building an economic and social infrastructure. Decision-making and resource-control within a household are important basic conditioning factors of food security at household level in which gender issues play a role. New policies and programs should take care not to add more work to women's already large burden of providing food and care for their households (Gittinger,1990).

At the level of underlying conditioning factors improvement of the household resource base is a first goal. IFAD states that their projects are designed to support production, productivity and generation of real income in order to promote directly or indirectly household food security (Frankenberger *et al.*,1993). Although, in the present study no direct relation was found between household socio-economic characteristics and body weight fluctuation as a sign of food insecurity, an improved resource base will spread the risk of food insecurity and improve possibilities for coping with food insecurity.

Concerning immediate conditioning factors which consist of coping behaviour used by a household, Gill (1991) rightly states that new counter-seasonal approaches should seek to identify and build on existing coping behaviour rather than try to replace them by innovations from outside.

Gill also pleads for policy interventions to be both cost-effective and sustainable. Cost-effectiveness can be obtained by targeting interventions at the most disadvantaged who are identified by sign indicators of food insecurity. Sustainability is achieved when emphasis is put on long-term perspectives of resource management, i.e. coping behaviour.

#### **Specific policy implications for the population studied**

Access to needed resources for household food security was questionable in the commune of Manta at the time of the present study. Credit schemes and extension were nearly absent, health services were marginal. Although the study area was relatively good accessible (by four wheel drive cars), it was rather isolated from external markets. No public transportation existed, except for the truck that arrived at market days. One sandy road goes from south to north through the district of Boukoumbe, traversing the village of Manta. During the rainy season, the condition of this road sometimes got so bad that cars could not get through. Improving infrastructure within the commune in order to make communication with other villages and towns easier might be a stimulus for the development of a more lively market economy with better competitive conditions for the local population.

Although poor soil conditions in the region limited food production, farmers spread risks by a diverse cropping pattern and the use of early crop varieties. Improved crop varieties and cultivation techniques may ensure a better food production. Gender task distribution should be taken into account here, since specific crops such as rice and beans are cultivated by women. An example in The Gambia showed that implementation of an irrigated rice cultivation system directed towards men, can disturb responsibilities and income opportunities of women and consequently household food security (Webb,1989).

Besides the development of agricultural activities, the generation of rural

employment opportunities can relieve the pressure on arable land and improve household food security through an increase in off-farm income (Tellegen,1993).

The richness of wild resources in the study area (Shea tree, African locust tree, Baobab) has potential value, nutritionally as well as economically. Shea butter, being the main fat source in the Otammari diet, constitutes an important part of the daily diet but gathering and processing of the shea nuts is a laborious task. Improved processing techniques may increase yields, resulting in higher availability of shea butter or locust bean mustard for consumption or as a trade commodity. Women's work load may be relieved and possibilities for cash income improved.

### **Final remarks**

This longitudinal study of the multi-faceted concept of household food security was a complex study. Although several issues have been taken into account it was not possible to pay attention to each element of household food security as discussed in the general introduction (Chapter 1). The IFAD-model proved to be a useful analytical framework in the discussion of household food security. Comparative or aggregated analyses of studies at individual, household and society level are needed to sharpen this model.

This study confirms that development projects to promote household food security should take seriously into consideration an enforcement of existing local coping behaviour patterns rather than a replacement by innovations from outside.

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## SUMMARY

In many developing countries, a seasonal pattern in rainfall causes fluctuations in aspects of daily life, such as seasonal agricultural labour needs, fluctuations in food security and variations in health and nutritional status. In general, seasonal food insecurity seems to operate concurrently with other adverse factors such as a high prevalence of diseases and a heavy work load during the wet seasons. However, the seasonality phenomenon is a recurrent problem and people may adjust to the demands of this adverse situation, through biological or behavioral adaptation at individual level or through coping behaviour at household level.

The aim of the study presented in this thesis was twofold. At the one hand it aimed at analyzing the possible relationships between coping behaviour, evolved by rural households in order to cope with seasonal food insecurity, and socio-economic characteristics at household level. At the other hand it looked into seasonal changes in food consumption, activity pattern and nutritional status at individual level. The study was carried out in north-western Benin, in the commune of Manta during 1990 and 1991.

In Chapter 1, the concepts of food security, seasonality and coping are discussed. Food insecurity may be either chronic, mostly due to poverty, or transitory, due to seasonal fluctuations in food production or food prices. The concept of household food security and coping with food insecurity is not viewed as a simplistic one, referring to food supply alone. A multi-faceted model as used by IFAD (International Fund for Agricultural Development) takes into account intra-household and gender issues, livelihood security, sustainability, cultural acceptability, efficiency and cost-effectiveness.

In Chapter 2, a food ethnographic study among the study population, the Otammari, is presented. Aim of this ethnography was to examine the ways in which the population acquires and uses foods, with special emphasis on seasonality, and to develop a systematic approach for food ethnographies. It appeared that the food system had changed very little since the 1950s. Certain aspects of the food system were identified that can be important in coping with seasonal food insecurity: consumption and trade of wild foods, especially shea nuts and locust beans; early crop cultivation such as *fonio*



(hungry rice); seasonal changes in eating pattern, notably a change in intra-household food distribution.

Chapter 3 reports on the relationship between socio-economic household characteristics and seasonal body weight fluctuation. No significant correlation was found for body weight fluctuations between the two study years, nor between body weight fluctuations of men and women belonging to the same household. When comparing dichotomized socio-economic classes for relative body weight fluctuations of men and women, no consistent trends were observed for both years nor for both sexes. Hence, in this study population where farmers are mainly self-subsistent with limited socio-economic differentiation, the magnitude of body weight fluctuation has no relation with socio-economic household characteristics.

In Chapter 4, coping behaviour of two household groups, characterized by sufficient and insufficient cereal stock, is compared. The group with insufficient cereal stock at the beginning of the year took more preventive coping strategies, such as income generating activities and migration, and more acute coping measures, such as gathering of wild foods and fasting, than the group with sufficient stock. However, the two groups did not differ in individual body weight fluctuation of men or women. This implies that the coping behaviour used by the insufficient cereal stock group may be effective enough to remain at the same level of nutritional status as the sufficient cereal stock group.

In Chapter 5 qualitative and quantitative dietary changes are studied as indicators of seasonal changes in household food security. The decline of cereal consumption in the pre-harvest "hungry" season was partly supplemented by pulses, more so for children than for adults. Contributions to energy and protein intake by own production were supplemented with food gifts, purchased foods and wild foods. Although not significant, results suggest a decline in requirement fulfilments for adults and an increase in requirement fulfilments of children in the pre-harvest season.

Chapter 6 deals with gender issues in time allocation to subsistence tasks. Women were largely responsible for home production and men for field production. Specific coping behaviour activities were mainly carried out by women. There did not appear to be a shift in task distribution between men and women in the pre-harvest season, when

work load is high and women have to combine home and field production.

Chapter 7 is the general discussion of the thesis. Indicators as used in the present study are linked to the IFAD-model for factors conditioning household food security. It is thus demonstrated that the present study paid attention to multiple facets of food security at both household and individual level. Data suggest that coping behaviour at household level was effective at the short term because individuals of insufficient cereal stock households did not lose more body weight than those belonging to sufficient stock households. More information however is needed on the long term effectiveness of coping behaviour for livelihood security. It is argued that the household food security concept should not only be used as an analytical framework but also as an organizing framework for intervention project design. Results of the present study give several starting points for development efforts intended to promote food security.

## SAMENVATTING

In veel ontwikkelingslanden zorgt een seizoenmatig regenvalpatroon voor seizoensfluctuaties in andere aspecten van het bestaan, zoals de seizoensvraag naar landbouwarbeid, fluctuaties in voedselzekerheid en variërende gezondheids- en voedingstoestand. In het algemeen lijkt seizoenmatige voedselonzekerheid tegelijkertijd op te treden met andere ongunstige factoren zoals een hoge prevalentie van ziekten en een zware arbeidsdruk in het regenseizoen. Het seizoensfenomeen is echter een regelmatig terugkerend probleem en de bevolking kan zich hieraan aanpassen door biologische of gedragsadaptatie op individueel niveau of door aanpassingsstrategieën op huishoudniveau.

Het doel van het in dit proefschrift beschreven onderzoek was tweeledig. Aan de ene kant richtte het zich op het bestuderen van relaties tussen aanpassingsgedrag van huishoudens, om voedselonzekerheid het hoofd te bieden, en sociaal-economische karakteristieken op huishoudniveau. Aan de andere kant werden seizoensveranderingen in voedselconsumptie, activiteitenpatroon en voedingstoestand op individueel niveau bestudeerd. Het onderzoek werd uitgevoerd in het noord-westen van Benin, in de commune Manta in 1990 en 1991.

In Hoofdstuk 1 worden de concepten voedselzekerheid, seizoenmatigheid en "coping" (of aanpassing) besproken. Voedselonzekerheid kan ofwel chronisch van aard zijn, meestal tengevolge van armoede, ofwel van voorbijgaande aard, tengevolge van seizoenmatige fluctuaties in voedselprijzen of -productie. Het begrip voedselzekerheid van huishoudens of het omgaan met voedselonzekerheid wordt niet gezien als een simplistisch model dat slechts afhangt van de voedselvoorziening. Een multi-dimensionaal model voor voedselzekerheid zoals gebruikt door het IFAD (Internationaal Fonds voor Agrarische Ontwikkeling) omvat punten zoals verschillen binnen een huishouden, geslachtsgebonden verschillen, bestaanszekerheid, duurzaamheid, culturele aanvaardbaarheid, efficiëntie and kosten-baten analyse.

In Hoofdstuk 2 wordt een voedsel-etnografie gepresenteerd die is uitgevoerd onder de onderzoekspopulatie, de Otammari. Doel van deze etnografie was het bestuderen van

de manieren waarop men zich van voedsel voorziet en waarop men het voedsel gebruikt, met de nadruk op seizoenmatigheid, en tevens om een systematisch aanpak voor voedsel-etnografisch onderzoek te ontwikkelen. Het voedselsysteem bleek weinig verandering te hebben ondergaan sinds de vijftiger jaren. Enkele elementen van het voedselsysteem die van belang kunnen zijn in het omgaan met seizoenmatige voedselonzekeerheid werden besproken: voedsel verzamelen in het wild, met name kariténoten en locustbonen; de verbouw van vroegrijpe gewassen zoals *fonio*; seizoensveranderingen in eetpatroon en met name een verschuiving in voedselverdeling binnen het huishouden.

In Hoofdstuk 3 wordt ingegaan op de relaties tussen sociaal-economische huishoudkarakteristieken en seizoenmatige lichaamsgewichtfluctuaties. Er werd geen significante correlatie gevonden tussen lichaamsgewichtfluctuaties in de twee onderzoeksjaren noch tussen lichaamsgewichtfluctuaties van mannen en vrouwen uit eenzelfde huishouden. Een vergelijking van dichotome sociaal-economische klassen voor relatieve gewichtsfuctuaties van mannen en vrouwen liet geen consistente trends zien voor beide jaren noch voor beide geslachten. In deze onderzoekspopulatie van zelfvoorzienende boeren met een beperkte sociaal-economische differentiatie, is er blijkbaar geen relatie tussen de grootte van gewichtsfuctuaties en sociaal-economische huishoudkarakteristieken.

In Hoofdstuk 4 wordt het aanpassingsgedrag van twee groepen huishoudens, gekarakteriseerd door een voldoende en onvoldoende graanvoorraad, vergeleken. De groep met een onvoldoende graanvoorraad aan het begin van het jaar, voerde meer preventieve aanpassingsstrategieën uit, zoals inkomensverschaffende activiteiten en migratie, en meer acute aanpassingsmaatregelen, zoals het verzamelen van wild voedsel en vasten, dan de groep met een voldoende graanvoorraad. De twee groepen verschilden echter niet in individuele lichaamsgewichtfluctuaties van mannen of vrouwen. Dit wijst erop, dat het aanpassingsgedrag van de groep met een onvoldoende graanvoorraad, effectief genoeg was om op eenzelfde niveau van voedingstoestand te blijven als de groep met een voldoende graanvoorraad.

In Hoofdstuk 5 worden kwantitatieve en kwalitatieve veranderingen in het voedselpatroon bestudeerd als indicatoren van seizoenmatige veranderingen in voedselzekerheid op huishoudniveau. De afname in graanconsumptie in het "honger" seizoen vóór de oogst werd gedeeltelijk aangevuld met de consumptie van peulvruchten, meer door kinderen dan door volwassenen. De bijdragen aan energie- en eiwitconsumptie door eigen voedselproductie werden aangevuld met voedselgiften, gekocht voedsel en verzameld voedsel. Alhoewel niet significant, suggereren de resultaten tevens dat de behoeftevoorziening van volwassenen afnam en die van kinderen toenam in het seizoen vóór de oogst.

Hoofdstuk 6 behandelt de geslachtsgebonden verschillen in tijdsbesteding aan levensonderhoud. Vrouwen waren met name verantwoordelijk voor de huishoudelijke productie en mannen voor de veldproductie. Specifieke aanpassingsactiviteiten werden voornamelijk door vrouwen uitgevoerd. Er bleek geen verschuiving te zijn in taakverdeling tussen mannen en vrouwen in het seizoen vóór de oogst wanneer de arbeidsdruk hoog is en vrouwen huishoudelijke activiteiten en veldproductie moeten combineren.

Hoofdstuk 7 omvat de algemene discussie van het proefschrift. De indicatoren die in dit onderzoek zijn gebruikt, zijn gekoppeld aan het IFAD-model voor factoren die huishoudvoedselzekerheid bepalen. Op deze manier wordt duidelijk dat dit onderzoek aandacht heeft besteed aan de veelzijdige aspecten van voedselzekerheid op huishoudniveau en op individueel niveau. De gegevens suggereren dat aanpassingsgedrag op huishoudniveau effectief was op de korte termijn omdat individuen van huishoudens met een onvoldoende graanvoorraad niet méér gewicht verloren dan individuen uit huishoudens met een voldoende graanvoorraad. Er is echter meer informatie nodig over de effectiviteit van aanpassingsgedrag op de lange termijn, m.n. voor de bestaanszekerheid. Er wordt gesteld dat het concept van huishoudvoedselzekerheid niet alleen als analytisch model maar ook als organisatiemodel voor het ontwerpen van interventieprojecten kan dienen. Resultaten van dit onderzoek bieden verschillende aanknopingspunten voor ontwikkelingsprojecten die zich richten op het verbeteren van de voedselzekerheid.

## RESUME

Dans les pays en voie de développement, les variations saisonnières de la pluviométrie provoquent certaines modifications de la vie quotidienne telles que l'aménagement des travaux agricoles, les variations de la sécurité alimentaire de l'état nutritionnel et de la santé. D'une manière générale, l'insécurité alimentaire et d'autres facteurs défavorables, telles que la prévalence de maladies et la charge de travaux pénibles, semblent agir simultanément durant les saisons pluvieuses.

Néanmoins, ce phénomène saisonnier étant un problème récurrent, la population s'accommode de cette situation hostile par des adaptations de la biologie et du comportement chez l'individu, ou par des choix stratégiques au niveau des ménages.

L'étude présentée dans cette thèse a un double objectif. D'un part elle examine les relations possibles entre les stratégies des ménages permettant de surmonter l'insécurité alimentaire saisonnière et leurs caractéristiques socio-économiques. D'autre part elle étudie la consommation alimentaire, l'emploi du temps et la fluctuation de l'état nutritionnel de l'individu. Cette étude a été menée au Nord-Ouest du Bénin, dans la commune de Manta au cours des années 1990 et 1991.

Le chapitre 1 présente les concepts de sécurité alimentaire, de fluctuations saisonnières et d'adaptation. L'insécurité alimentaire peut être ou bien chronique, en raison de la pauvreté principalement, ou bien transitoire, à cause des fluctuations saisonnières de la production et des prix des produits agricoles. Le concept de sécurité alimentaire au sein du ménage et d'adaptation à une situation d'insécurité n'est pas limité seulement à l'approvisionnement en nourriture. Un schéma multi-modal, utilisé par IFAD (Fonds International pour le Développement Agricole) intègre les éléments suivants: la distribution au sein du ménage et les différences liées au sexe, la sécurité de l'existence, la durabilité, l'acceptabilité culturelle, l'efficacité et la rentabilité.

Dans le chapitre 2, une étude ethnographique alimentaire de la population concernée, les Otammaribé, est présentée. L'objectif de cette étude était, d'une part d'examiner les sources d'approvisionnement et l'utilisation de la nourriture, en mettant

l'accent sur l'importance des saisons, et d'autre part, de développer une approche systématique de ce type de travail. Il apparaissait que le système alimentaire avait peu changé depuis les années cinquantes. Certains éléments de ce système ont été identifiés comme pouvant jouer un rôle important pour l'adaptation à l'insécurité alimentaire saisonnière: aliments sauvages (en particulier noix de karité et graines de néré), mise en place de cultures hâtives comme le *fonio*, changements dans la façon de consommer, avec en particulier une nouvelle distribution alimentaire au sein du ménage.

Le chapitre 3 traite de la relation liant les caractéristiques socio-économiques des ménages aux fluctuations saisonnières du poids corporel. Aucune corrélation significative n'a été trouvée pour les fluctuations en poids corporel, ni entre les deux années étudiées, ni entre un homme et une femme du même ménage. La comparaison des classes socio-économiques dichotomes, en prenant les fluctuations de poids corporel des hommes et des femmes, n'a fait ressortir aucune tendance cohérente, ni pour les deux années, ni pour les deux sexes. En effet en considérant la population étudiée, au sein de laquelle les paysans sont pour la plupart autosuffisants, avec des différences socio-économiques limitées, l'importance des variations de poids corporel n'a pas de relation avec les caractéristiques socio-économiques des ménages.

Dans le chapitre 4, les adaptations à l'insécurité alimentaire sont comparées entre deux groupes de ménages, caractérisés par un stockage des céréales suffisant et insuffisant. Le groupe des ménages au stockage insuffisant utilisait davantage de stratégies d'adaptation préventives que ne le faisait l'autre groupe, comme la production de revenus, la migration ou en adoptant des mesures curatives agissant directement sur l'alimentation telles que le recours à la cueillette sauvage et le jeûne.

Cependant les deux groupes ne présentaient aucune différence de fluctuation de poids corporel des individus masculins ou féminins. Cela implique que les stratégies d'adaptation utilisées par les ménages du groupe au stockage de céréales insuffisant semblaient être assez efficaces pour maintenir le même état nutritionnel que les ménages du groupe au stockage suffisant.

Dans le chapitre 5 les changements diététiques qualitatifs et quantitatifs ont été étudiés comme étant des indicateurs des fluctuations saisonnières de la sécurité

alimentaire des ménages. La réduction de la consommation de céréales dans la période précédant les récoltes, la soudure, a été compensée partiellement par l'utilisation de légumineuses, plus pour les enfants que pour les adultes. Les contributions de la production à la consommation d'énergie et de protéine ont été supplées par des cadeaux de nourritures, des achats de denrées alimentaires et par des aliments sauvages. Les résultats ne sont pas significatifs, mais suggèrent une baisse de la couverture des besoins en énergie et en protéine pour les adultes et une augmentation de la couverture des besoins des enfants de 2-5 ans dans la saison précédant la récolte.

Le chapitre 6 traite des différences d'emploi du temps entre les deux sexes pour les tâches de subsistance. Les femmes étaient largement responsables des productions ménagères et les hommes des productions des champs. Les tâches résultant de l'adaptation à l'insécurité alimentaire ont été exécutées principalement par les femmes. Il n'a pas semblé y avoir de changement dans la distribution des tâches entre femmes et hommes dans la saison pré-récolte, au moment où la charge de travail est importante, les femmes devant alors combiner la production ménagère avec la production des champs.

Le chapitre 7 constitue la discussion générale de cette thèse. Les indicateurs utilisés dans la présente étude sont combinés au modèle IFAD pour les facteurs conditionnant la sécurité alimentaire du ménage. Ainsi, la présente étude attire l'attention sur les multiples aspects de la sécurité alimentaire à la fois au niveau de l'individu et du ménage. Les données suggèrent que les stratégies d'adaptation des ménages ont été efficaces à court terme puisque les individus des ménages ayant un stock de céréales insuffisant n'ont pas perdu davantage de poids que ceux des ménages au stock suffisant. Cependant plus d'informations sont nécessaires afin de connaître l'efficacité sur le long terme des stratégies d'adaptation pour une sécurité de l'existence. Le concept de sécurité alimentaire du ménage ne devrait pas être utilisé comme un cadre seulement analytique mais aussi préparatoire à l'élaboration de projets d'intervention. Cette étude propose plusieurs idées forces pouvant inspirer des actions en faveur d'un développement promoteur de la sécurité alimentaire.



## ACKNOWLEDGEMENTS

A multi-centre study, funded by the EC-STD programme (STD-1 contract no. TSD-M-107-NL, STD-2 contract no. TS2-0150-NL and STD-3 contract no. TS3\*-CT91-0026), was set up by an international team of researchers: Prof. Dr. A Ferro-Luzzi (Rome) as coordinator, Prof. Dr. JGVA Durnin (Glasgow), Prof. Dr. PS Shetty (Bangalore) and Prof. Dr. JGAJ Hautvast (Wageningen). Within the framework of a Beninese-Dutch university cooperation, part of this study was carried out in Benin by two research assistants, Eric Alain D Ategbro and the author of this thesis. We shared the topic "*Adaptations to seasonal fluctuations in food availability in rural households in north-western Benin*". Eric Ategbro studied biological, metabolic and behavioral adaptations at individual level and I studied the socio-economic aspects of coping at household level and the impact of such coping behaviour at individual level. We are grateful to the European Community and to the Dutch-Beninese university cooperation project for the financial support of these studies.

Prof. Hautvast gave me the opportunity to start this study on a relatively unfamiliar topic in his department. I am obliged to him for this challenge and for the inspiring discussions we had in Wageningen. Dr. AP den Hartog was my supervisor in the field and in Wageningen. His visits to the north of Benin were very encouraging and I thank him for his support.

During my 4 years as PhD student I was under contract at the Africa Studies Centre in Leiden. I would like to show my appreciation to Prof. Hoorweg for the stimulating discussions we have had, always making me look at another perspective.

Due to the cooperation with the Department of Nutrition and Food Sciences (NSA) of the Faculty of Agricultural Sciences (FSA) at the National University of Benin it was possible for me to conduct my fieldwork in Benin. I am grateful to the former dean of the FSA, Dr. Mama Adamou N'Diaye, to the vice-dean Dr. MC Nago and to the former head of the NSA, Dr. HF Nouwakpo for allowing me to be a visiting scientist. I am especially indebted to the responsible person of the cooperation programme, Dr. FLHA de Koning, for his interest in my work and for his willingness to help me whenever necessary.

Eric, my colleague in the field: thank you for the work discussions and the sociable moments we shared together in "our" village. Your presence in Wageningen during the difficult task of analyzing the heap of data and writing down the results was very helpful.

Many others contributed to the enormous task of executing the fieldwork and analyzing the data. Without their help it would have been impossible to write this thesis:

- the Beninese field workers: Josephine Kouaro, Paulette Boki, N'Tieta Yaconkou, Tempa N'Tcha, Pierrette Bagri, Loreen N'Tia, Bruno N'Cha, Achille Toumoudougou and the stand-in assistant, Eudoxie Toumoukoun,
- the Beninese graduates: Cyriaque Hinson, Romain Dossa, Daniël Gbèvè and Paul Lanklounon,
- the Dutch students: Renée Bakker, Marieke Trompetter, Ankie Mentink, Stineke Oenema, Gea Witvoet, Jantine van Woerden, Lucy van de Vijver, Geri Wuis and Marianne van Lubek.

But work alone does not make one happy, especially not when you are far away from the rest of the world. I really appreciated the stimulating company of my friends in Benin: Célestin, Annette, Rachael, Nina, Didier and Pierre.

Back in Wageningen I could not have finished this thesis without the solidarity among the PhD-fellows. Reggy, Carina and Inge deserve a great deal of the credits. A special word for Inge who supported me as a colleague and friend. Thank you for the numerous discussions, comments, advice and moral boosts during the last 4½ years.

Then, I could not have left for Benin without the support of a few people who are very dear to me. Wim, thank you for everything. Pap and mam, thank you for your everlasting confidence, encouragement and interest in my work.

Wageningen, November 1993,

Marti J. van Liere

## CURRICULUM VITAE

Martina Johanna van Liere was born on the 18th of June 1963 in Beek, the Netherlands. In 1981 she graduated from secondary school with a beta-orientation, at the "Christelijk Lyceum Dr. W.A. Visser 't Hooft" in Leiden.

In September of that same year, she started her studies in Human Nutrition at the Wageningen Agricultural University. During her study she spent a practical period of 6 months at the International Centre for Diarrhoeal Disease Research in Dhaka, Bangladesh and 5 months in Cotonou, Benin for her Masters research. In 1988, she obtained her Masters degree with honours, with Human Nutrition, Extension Sciences and Public Health as the major topics.

In January 1989, she started as a PhD-fellow in the Postgraduate Programme in Human Nutrition at the Department of Human Nutrition in Wageningen. The research topic was "*Adaptations to seasonal food insecurity at household level in north-western Benin*". In July 1989, she participated in the Postgraduate Summer Course on Epidemiology in Human Nutrition and Public Health, in Southampton, UK. From December 1989 till January 1991 she carried out the field work for above-mentioned study, described in this thesis, in the Atacora province of the Republic of Benin.

In January 1994, she will join the "European Prospective Investigation on Cancer" at INSERM (Institut National de la Santé et de la Recherche Médicale), Paris.