Borrowing and Off-farm Employment: Conditional Strategies to Reduce Seasonal Fluctuations in Food Security

A case study from India

Martha Negash

MSc. Thesis

Supervisors: Dr. R. Ruben and M. van den Berg

Wageningen Agricultural University
Department of Development Economics

January, 1998

Acknowledgement

I am very much indebted to my supervisors Dr. R. Ruben and Marrit van den Berg. Their help was tremendous. They continuously guided and supported me starting from the formulation of the research idea. My gratitude also goes to the Department of Development Economics (WAU) for supplying the ICRISAT data set. Marrit was very helpful even in the management of this data set and in all the empirical part of the thesis.

My heartfelt gratitude is to Wageningen Agricultural University for the financial support I received throughout my MSc. study in The Netherlands.

I am very glad to say 'thank you!' to all of my families, especially to my father Negash Zenebe. He was the best teacher to his children, and with out his encouragement and care I would not have been able to continue my MSc. I would like also to thank Million Temesgen, my fiancé, he was with me all the time through phone calls and letters.

Lastly, my thanks go to Asmare for the valuable advice he gave me and friendship I had with him.

Table of Contents Page

Acknowledgement i
Table of Contents ii
List of Tables iii
List of Figures iii

CHAPTER 1 BACKGROUND OF THE STUDY 2

1.1 Introduction 2
1.2 Statement of the Problem and Hypothesis 3
1.3 Objectives of the study 5

CHAPTER 2 DESCRIPTION OF THE STUDY AREA 5

2.1 Cropping Systems 7
2.2 Rural Labour Markets 8
2.3 Rural Financial Markets 9

CHARTER 3 LITERATURE REVIEW 11

3.1 Seasonality in Food Security 11
3.1.1 Economic Approaches of Seasonal Analysis 13
3.1.2 Household Strategies 16
3.2 Rural Credit Markets 20
3.2.1 Rural Finance 20
3.2.2 Credit Use 22
3.3 Rural Labour Markets 23

CHAPTER 4 MATERIALS AND METHODS 26

4.1 The Data 26
4.2 Theoretical Background 27
4.3 Estimation Procedures 31

CHAPTER 5 EMPIRICAL RESULTS 33

5.1 Income Levels and Composition 33
5.2 Income and Farm Household Characteristics 37
5.3 Seasonal Income Fluctuations 38
5.4 Food Expenditure Levels 39
5.5 Seasonal Food Expenditure Fluctuation 41
5.6 Seasonal Food Expenditure Effects of Off-farm Income and Credit 42
5.7 The Effect of Farm Household Characteristic on Food Expenditure Elasticity 46

CHAPTER 6 CONCLUSION 49

APPENDIX A. 51

REFERENCE 52

List of Tables

Table	Page
4.1 Farm size classification (in ha.)	26
4.2 Total number of cases analysed in each village	27
5.1 Mean monthly per capita total income (in Rupees) organized by village, land holding class, and season	35
5.2 Characteristics of farm households with respect to income status(1975-1984)	37
5.3 Seasonal variation in income (Coefficient of Variations)	38
5.4 Share of food expenditure as a percentage of total expenditure by village, land holding category and season	39
5.5 Mean comparison of food expenditure- Aurepalle .	40
5.6 Mean comparison of food expenditure- Kanzara .	40
5.7 ANOVA result: Total monthly food expenditure/capita variance 'explained' by sub-groups in percentage terms	41
5.8 Summary statistics for variables used in the food expenditure equation	43
5.9 Parameter estimates for marginal propensity to consume with respect to Credit and Wage income organised by Village and season	44
5.10 Regression analysis of food expenditure elasticity	47

List of Figures

Figure	Page
2.1 The location of the study villages within India's semi-arid tropics (SAT)	5
5.1 Mean Income compositions by land size class- Aurepalle	35
5.2 Mean Income composition by land size class- Kanzara	35
5.3 Income components of small farm households by season-Aurepalle	37
5.4 Income components of small farm households by season-Kanzara	37

Chapter 1 Background of the study

"Rural households in arid and semi-arid areas of India routinely plan for and manage uncertainty associated with regular seasonal fluctuations and periodic drought-induced crises." Alter Chen Martha (1991, p. 19)

1.1 Introduction

Seasonal variation in agricultural production results in two sets of related problems: unevenness in resource requirements and unsuitability in the flow of outputs. For rural subsistence farm households, the major problem is seasonal variation in food consumption (Gill, 1991). Farm households expect seasonality in agricultural production. To cope with the seasonal nature of their major income source, which is agriculture, farmers may adopt various strategies. These strategies could be one or a combination of the following: diversifying income sources, entering into the labour or land tenancy market, drawing down stored goods or fixed assets, adjusting consumption (shifting or reducing), or borrowing and relying on social security arrangements. Resource conditions, market structure and other socio-economic conditions may influence the selection of the appropriate strategy. Households with sufficient resources, such as food stocks or other assets like gold or livestock, may smooth consumption throughout the year, while others may adopt certain strategies to meet short-term needs such as borrowing. Also engagement in off-farm employment may permanently or seasonally contribute in smoothing seasonal food fluctuation.

This thesis focuses on the question: To what extent the income obtained through participation in seasonal off-farm employment and / or borrowing on the rural financial market can serve this purpose to cope with problems related to seasonal food fluctuations in semi-arid tropics of India.

The thesis is structured in six chapters. In this first chapter the research problem and the objectives of the research are explained. The description of the study area is presented in

chapter 2. Chapter 3 offers a review of literature. In that chapter, major recent works on the issue of seasonal food security and on the features of rural credit and labour markets are reviewed. In chapter 4, the type of data used for the analysis and the approach adopted to analyse the research problem are presented. The empirical findings and test results are presented and discussed in chapter 5. Finally, some policy implications of the findings and an overall assessment (weakness and strengths) of the study are presented in chapter 6.

1.2 Statement of the Problem and Hypothesis

Unpredictable variation in climate is a major cause of fluctuation in agricultural production. To a greater extent, weather is an uncertain and uncontrollable production factor. Climatic variation results in agricultural production that follows a seasonal pattern, even if seasonallity is not a fixed and rigid constraint (Timmer *et al.*, 1980). If crop production constitutes the major revenue earned by farmers, its seasonality will lead the major proportion of income to be unstable. The source of income fluctuation is not only production related. Output and input price instabilities may also influence farmers' decisions regarding resource allocation. In a situation where the major source of income faces seasonal fluctuation, farmers behave differently than they would if their source of income is stable.

If capital markets are perfect, the right price and information signals would give rise to efficient resource allocation, and households would be in a better position to smooth income variability from savings and borrowing (Sadoulet and de Janvry, 1993). However, earlier observations show us that low-income countries' markets are poorly integrated, inefficient, and selective as to whom they effectively reach and serve (Sahn, 1989). There is some evidence that not all households are equally capable of smoothing their income variability by adjusting temporal savings and dis-savings.

In the Semiarid Tropical regions of India, intensive rainfall follows a long hot and dry period. The local season is divided into three periods: The Kharif or monsoon season (June – October); the Rabi or winter season (November – March); and the Summer season (April – May). Towards the end of the summer season food stocks are gradually, if not completely, depleted. There is a high shortage of cash during this period to purchase farm inputs. There is uncertainty on the duration of the rainfall period on which the production process depends. Farmers try to allocate resources in such a way that they can meet input bottlenecks during peak seasons and also to minimise fluctuation of income.

Households have to synchronise the seasonal opportunities or constraints of several occupations, partly because of the incompleteness of markets. Some households synchronise cultivation with wage labour and others, who have only access to non-irrigated land, often look for wage employment during Rabi season when cultivation requires irrigation. Households also attempt to synchronise on-farm activities with off-farm activities, shifting resources to off-farm activities during periods of low labour demand for on-farm agricultural activities. Previous studies on South India perceived that changing net borrowing position in the financial market and on-farm off-farm labour adjustment dominate as main strategies to compensate for income shortfalls (Walker and Ryan, 1990; Maitra, 1996).

Walker and Ryan (1990), analysing the aggregate data from three villages in South India rejected the hypothesis of marked seasonal variation in nutrient intakes. Harriss (1990) refuted this result. She adds that seasonal relationships in specific villages might be masked due to aggregation problem. Therefore, there is no empirical evidence of significant seasonality of food consumption in South India. The importance of credit and off-farm employment in smoothing seasonal food consumption has not been studied explicitly. This research was initiated with the aims of assessing the significance of seasonality in food consumption and the contribution of off-farm income and credit in food consumption over seasons. Two major hypotheses are forwarded: first, whether food

consumption significantly varies from one season to the other or not, and second, if the use of off-farm income and credit for food consumption differs between seasons.

1.3 Objectives of the study

The study emphasizes the following objectives:

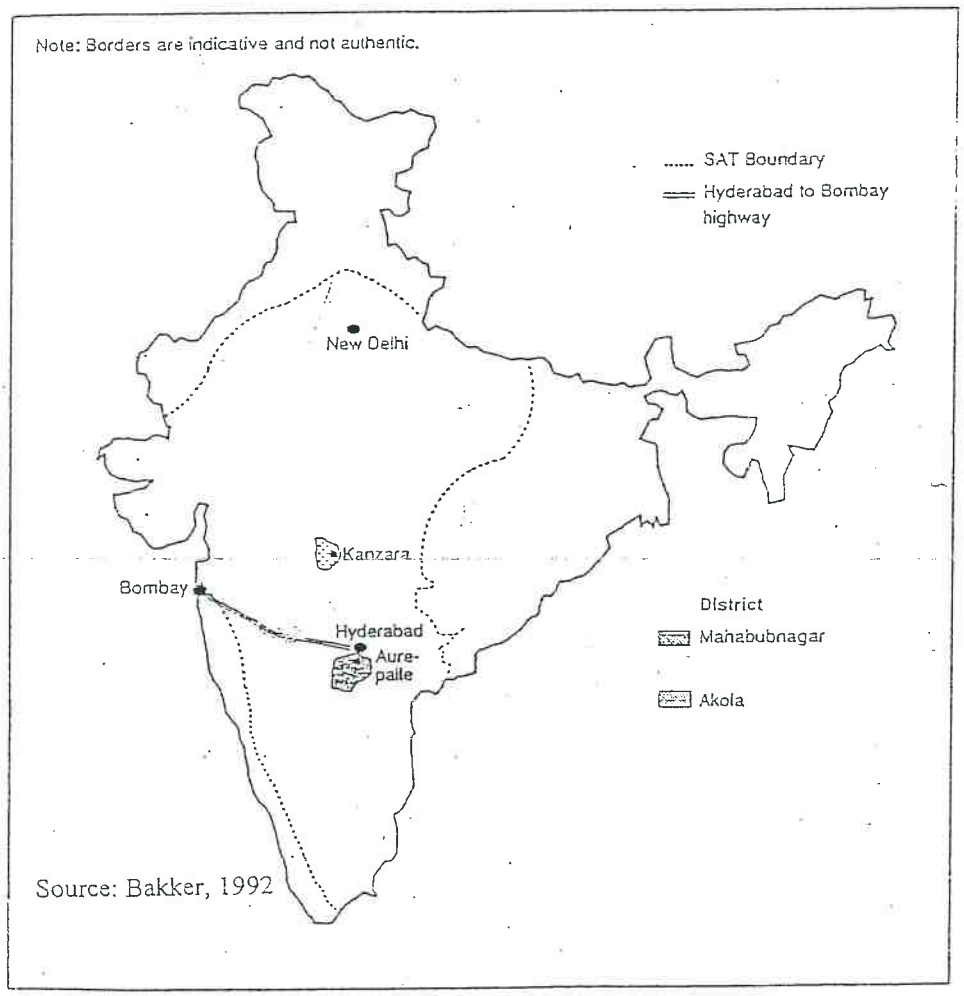
1. To examine the prevalence and extent of food consumption seasonality.
2. To assess the use of credit and off-farm income as a strategy to smooth seasonal food consumption.
3. To investigate the relationship between the use of credit and off-farm employment in food consumption.

Examining the consequences of seasonality in households' food security with respect to strategies that households use and the constraints they face is relevant for policy makers in timing and targeting programs. Policies can be more cost-effective if they are timed and targeted to meet the need of households that face severe constraints in seasonal strategies. Understanding which factors condition the use of specific strategies will aid policy analysts in strengthening successful mechanisms for smoothing intertemporal consumption.

Chapter 2 Description of the study area

The study villages Aurepalle and Kanzara are located respectively in Mahbubnagar and Akola districts of India's semi-arid tropics (SAT). The location of the villages is indicated in the figure 2.1. The dryland agriculture in the SAT villages is dependent on the Southwest monsoon, which usually becomes active around mid-June and recedes by mid-October.

Figure 2.1 The location of the study villages within India's semi-arid tropics (SAT)



The study area has experienced increasing irrigated area from ground water which was facilitated by the available infrastructure (subsidised electricity, cheap institutional credit,

etc.) and favoured by technological change. Irrespective of the sources of finance, digging, deepening wells and buying electric pump-sets accounts for a large share of agricultural investment in all the villages. Rosenzweig and Wolpin, (1994) based on the 1983 survey figured out that for all land size classes, immobile capital (land and buildings) makes up the major portion (≈85%) of the total wealth and bullocks represent the greatest share of non-real estate wealth for all land size class[1].

Inter-village differences in soil type and degree of rainfall uncertainty are considerable (Walker and Ryan, 1990)[2]. Aurepalle is located in a region where the soil has limited water storage capacity and rainfall is low and erratically distributed within and across the years. Kanzara has soil with medium storage capacity but rainfall is more reliable although at a low level.

At the time of the 1975 census, 475 families lived in Aurepalle. The majority of the population (around 67%) depends on cultivation, and 30% of the population are landless households, and a few people depend on trade or handicraft production for their living. Tree crops, particularly toddy palm trees, are becoming important sources of earnings for many households in this village. The toddy trade is heavily regulated by the state, which allocate tapping rights directly to the households. Tapping rights are embodied in renewable licenses issued by the government. The loss of tapping rights even for a year can result in a severe shortfall in income. About one quarter of the village population is engaged in toddy tapping which is traditionally a caste occupation. Caste strongly influences the socio-economic position of households in the village. Several households in each of the villages own sheep and goats and rely heavily on income from livestock trading as a supplement to labour earnings and crop revenues. Large farm households are more involve in dairy production and marketing, especial in milk and milk products, than in trading the livestock.

[1] Land size classes are determined from the size composition of land holding in each village.
[2] This section draws mainly on Walker and Ryan (1990) which offers an in-depth description of the area.

In Kanzara there were only 170 households in 1975. Landless households depending on wage labour make up around 35% of the total population. Kanzara experienced pronounced growth in income and consumption especially after 1980. The main reason for this was a rapid diffusion of technologies including new crops, modern cultivars such as hybrid sorghum, improved inputs such as chemical fertilisers and pesticides. Caste is not as much a marker between landowners in Kanzara as it is in Aurepalle.

Income variability in drought prone Aurepalle was more acute than in rainfall assured Kanzara from 1975 to 1984. Within each village the level of income variability did not differ much by farm-size class. Walker and Ryan (1980) suggested that this might be due to the concentration of toddy tapers among the small farm household groups, with a fairly assured income base.

2.1 Cropping Systems

The villages have agricultural economies characterised by complexity and diversity in cropping patterns, which includes monocropped paddy and monocropped and intercropped groundnut, sorghum, millet, and pigeon pea. Inter-cropping of at least two types of species within the season is common.

In all the villages, cultivation practices including operations such as ploughing and harrowing, is carried out with animal draft power, usually bullocks. Most of the pre-harvest activities must be carried out within a limited span of time. Therefore, ownership of work animals is crucial to ensure timeliness of pre-harvest farm operations. The seasonal nature of the dryland agriculture characterises bullock demand by sharp seasonal peaks and an incomplete seasonal bullock market, even while the seasonality of demand for draft power is predictable over years.

Crop diversification is one of the most important strategy of risk management in the area. However, crop diversification depends on resource endowments, particularly draft power

availability, in addition to the risk attitudes and perceptions of the farm households. The influence of irrigated area was also significant. In Mahbubnagar (particularly in Aurepalle with about a quarter of its cropped area irrigated by tank) irrigation leads to more specialisation in paddy production. Crop diversification showed significant effects for stabilising households' crop income especially in the rainfall assured Kanzara village.

Regarding commodity markets, it has been noted that villagers market their produce in nearby markets. Farmers seldom sell their product immediately after harvest. They store and market their crops in a piecemeal fashion.

2.2 Rural Labour Market

Rural labour markets in India are characterised by a variety of personal ties between employers and labourers. There are two distinct types of labour markets: casual and long-term labour markets. The casual market has two components:

1. Daily-rated - for which payment is made each day for an agreed number of hours and contracts are negotiated for short periods.
2. Contracts and temporary migration - involve both farm contracts and off-farm labour contracts with remuneration at a piece rate. These types of contracts involve longer period than the daily-rated case.

In general the earnings from the daily labour market constitute the highest proportion of wage income. The long-term sub-market is composed of regular farm servants and domestic servants. According to Pal (1996), the majority of regular farm servants in Aurepalle come from families with marginal land; in some cases, they own some cultivable land. The market for regular farm servants is a strongly caste-bound system where most regular labourers come from the lowest caste category. Access to interest-free wage advances (that is, credit) was found to be the primary motivation for labourers who could not secure credit in the daily labour market to choose regular farm contracts.

Kanzara is one of the villages where the Maharastra Employment Guarantee scheme (MEGS) was in effect. The employment scheme was introduced in 1972 in many villages of India and has played a significant role in combating seasonal malnutrition among poor households by providing employment in the off-seasons or in drought years (Mahendera Dev, 1995). The availability of off-farm employment opportunity from MEGS contributed to inter-village income variation. The scheme has been effective in smoothing income variability of the participants. Landless households that relied almost entirely on earnings in the daily agricultural labour market in Kanzara, where the employment scheme had operated since 1977, had about a 50% less variable income stream than those in Aurepalle. The most important effects of the scheme are seasonal stabilisation of incomes of the poor and enhancing off-farm opportunities for women.

Households benefit from the MGES if they have at least one able-bodied work force member. Those people who are old, very young or disabled are usually excluded from this employment opportunity because they can not perform rigorous manual labour.

The employment scheme has a self-targeting character, since many findings show a strong inverse relationship between participation in the employment scheme and wealth in the form of total assets. The size of the relationship was particularly strong for women: when wealth increased, women's participation fell more sharply than men's. The effect of wealth on participation was much stronger in Kanzara among the other villages because of the absence of abundant other employment opportunities.

2.3 Rural Financial Markets

The financial market in the study area consists of a formal and an informal sector. The formal sources of credit are co-operatives, nationalised banks and regional rural banks. The public sector of financial institutions experiences a high degree of default. Moneylenders, relatives, friends, landlords, employers, private shop owners and others constitute the informal sector. In the Mahbubnagar villages, particularly in Aurepalle, the

informal money lending system is well developed and provides as many loans as the formal institutions in Akola villages. The loans in the informal sector are usually medium-term or seasonal loans. Except for some very small amounts, villagers have differentiated access to loan depending on their asset position and reputation. Farmers with poor credit history can only get seasonal loans tied to expected crop production. Seasonal loans given at the start of growing period bear high interest rates and usually borrowers take such loans only once a year. For landless households with a limited amount of security assets, entering into long-term labour contracts is a mean of getting credit in the form of advance payment.

Charter 3 Literature Review

3.1 Seasonality in Food Security

Food security is often defined as an access to enough food for all individuals, at all times, for an active, healthy life (Retutlinger, 1987; Maxwell, 1996). The general classification is to distinguish between chronic and transitory food insecurity. Chronic food insecurity is a continuously inadequate diet resulting from the lack of resources to produce and acquire food, while transitory food insecurity is a temporary disruption in the ability of the households to acquire sufficient food. Both chronic and transitory food insecurity issues can be studied at different levels (household, village, market, and/or national). Distinguishing between seasonally and persistently food insecure households is important, since policies needed to alleviate the seasonal and persistent food insecurity are likely to be quite different. For instance, policies designed to reduce periodic food shortages, such as food-for-work programs, may help the seasonally food insecure, but are unlikely to be successful in alleviating persistent food insecurity.

Reardon and Malton (1989) look at two categories of seasonal food insecure households: those insecure only in a single season, and those chronically insecure during several seasons. They found significant differences in structural and behavioural characteristics for households that are, and are not, chronically insecure. Dependency ratios were higher, land resources were more limited and livestock holdings were lower among households who were food insecure over several seasons.

Seasonal instabilities in food security are most pronounced in low income countries, where agricultural progress is slow, infrastructure is limited, and markets remain poorly integrated, inefficient and selective as to whom they effectively reach and serve (Sahn, 1989). As a consequence of seasonal patterns in the rural economy, the extent to which consumption fluctuates over seasons and how households cope with it has to be a concern of policy

makers and economists in order to understand and reduce the seasonal dimensions of rural food insecurity. Incorporating seasonal aspects in the planning process may be a very useful part of temporal targeting, and can be used as well for a timely distribution of relevant technology packages in a particular region. However, for various reasons, seasonality aspects of agriculture have been less explored professionally except some cases. Chambers et al. (1981) mention as the main reasons the lack of detailed year-round data that is required for seasonal analysis, and the tendency of researchers to focus only on accessible parts of rural areas which might not be susceptible to seasonal fluctuations.

The major available studies on seasonal aspects of food security either focus on nutrition and related health issues, or on economic issues of seasonal income and food consumption. Some studies focus mainly on the nature and extent of variability in food intake and nutritional status. Sahn (1989) provide a comprehensive review of these studies (see also Chambers *et al.*, 1981 and Gill, 1991). Most of these studies use individual and household-level data, usually over a period of one year or longer, to measure fluctuations in family food availability, calories and protein intake, and anthropometric measures. Most results showed distinct fluctuations in food availability throughout the year, and some results found associated fluctuations in nutritional status. A major concern of these studies is the effect of seasonality on rural poverty, household food security, health and nutrition. Based on research and experience in Africa, the role of seasonality in conditioning nutritional and health outcomes was emphasised (Chambers *et al.*, 1981; Sahn, 1989; Gill, 1991). Testing Chamber's hypothesis that there are marked seasonal variations in nutrient intakes, Walker and Rayn (1990) reject it in their analysis of aggregate data from three villages in south India. Their regression analysis looked into the intake of children, showing no significant seasonal effects on nutrient intake despite the highly seasonal ecology of semi-arid tropics. Harriss (1990) explained that this is due to the aggregation problem that has masked the seasonal relationships in specific villages.

A set of seasonality studies with nutritional focus emphasise how the seasonal or characteristics of the rural economy caused poverty through processes such as

disaccumulation of assets during lean seasons and indebtedness (Longhurst and Payne, 1981; Gill, 1990). The seasonal nature of climate and its effect on agriculture, income-earning opportunities and prices faced by households may lead to food insecurity and poverty. Sahn (1989) explained that seasonal variations in climate lead to households food insecurity through the links in households' desire to obtain food and households' ability to save intertemporally, in the form of asset and food stocks. The consequences of seasonal fluctuations can burden rural households, especially poor households through short periods during the year when food intake may be inadequate as a result of work overload, high prices and depleted food stocks. This may result in a deteriorated nutritional status. Undernutrition increases the susceptibility of the poor to illness, which in turn makes it difficult for poor households to get work. According to Gill (1990) survival strategies may sometimes depend on borrowing, which can lead to indebtedness. If such a pattern continues over several years, year-to-year seasonal effects may reduce households ability to plan for normal seasonal patterns.

In the following section some of the studies with an economic focus of seasonality, particularly on the relationship between income variability and consumption variability are highlighted.

3.1.1 Economic Approaches of Seasonal Analysis

According to Sahn (1989), the ability to obtain food in a given season is determined by the level and flow of wage and agricultural earnings and food availability for home consumption, the seasonality of food prices, and intertemporal savings. The determinants of access to food at the household level include the desire to obtain food (i.e. the household's preference ordering) and the ability to obtain food (i. e. the ability to produce and purchase food).

Pinstrup-Anderson and Jaramillo (1987) look into the relationship between fluctuations in prices and incomes and fluctuations in consumption. Walker and Ryan's (1990) study of the

six villages in India's Semi-Arid-Tropics (1990) explores the relationship between income, consumption and wealth. Paxson (1993) examines the consumption and income seasonality in Thailand. The former two studies confirm that fluctuations in consumption are positively related to fluctuations in income seasonality. Paxson's study isolates the effect of income seasonality on consumption from that of prices and preferences. The later study shows that the timing of income flows has little to do with the timing of consumption across seasons and the result does not support the idea that income variation is directly responsible for seasonal consumption variation.

Fluctuations in earnings do not necessarily imply similar fluctuation in the patterns of expenditures. Even if a household has income during only one season, it has a potential to keep consumption 'constant' through saving and dissavings. Households may have various types of savings. Saving can be done in the form if cash or kind. Savings in kind involve smoothing consumption streams through storing own production and gradual drawing down stocks as required. The decision for storing and consuming own production or selling it in the market place and saving the earnings for retail purchase are determined by the differences between farm gate and retail prices, and by shifts in the relationship between these prices from one season to the next (Anderson and Leierson, 1978).

A Household's ability to smooth consumption intertemporally is strongly determined by the household's consumption, saving and investment behaviour, which in turn are influenced by the level and variability of income, prices, the availability of assets and the performance of financial markets, and the household's ability to store food intertemporaly (Walker and Ryan 1990). Allocating income by households over different seasons of a particular year constitutes intertemporal decision making. One season income can be consumed over consequent seasons when income falls from the expected level or when it is below the required level.

Empirical studies on intertemporal demand that are primarily concerned with the relationship between consumption and income are extensive. Most of these empirical studies

on the relationship between income and consumption have been based on the early studies of Friedman's permanent income hypothesis and Modigliani's life-cycle model. As cited by Deaton (1996), Friedman assumed that consumers want to smooth their actual income stream into a constant consumption stream through time. Mondigliani's hypothesis is nearly identical to Friedman's except that permanent income is defined as the constant per period expenditure that exhausts households' wealth.

Rosenzweig and Wolpin (1989) and Paxson (1993) have explored the dynamic relationship between income and consumption and consumption smoothing over time using life-cycle-permanent-income hypothesis model. Rosenzweig and Wolpin (1989) looked at the role of assets in household intertemporal consumption smoothing. Using longitudinal household data from India, they considered binding credit market constraints and look at the use of bullocks as an investment asset for income generation and consumption smoothing.

Paxson (1993) used cross-section data from Thailand to look at the timing of income and their effect on consumption expenditures along with the role of savings. Her results showed that the timing of income flow was not related to the timing of expenditure across seasons and savings patterns differ among different groups reflecting differential saving behaviour to smooth consumption. Households in different income groups showed similar seasonal expenditure patterns.

An agricultural household model has also emerged as an important tool for analysing intertemporal decision-making of farm households. Roe and Graham-Tomasi (1986) developed a conceptual framework for a dynamic agricultural household model which looks at risk and dynamics in the decision making process of rural households. In most cases it is applied in studies of sequential nature of households decision making, where two periods are specified to account for decisions made during the planting and harvesting seasons. For instance, Saha (1994) used a two-season model of a household's production, consumption, labour supply and storage decisions in an environment of output and price risk. Saha analysed a risk-averse household's response to changes in seasonal prices and indicated that

a household's intertemporal income transfer decisions are influenced, among other factors, by the decision maker's risk attitude. Besides that, under risk avers preferences, the household's optimal consumption, production and labour supply choices are not 'separable'. A similar finding by Roe and Graham-Tomasi (1986) show that even if intertemporal consumption smoothing is allowed, given the existence of perfect credit markets, the introduction of risk implies nonseparability between production and consumption decisions. One reason for the lack of separability is the absence of insurance markets.

Under the presence of complete markets, the consequences of income fluctuations would not need to be reflected on consumption. A common understanding on consumption smoothing is that consumption smoothing exists, but at the same time, it is also shown that consumption smoothing is incomplete and selective for those who have poor asset holdings and substantial constraints in borrowing. Different household groups experience seasonal phenomena in different ways, and, therefore make different seasonal adjustment. A study by Morduch (1995) on three villages in rural South India supports the idea that substantial consumption smoothing exists especially among the better-off farmers. Gill (1991) also argues that seasonality of consumption obviously varies with social and economic status. Cultivators may mix crops and animal husbandry, others may use credit advances, interlinked labour contracts or migrate for some time of the year. Investigating the mechanisms by which different classes of farm households reduce fluctuations in food consumption within and between years and the factors which constrain the effective manipulating of these mechanisms, requires an understanding of the economic aspects of seasonality in income and consumption.

3.1.2 Household strategies

There are a number of strategies that households use to protect themselves from the negative effects of seasonality. There are social adjustments, which develop and exploit social relationships, such as remittances, transfers and informal credit arrangements among

friends and relatives. Some of the recent literature on social mechanisms is framed within the context of households' response to risk, since insurance markets are largely absent in rural economies of developing countries (Rosenzweig, 1988, Rosenzweig and Stark, 1989, Udry, 1994). In this context, risk is an important element of consumption smoothing, because risk influences the allocation of income to consumption. Townsend, (1995) discussed the importance of risk for income and consumption smoothing. When full markets for consumption smoothing do not exist, risk aversion can affect how households decide both the composition and nature of their income generating activities. Production choices are made taking into account the possibility of reducing the likelihood that shocks will happen.

The effect of seasonality in agriculture on the periodicity of earnings of rural households is determined by their sources of income. Consequently, diversification of income sources is an element of household's strategy to cope with seasonality. Agriculture is not the only source of income for rural households. A cross-country survey analysis in Von Braun and Pandya-Lorch (1991) shows that households diversify income sources both within agriculture as well as outside agriculture. The relative magnitude of the different income sources may depend on a subjective risk element, resource endowment, employment opportunities, and institutional factors. Households may diversify the sources of income because when household members are involved in multiple activities and pool their income, total household income may be less subjected to extreme variation. As Doss (1996) has explained, households use intrafamily and interfamily income sharing as a mechanism for smoothing, given imperfect covariance between kin-related households' stochastic realisation of income.

Seasonal searches for cash and kind loans are usually considered as a dominant strategy for poor households to cope with seasonal food fluctuations. Borrowing as a food security strategy may be conditioned by various factors (among which resource endowment is the major one), and hence seasonal loans may not be equally available to all households. The poor may be more susceptible to borrowing constraints than the rich. Gersovitz (1989)

pointed out three reasons why the poor households may be more desirous of borrowing to offset various shocks than the rich households and hence are often considered as susceptible to borrowing constraints:

I. The poor household experience shocks that are proportionally larger than the rich, because there are economies of scale that discourage them from diversifying income sources.

II. The marginal utility of consumption places a premium on very stable consumption at low incomes, because their subsistence requirements must be met.

III. The poor save proportionally less than the rich, and so they have a relatively less wealth to buffer consumption.

However, due to precautionary purposes, households may be reluctant to borrow even if credit is not constrained from the supply side (Deaton, 1996). A loan may protect consumption now, but since it has to be repaid in the future when things may be worse than they are at present, consumption may have to be cut when income is low. Although discussions on borrowing constraints are complicated by various issues, it is undoubtedly true that high household-specific transaction costs constrain some households from using credit as a seasonal food security strategy. According to De Janvry *et al.* (1991) a market may selectively fail for a particular households when the cost of a transaction through market exchange creates disutility to these households greater than the utility they gain from participating on the market.

Strategies that are not discussed above, like liquidation of assets to purchase food, migration outside the village and participation in the government work schemes are also extensively used by farm households as strategies to reduce seasonal food fluctuation. Many of the above strategies exist in rural households in India. Martha (1991) has described in detail these strategies for Semi-Arid India. The role of credit markets in India as documented by Walker and Ryan (1990) shows a large number of households that rely on traditional and informal loan transactions to meet both consumption and production expenses.

Regardless of the capacity and skills of households to cope with increased variability in earnings, expectations about future income and prices are crucial elements of their intertemporal utility function. According to Sahn and Von Braun (1985), increased production variability makes correct anticipation more difficult. This is especially problematic for poor households, who are likely to have a very high internal rate of discount. Walker and Rayn (1990) findings indicate that consumption variability is much less than income variability- that is the elasticity of the coefficient of variation (CV) in consumption with respect to the CV in income was in the range of 0.3 to 0.5. Similar findings were made in North Arcot, India (Pinstrup Andersen and Jaramillo, 1985).

The previous lessons about seasonality in food security tell us that seasonality in agriculture exists and that it influences consumption. However, households do not equally face seasonality effects in the same way and all the seasonal fluctuations observed in food consumption cannot only be attributed to single factor - income fluctuation, since also variations in prices or preferences may have considerable consequences. Households' strategies to cope with seasonality are determined by personal preferences and resource endowment. Households' strategies for smoothing intertemporal consumption reflect the households' resources, and their ability to avoid the harmful effects of seasonal fluctuations coupled with poorly functioning markets. For households that face borrowing constraints coupled with limited assets (particularly land) and variable agricultural income, non-agricultural wage income will have a paramount importance for smoothing consumption over seasons.

It is beyond the scope of this thesis to make a full assessment of literature on credit and labour market. Therefore, in the next two sections a short review of the most frequently theories of rural credit and labour markets and their implication for food security is presented.

3.2 Rural Credit Markets

3.2.1 Rural Finance

Preventing food inadequacy both at the individual level and at national level needs to be one of the goals of a broad based component of food policy (Gittinger *et al.*, 1987). In line with this and many other objectives, expansion of credit has been part of agricultural policy in many low-income countries. Since rural credit markets are characterised by a dual nature, informal sector credit is also available at the village level. Formal and informal credit markets can be distinguished from each other in various ways. In their attributes of risk associated with default and on the bases of legal procedures, the two sectors are quite different. In informal institutions, a lender who may be a borrower's friend or landlord or a professional moneylender, makes the loans on his own account and bears the full risk of default personally. In the formal sector, institutions act as intermediaries between those from whom they take deposits and those to whom they give loans, reconciling the interests of borrowers and savers who may be settled far from each other. The informal sector may involve simple person-to-person arrangements instead of written agreements, based on personal knowledge of each other's affairs. This kind of arrangements for loan procedures are strictly substituted by a set of procedures in the formal institutions, designed to reduce the need for close personal supervision of their clients. Subjective assessment of the ability to repay a loan is replaced by judgement against a set of criteria by which credit-worthiness is assessed, and supported by pledges of security in the form of land or other assets.

There are several inadequacies related to dualistic rural capital markets in developing countries (Von Pischke *et al.*, 1983). Informal lenders serve highly localised borrower clientele, while their capital resources are limited in area and also in volume. The usual rural lending institutions bring in outside capital, but in most cases their scope is limited and they are mostly available for large farmers. Existence of such formal institutions is limited to rural areas of developing countries. Donald (1976) explained that in most developing countries, informal private lending is a far more important source of funds for farmers than

credit from public institutions, while there are only few countries for which public cre exceed 20 percent of outstanding loans. The available institutional markets for credit a also highly distorted due to policy failures and market failures. As Stiglitiz (1989) pointe out, it is a common observation that farmers in developing countries are unable to obta credit, or they can do so only at usurious interest rates. This implies that rural cred markets do not operate efficiently, since there exist wide market failures. High interest rat in the informal sector may not necessarily reflect inefficiencies but rather may be due to hig administrative costs and high risk of small-scale rural lending. Empirical finding by Sing (1983) show that the cost components for farmer money-lenders in Indian villages indicat that what seems to be a high interest rate is largely explained by high opportunity costs an risks.

Market failures occur when a competitive market fails to bring an efficient allocation o resources (Besley, 1994). In this case, credit market failure is defined as the inability of a free market to bring about constrained Pareto-efficient allocation of credit. Market failure arise due to high transaction cost, externalities, information asymmetries and equity reason (for example when the market is unable to take care of income distribution). Hence, credit markets diverge from the idealised perfection. In most of the new institutional economics literature it is well documented that information asymmetry (*i.e.* hidden action, moral hazard) is a problem for attaining efficient transactions. Unobservable information is often mentioned as a major source of market imperfections, sometimes to the extent of preventing transactions across market or organisations (Douma and Schreuder, 1991).

Based on the above definition of market failure, Besley (1994) pointed out three problems in relation with distinct features of rural credit market in rural developing countries: enforcement difficulties, information problems (which mainly involve moral hazard and adverse selection), and covariant risk and segmented markets. Many credit contracts are backed by collateral requirements to insure repayment. If a borrower defaults, a lender can take up the physical asset on which the loan agreement is made. Enforcement problem is one feature of rural credit markets in developing countries, because the borrowers are too

poor to have assets that could be collateralised, and because poorly developed property rights make appropriating collateral difficult at the event of default.

Organizing markets can allow to achieve a partial solution to these problems. According to Udry (1994), there are two organisational features of credit market: the first one is pledging of collateral and the second is contractual interlinkage between markets. In contrast to what has been emphasized about the prevalence of information problem in the credit market, the study from North Nigeria by Udry shows the existence of a minimal use of collateral and no evidence of contractual interlinkage with other markets. In this special case, information asymmetry problems are unimportant, and their institutional consequences are absent, and hence, credit play a direct role in allowing individuals to smooth income shocks over time.

Except in some cases like discussed above, most often credit markets will be neither completely lacking nor completely functioning. Transaction costs, information problems (moral hazard) and difficulties in enforcing contracts, however, can limit their effectiveness.

3.2.2 Credit Use

If household wants or needs to make expenditure which are within any period of time larger than its income for the same period, then they will need either to draw upon their savings or they have to make use of credit (Stephen and Henry, 1987). Expenditures beyond the levels of current earnings may occur either due to unusually low income (caused, for example, by a poor harvest or perhaps an illness which prevents key member of the household working) or unusually high expenditures for both planned and unforeseen purposes. Planned purposes include religious festivals, marriages, taxes, agricultural input, and others. Unplanned purposes include family emergencies such as illness, death or natural disaster. Schrieder (1996) showed that access to consumption credit smooth consumption more efficiently than traditional coping strategies such as productive asset depletion or migration. Using data from Cameroon, the analysis by Schrieder indicated how consumption credit can help in reducing temporary food shortage while maintaining human productive capacity. Transitory

food insecurity can thus be reduced through access to consumption credit, to be repaid later by means of the labour force that was maintained with credit during the food deficient period. However, it is difficult to make distinction between 'consumption' and 'production' credit (Von Pischke *et al.* 1983; Moll, 1989). Where money is needed urgently for a particular purpose, then incoming funds can be used for that purpose whether it is productive or not. In other words, a lender cannot ensure that any loan is to be used for a particular purpose unless that purpose also accords with the borrower's own priorities. Since money in general is fungible, claims on real resources can be used to buy any good or service available in the market.

In its broader sense, Stephen and Henry (1987) gave the following remark on the use of credit:

> "There are wide variations between communities. Some – probably those with a low population and that are firmly subsistence based – make relatively little use of credit, with households relying mainly on savings to make investments and to meet any unusually high demands for consumption expenditure. Where loans are needed villagers often borrow from relatives or friends rather than traders or moneylenders with whom they lack close links. In other types of communities, informal credit may be a way of life, with households finding every year that there is a period before harvest when food stocks are exhausted and borrowing is necessary in order to buy food and others necessities, perhaps against the security of a standing crop. When planting time comes, because income from the previous season's crops has all been used up on immediate consumption needs and on repaying past loans, further borrowing is necessary to bye inputs like fertiliser..." PP 62-63.

Therefore, farm households are flexible in their use of credit. The existence of an attractive opportunity to use additional capital in production will lessen the tendency to use borrowed funds for consumption purpose (Donald, 1976).

3.3 Rural Labour Markets

The initial departure for labour market study is the existence of the market itself. In the extreme case where there is no labour market, a farmer's labour input depends on families

composition. As it is documented by Ellis (1993), Chayanov's farm household model focuses on the subjective decision made by the household with respect to the amount of family labour committed to farm production in order to satisfy its consumption. When transaction costs are high enough to prevent exchange, the market may fail to exist completely. However, it is worth mentioning that even in the existence of a labour market, the usual assumptions of a perfect functioning market generally do not hold true. According to the summary of Corsi (1994), the labour market is perfect when it fulfils the following assumptions: availability of job at existing wage rate, continuos divisibility of external work, perfect certainty of external wages as well as farm income, and free transaction cost of external employment.

Alderman and Sahn (1989) classified models in rural wages under two sets: (1) models in which wage is institutionally and exogenously fixed, or (2) models belonging to a neo-classical framework in which wages are determined by aggregate shifts in demand and supply. It has to be kept in mind that there are a range of alternatives between the two dichotomies. Among these, efficiency models and implicit contract models are widely used to explain wage formulations and rural labour market characteristics in developing countries.

Efficiency models explain how low household income and nutrition restricts the amount of work that members of a household can perform. A low input of labour because of malnutrition during critical agricultural operations (such as harvesting) may limit total output, especially if the operations should be performed during a very short period of time. An inadequate labour input then perpetuates the low household income, which, in turn, perpetuates malnutrition and income and labour efforts.

According to Dreze and Mukherjee (1989) implicit contracts theory focuses on explaining the dual role of contracts: labour allocation and risk sharing. Permanent labour contracts allow employers to minimise the risk of having to pay excessive wages at times of peak labour demand. In this way, workers may be able to achieve near perfect income smoothing

for the duration of contract. As a consequence, even workers facing sharp constraint in obtaining credit can smooth consumption. Long-term labour contracts are often linked to credit markets. In addition to their advantage as means to control the flow of consumption from one season to the next, such long-term agreements are considered as a means to reduce risk for labourers and search-costs for employers.

Dreze and Mukherjee (1989) made an extensive review on the features of labour markets in India. Their major findings show that most rural labour markets are dominated by a common feature of casual labour and uniform wages. Pal (1996) examines worker's choice between casual and regular contracts, investigates the role of non-wage factors in the choice of labour contracts. Results from ICRISAT villages in India suggest that risk-averse landless labourers tend to prefer casual to regular contracts because earnings from casual contracts are relatively higher. Pal (1996) suggests that comparative attractiveness of regular contracts depends on whether labourers have access to credit and other jobs.

Off-farm employment opportunities allow land-owning farm households to exploit opportunities of off-farm employment to reduce seasonality of work and income. As Alderman and Sahn (1989) showed, labour inputs and earnings of agricultural households from own-farm activities may be highly seasonal, off-farm employment opportunities and enable farm households to hire out their labour during the slack season and thereby minimise the impact of the production cycles in agriculture. Rosenzweig and Stark (1989) find that households facing greater volatility in farm income are more likely to have a household member employed in steady wage employment.

Chapter 4 Materials and Methods

4.1 The Data

The data set used for this study is from the village level survey carried out by ICRISAT[1] in India. The survey covers three villages during the period 1975-1984. The sampling procedure is elaborated in Singh, Binswanger and Jodha (1985), and the most relevant aspects for this paper are summarized as follows. Data have been collected on production, expenditure, time allocation, prices, wages, and socioeconomic characteristics by interviewing household respondents at a regular interval of 3-4 weeks. In each village 40 households were selected: 10 landless who operated land less than 0.2 ha. of land and whose main occupation was wage labour, and 30 cultivating households. The cultivating households were stratified according to operated land size in to three equal groups in each village(table 4.1). 10 households from each group were randomly chosen.

Table- 4.1 Farm size classification (in ha.)

Village	Land holding class		
	1	2	3
	Small	Medium	Large
Aurepalle	0.20-2.50	2.51-5.26	>5.26
Kanzara	0.20-2.26	2.27-5.59	>5.59

Source: Singh, Binswanger and Jodha (1985)

Only two of the villages (Aurepalle and Kanzara) are used for this analysis. The third (Shirapur) is excluded because complete seasonal data set was not available for research. Seasonal food expenditure and seasonal income data by category (labour income, crop income etc.) are extracted from the household transaction data. The data are deflated by the respective village-specific consumer price indices. The local calendar has three agricultural

[1] International Crop Research Institute for the Semi-Arid Tropics

seasons; Kahrif or Monsoon (June - October), Rabi or post monsoon (November - February) and summer season (March - May). Therefore, the complete data of the analysis will have three observations per year for ten years and for thirty households. Excluding households which are observed for less than seven years, and correcting for a few outliers, the number of cases analysed in each village is summarised below.

Table – 4.2 Total number of cases analyzed in each village

Village	No. of cases
Aureplle	744
Kanzara	758

4.2 Theoretical Background

The most common procedure for looking at the relationship between income and consumption is the extension of the neo-classical microeconomic model of demand, which take into account decision making over time. When time is introduced into neo-classical models of demand, the household is assumed to maximise utility over time subject to a full wealth constraint, *i.e.* discounted expected future earnings. The solution to the maximisation problem is a set of demand functions that are a function of discounted prices and wealth in each year period. Estimation of these demand functions allows the testing of hypotheses about the trade off between current and future consumption (Deaton and Muellbauer, 1980).

Our method for analysing the use of off-farm employment and credit for food security is based on estimation of a Engel function for food. Frequently, demand functions are used to draw consumption parameters related to the size of income and prices. That allows one to analyse the consequences of relative price changes and or income changes on commodity demand. A demand function, as defined by Colman and Young (1989), is a relationship

between the quantities of a good (say Q_1) and the economic factors that influence the consumer's choice. The relationship can be represented as:

$$Q_1 = f(p_1, p_2, \ldots p_i, Y) \qquad 4.1$$

where Q_1 is the quantities of the good purchased in a given time period, $p_1, p_2, \ldots p_i$ are prices of the consumer goods in the market and Y denotes the consumer's income. When data is not available on price variation over time, estimation of Engel functions becomes relevant to infer how consumption varies between households at different income levels. An Engel function has the following general form:

$$Q_1 = f(Y, Z) \qquad 4.2$$

where Z are the household characteristics that vary across households (like family size education and others). Engel curves depict the relationship between the quantity of a good purchased and the consumer income, all other factors held constant.

The Engel function that seems to be useful for this study is a function that allows us to analyse the variation of parameters by sources of income. The marginal propensity to consume (MPC) from different income sources is often assumed to be the same in most consumption analyses. This implies that income from one source is a perfect substitute for another. Recent studies, however, found significant differences on the MPC from different income sources (Carriker *et al.*, 1993). These findings support the notion of MPC of volatile incomes is lower than MPC of stable incomes. In our consumption analysis this concept of differentiated marginal effects by income sources seems to be important because farm income is more volatile than wage income. According to Alderman (1986), estimates that distinguishe the sources of income rather than size of income may be used for various purposes. The major areas where such an analysis may be useful are for the analysis of the effects of transfer programs, patterns of consumption from earnings of different household members, or marginal propensities to consume from cash as opposed to agricultural or in-kind earnings.

The household decision making is modelled as a utility maximisation problem. The household derives utility in period t from the consumption of a bundle of commodities, which is subject to a budget constraint. A one period utility function can be represented as follows:

$$\mu_{it} = \mu(q_{1t}, q_{2t}, \ldots q_{it}) \qquad 4.3$$

where, q_{it} = consumption of commodity goods in period t

The utility function is assumed to be twice differentiable, continuous, quasi-concave and increasing in all arguments. The marginal utility of consumption goods consumed at any given period are also assumed to be independent of the amount of goods consumed in any other period, i.e. they are intertemporally separable.

The household budget constraint in period t is described by the expression,

$$q_{it}P_{it} = X_{it} + B_t + S_{t-1} - S_t \qquad 4.4$$

where, p_{it} = commodity prices

X_{it} = income in period t from different sources

B_t = borrowing

S_{t-1} = one season lagged saving

S_t = Saving in period t

The budget constraint in each period depends on the sales of value of agricultural outputs, off farm wage earnings, non-wage exogenous income from gifts and remittances and income from small business activities (trade income). Households are assumed to borrow funds and make saving-disaving adjustments. Therefore, credit and monetary saving indicators are included on the right hand side of the budget constraint.

The 'permanent-income-life-cycle' specification is chosen to specify the relationship between income and consumption. The basic life-cycle hypothesis may have the form:

$$C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1} + \alpha_3 W_t \qquad 4.5$$

where t refers to time, C is consumption expenditures, Y is income, W is wealth, and $\alpha_1,\alpha_2,\alpha_3$, and α_4 are parameters. If incomes from separate sources are fungible, (4.5) is equivalent to:

$$C_t = \alpha_0 + \alpha_1 (Y_{1t} + Y_{2t} + \ldots Y_{zt}) + \alpha_2 C_{t-1} + \alpha_3 W_t \qquad 4.6$$
$$= \alpha_0 + \alpha_1 \sum_{s=1}^{z} Y_{st} + \alpha_2 C_{t-1} + \alpha_3 W_t$$

where Y_{st} is income from any of z different sources in year t. If income sources are not fungible, (4.6) is not appropriate. Instead a system of consumption function, which allows for planned allocation of consumption among different incomes, is needed[2]. A life cycle meeting such requirement may be specified as systems of equations:

$$\lambda_1 C_t = \alpha_{01} + \alpha_1 Y_{1t} + \alpha_{21}\lambda_1 C_{t-1} + \alpha_{31} W_t \qquad 4.7\ (a)$$

$$\lambda_2 C_t = \alpha_{02} + \alpha_{12} Y_{2t} + \alpha_{22}\lambda_2 C_{t-1} + \alpha_{32} W_t \qquad 4.7\ (b)$$

$$\lambda_z C_t = \alpha_{0z} + \alpha_{1z} Y_{zt} + \alpha_{2z}\lambda_z C_{t-1} + \alpha_{3z} W_t \qquad 4.7\ (c)$$

where λ_s (which sum to 1) represent the unknown proportions of planned consumption from the corresponding income sources. Summing (4.7a) to (4.7c) gives the following estimable equation

$$C_t = \sum_{s=1}^{z} \lambda_s C_t \qquad 4.8$$
$$= \sum_{s=1}^{z} (\alpha_{0s} + \alpha_{1s} Y_s + \alpha_{2s}\lambda_s C_{t-1} + \alpha_{3s} W_t$$
$$= \alpha_0^* + \sum_{s=1}^{z} \alpha_{1s} Y_{st} + \alpha_2^* C_{t-1} + \alpha_3^* W_t$$

in which

$$\alpha_0^* = \sum_{s=1}^{z} \alpha_{0s},\ \alpha_2^* = \sum \alpha_{2s}\lambda_s,\ \textit{and}\ \ \alpha_3^* = \sum_{s=1}^{z} \alpha_{3s}$$

The estimates of α_{1s} give the short run marginal propensity to consume income from source s.

[2] See Carriker *et al.*, 1993 for the detail procedure of the model.

4.3 Estimation Procedures

The analysis of food consumption in the next chapter starts by making a preliminary analysis of the sample households' income and expenditure variables. Comparison of the mean levels of income and food expenditure by seasons for different farm household groups is undertaken using statistical tools. Income compositions are considered as a reflection of strategies implemented by rural households in response to preferences, resource bases and opportunities to smooth consumption over seasons.

In line with this, the sources of total income variation as well as total food expenditure variation are described and compared. Coefficients of variations (CVs) are calculated from the 10 years of individual observations. The data should first be cleaned of trend effects before estimating CVs. Thus, deflated per capita income and expenditure are linearly detrended. The following definitions to calculate the CVs (Pindyck, and Rubinfeld, 1991).

$$CV(y) = \frac{Var(y)}{\bar{y}} \text{ , where } \quad Var(y) = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - \bar{y}\right)^2$$

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i \text{ and } y_i = \textit{the i's observation variable } y$$

Analysis of variance (ANOVA) is used to assess the possible factors (sources of variation) that explain the total variation in food expenditure. The ANOVA method aims to split the total variation of a variable (around its mean) into components which may be attributed to specific (additive) causes (Koutsoyiannis, 1981).

The factors (or strata) used in the ANOVA are basically land holding classes and seasons. The data are divided in sub-groups according to the strata. The mean expenditures of the sub-groups can be compared and if a given factor is an important cause of variation in expenditure that will be reflected in a large difference of the means of the sub-groups and a large dispersion of the means of the sub-groups around the common mean.

Next to variance analysis, the major work of this thesis lies on the estimation of the consumption equation, which is represented by equation (4.8) in section 4.2.1. Ordinary Least Square regression is used to estimate the equation. Linear specification of Engle curves often fail to fulfil one of Engle curve properties i.e. a declining marginal propensity to consume as income increases. Therefore, equation (4.8) is estimated for different groups of households assuming food expenditure in each group is linear. The total observations in each village are divided into the three land holding categories defined above. Consumption equations of each group are estimated for three seasons. The observations are considered as random observations, thus the time-series component of the sample is not incorporated in the analysis. In other words, we assumed serially uncorrelated errors. Tests for normality and heteroscedastisity are applied. The relative importance of income sources to food expenditure of the households is analysed for different seasons of the year. A Chow test of equality between sets of coefficients in two regressions is used to test the equality of parameter estimates of the three seasons (Pindyck and Rubinfeld, 1991).

Chapter 5 Empirical Results

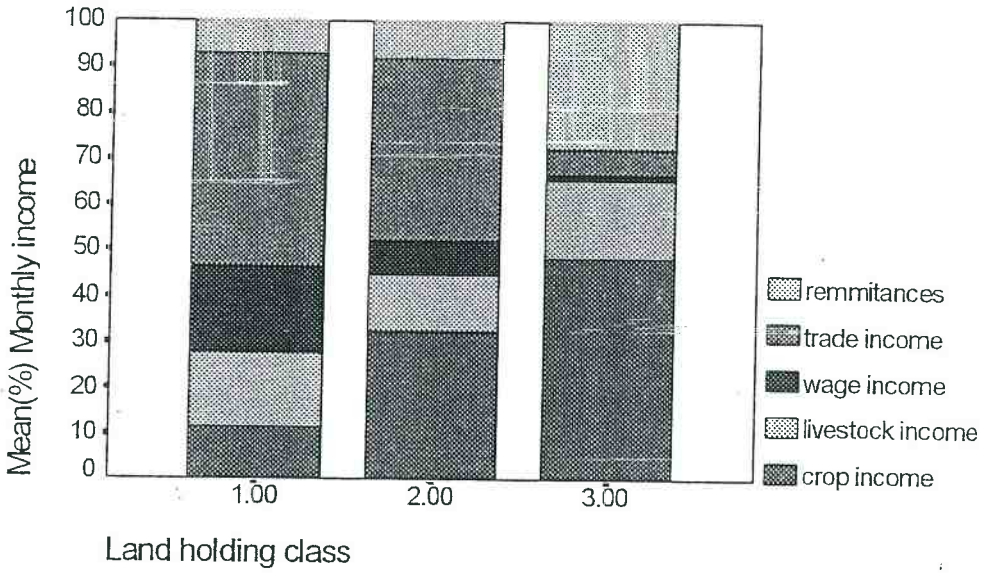
5.1 Income Levels and Composition

Income is usually considered as an important determinant of consumption and an indicator of household food security. Farm households do not exclusively engage themselves in only one kind of activity, but try to diversify their source of income during the year. The farmers in the two villages generate income from various sources. Income recorded under crop income is the net return from crop production on the farm. Livestock income is the total value of animal products net of all labour, veterinary, feed and other expenses. Wage income is income earned by household member(s) from off-farm employment. Trade income includes the net income from sale of handicrafts, retail and shopping business and similar services. Remittances and gifts are also important income sources in both villages.

The relative importance for income sources to the farm households differs according to land size classes and across seasons. There are also remarkable differences between villages. Differences in the levels of households income and income composition within villages reflect the differences in resource endowments, production environment, off-farm employment opportunities, and access to markets.

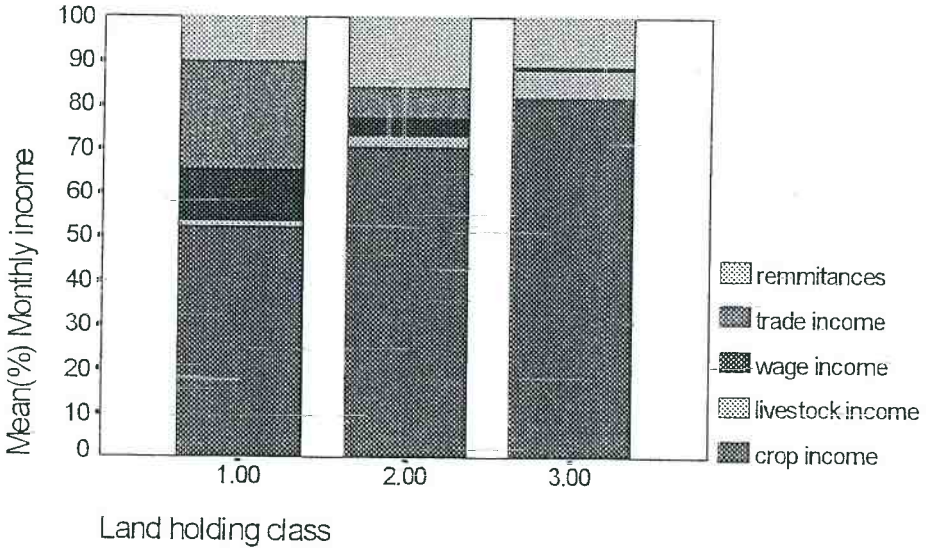
Figure –5.1 and Figure –5.2 show the monthly average income of the households by income type for three land-holding classes in Aurepalle and Kanzara respectively. An immediate observation is that trade income has a higher mean value in the two lower land class households particularly, in Aurepalle. Many farm households earn trade income from the extensive toddy tapping activity found in the village. About one quarter of the village population is engaged in toddy tapping, which is a traditional cast occupation. Households sell the fermented milky juice of the palm fruit as a liquor or toddy. In Kanzara, monthly crop income constitutes around 50% (fig-5.2) of total income for the small land size class while in Aurepalle the proportion is only 10%. Kanzara is more rainfall assured and land size is higher.

Fig- 5.1 Mean income compositions by land size class-Aurepalle



Land distribution is also more even in Kanzara as compared to the other village. Therefore in Kanzara, all land-holding groups earn the biggest proportion of their income from on farm activities. Several cultivator households in the more fragile production environments of Aurepalle incurred sizeable crop losses in some years that resulted in negative household crop income. Livestock income is relatively more important in Aurepalle than in Kanzara.

Fig- 5.2 Mean Income composition by land size class-Kanzara.



Wage earnings are clearly a more important source of income for small farm households particularly in Aurepalle where land size holding is generally smaller. In Aurepalle, remittances are highest for large farm households constituting about 30% of the total earnings. A relatively high income may allow large farmers to send their family members to school and hence increase their opportunity of employment outside the village.

The mean monthly income per capita organised by village, seasons, and land-holding classes is presented in table 5.1. A multiple comparison significant test shows that the mean income level of the three land size class significantly differ from each other[1]. The result suggests that land size is correlated with level of income in both villages, *i.e.* higher land size corresponds to higher income. In summer income is lowest. Hence, this season will be most critical for food security.

Table 5.1 Mean monthly per capita total income (in Rupees) organised by village, land-holding class, and season

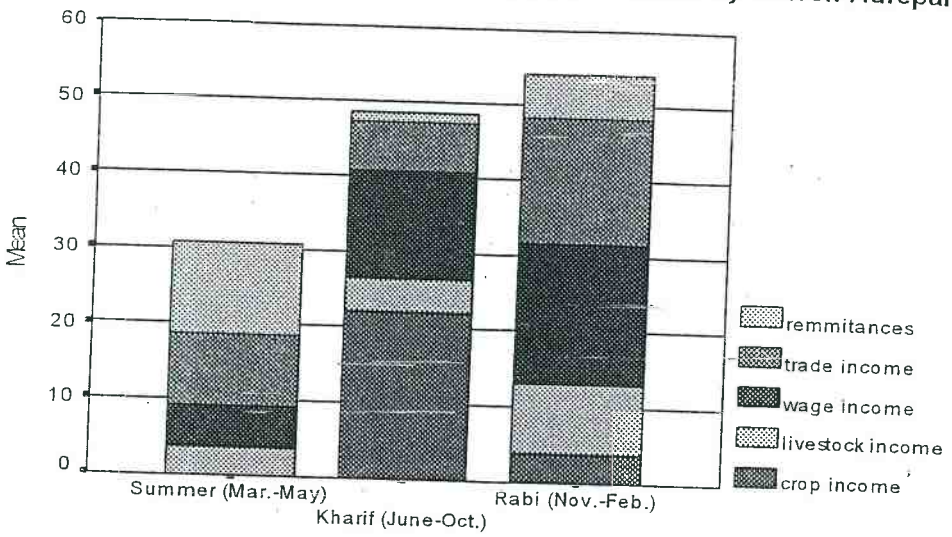
Village-Class		Season		
		Summer (Mar-May)	Kharif (June-Oct.)	Rabi (Nov.-Feb.)
Aurepalle				
	Small	31.00	48.65	54.13
	Medium	39.00	97.89	60.20
	Large	68.00	234.39	135.01
Kanzara				
	Small	21.11	78.60	18.80
	Medium	25.56	135.83	21.79
	Large	60.83	383.64	62.71

The relative importance of the income sources across seasons is shown by Figures 5.3 and Figure 5.4. In both villages small farm households do not generate crop income in the summer, and most crop income is earned in the Kharif season. In Aurepalle (Figure 5.3) trade and remittance are most important in the summer when farmers run out of crop income. Crop income is not sufficient and not reliable for the Aurepalle farmers. As mentioned earlier rainfall is less dependable here and land size is lower. Wage income is

[1] SPSSPC One way procedure was used to calculate the Tamhane's T_2 test at 0.05 level of significance.

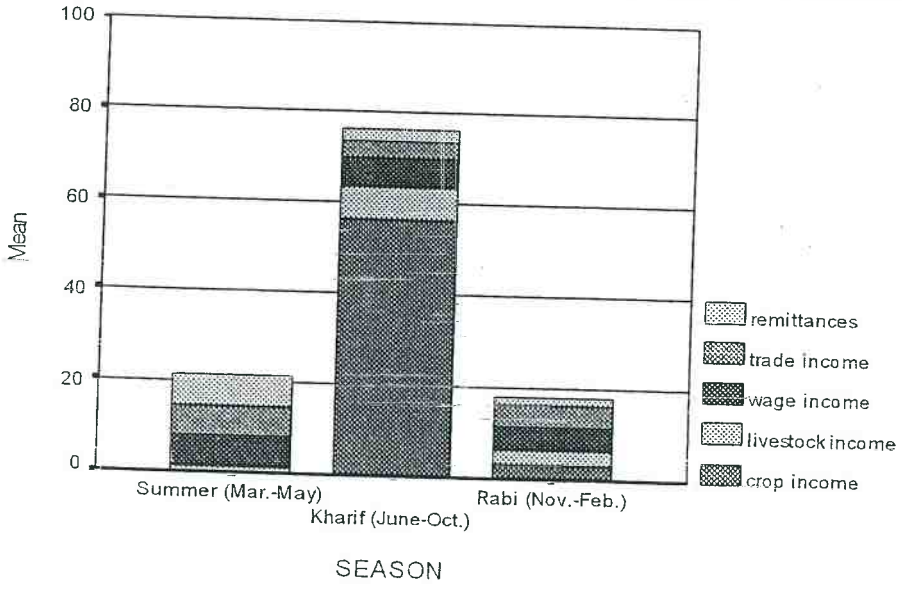
most important in Rabi, the season after harvest, when the on-farm labour requirement is low.

Figure 5.3 Income components of small farm households by season-Aurepalle



In Aurepalle wage is less important in the summer. This could be because farm households may engage in land preparation and because the off-farm employment opportunity may become low. Farmers in Kanzara have fairly stable wage income across seasons (Figure 5.4). Stock adjustment may be more important seasonal strategy in Kanzara than on-farm and off-farm labour adjustment.

Figure 5.4 Income components of small farm households by season-Kanzara



Although agriculture comprises the largest share of income, it is important to see that this income is clearly not sufficient for all households to meet their food expenditure throughout the year. The figures presented above confirm that farm households receive their income from a variety of employment activities and these activities vary seasonally.

5.2 Income and Farm Household Characteristics

Land is an important source of income in the study villages. In addition to land size there are also other farm household characteristics which have a casual relationship with income (which is an indicator of food security). Farm household characteristics at different level of per capita income are summarized in table 5.2 to explore the differences between low per capita income, medium and high per capita income household groups. The mean monthly per capita income of the ten years is considered to classify households as lower, medium and higher income households. Given difference by villages in the levels of income and food expenditure, households which are at a low income level may appear to be homogeneous groups in terms of relative levels of some economic indicators.

Low income is correlated with lower land-holdings owned and operated and low levels of total assets (table 5.2) particularly in Aurepalle. Education level is also almost nil in Aurepalle for lower income groups. In Aurepalle life cycle differences, measured by household size and the average proportion of children in the household, indicate that households who are in a lower per capita income group have a higher proportion of children and a larger family size.

Table 5.2 Characteristics of farm households with respect to income status (1975-1984)

Village - Income Status	Age of the Head*	Family size	Child/ total	Education (Number of years at school)	Own land-holding	Operated-to- owned land ratio	Number of Own Bullocks	Assets (as % of village median)
Aurepalle: Lower	53	6.59	.44	0	1.99	.77	.67	55
Medium	52	6.10	.32	2	7.33	1.00	1.00	86
Higher	58	5.40	.28	4	9.51	1.22	2.87	357
Kanzara: Lower	42	7.12	.40	4	4.42	.82	1.33	188
Medium	41	7.55	.42	4	4.82	.91	1.43	223
Higher	46	7.32	.39	5	7.47	1.25	2.74	404

*Age refers to average age in 1984

The three income classes in Kanzara are not different from each other with respect to family size, composition and education level. Instead, significant difference among the income groups is observed with respect to their assets holding. Total asset of higher income groups in Kanzara is four times that of the village median while it is only around two times higher for lower income groups. The total asset holding as a percentage of village median for lower income groups appear to be more than 100 percent, because the village median asset is less than the mean asset level of the lower income groups.

5.3 Seasonal Income Fluctuations

To examine to what extent income fluctuates over seasons, coefficients of variations (CVs) are calculated for the sample households. CVs calculated for farm and total income are presented in table 5.3. Farm income is a highly variable income source over seasons. It is obvious that crop earnings have a strong seasonal nature in areas like the Semi-Arid Tropics where agricultural production is dependent on rainfall and few irrigation facilities are available to generate income from agriculture throughout the year. Total income is less variable than farm income in both villages: the seasonal variability of total income in Aurepalle is 5 times less than the variability of farm income. Therefore, the importance of non-farm income sources (particularly that of wage income, trade and livestock) to stabilise total income across seasons is clearly shown.

Table 5.3 - Seasonal variation in income (Coefficient of Variations)

Variables	Villages	
	Aurepalle	Kanzara
Farm income	5.04	3.24
Total income	1.04	2.08

Seasonal variability of total income is higher in Kanzara because the major income source in Kanzara is crop revenue. As discussed in the previous chapters, the two villages are different from each other in many aspects. Employment opportunities both in agriculture

as well as outside agriculture, resource endowments, resource distributions, structure and functioning of the financial markets are quite different between the two villages.

5.4 Food Expenditure Levels

The major components of food expenditures in all villages are cereals, pulses, meat and meat products, sugar and sweets, oil, vegetables and spices. Households may have the ability to adjust the consumption bundle and pattern of expenditure in seasons of low income, for example, the purchase of non-food items can be timed to good seasons. While some non-food expenditures can immediately be reduced, there are other important basic non-food items (for instance shelter and agricultural inputs) which farm households (particularly the poorest) cannot substitute for food. Adjustments in the consumption pattern revealed if differences are observed in the share of food expenditure over seasons. The difference in the share food expenditure between seasons is not so pronounced within each land size class (table 5.4). Large differences are not observed in the share of food expenditure between land-holding categories, which means that households do not differ much in allocating their total expenditure to food and this is the case for both villages.

Table 5.4 Share of food expenditure as a percentage of total expenditure by village, land-holding category and season

Village -Class	Season		
	Summer (Mar-May)	Kharif (June-Oct.)	Rabi (Nov.-Feb.)
Aurepalle			
Small	76.12	78.05	78.03
Medium	72.44	74.16	76.27
Large	70.32	71.20	69.18
Kanzara			
Small	67.26	74.11	72.31
Medium	68.45	73.41	70.21
Large	62.23	67.09	65.77

The level differences of food expenditure may show differences in purchasing power or differences in capacity to produce food at farm level. In an area where agriculture provides the main means of living, land area owned determines the level of income and hence consumption. We have seen in the previous section that income levels are significantly

differentiated by land size class. To test whether these differences are translated into differences in per capita food expenditures, we used a multiple comparison test[1] (table 5.5 and 5.6).

Table 5.5 Mean comparison of food expenditure[2]- Aurepalle

Multiple Comparisons

Dependent Variable: food exp. per capita

Tamhane

(I) RLHC_1	(J) RLHC_1	Mean Difference (I-J)	Std. Error	Sig.
1.00	2.00	-2.7851	2.039	.304
	3.00	-12.9989*	1.889	.000
2.00	1.00	2.7851	2.039	.304
	3.00	-10.2138*	1.953	.000
3.00	1.00	12.9989*	1.889	.000
	2.00	10.2138*	1.953	.000

*. The mean difference is significant at the .05 level.

Table 5.6 Mean comparison of food expenditure- Kanzara

Multiple Comparisons

Dependent Variable: food exp. per capita

Tamhane

(I) RLHC_1	(J) RLHC_1	Mean Difference (I-J)	Std. Error	Sig.
1.00	2.00	-3.8677*	2.048	.048
	3.00	-7.8187*	2.087	.001
2.00	1.00	3.8677*	2.048	.048
	3.00	-3.9510	1.934	.190
3.00	1.00	7.8187*	2.087	.001
	2.00	3.9510	1.934	.190

*. The mean difference is significant at the .05 level.

As expected, large farm households have higher levels of per capita food expenditure than smaller farm households in both villages. One would expect that households with less land use various strategies to assure certain level of consumption, which can not be financed by farm income.

[1] This Tamhane test is different from ANOVA because it does not determine to what extent mean differences between the created groups explain the total variation, but only helps to tests the existence of differences in mean values.

[2] RLHC 1, 2 and 3 represent small, medium and large farm household classes respectively.

5.5 Seasonal Food Expenditure Fluctuation

Various elements may contribute to the variability of household food expenditure; Income level differences, seasonal variability, resource endowments and household characteristics and preference differences. The significance of various factors in explaining the total variability of expenditure is analyzed below.

Table 5.7 ANOVA result: Total monthly food expenditure/capita variance 'explained' by sub-groups in percentage terms.

Variables	Villages	
	Aurepalle	Kanzara
Total Variation(Rs)	6729	569
Household	20.7	23.4
Year	28.5	10.9
Land-holding class	5.6	1.8
Seasons	6.3	6.1

The ANOVA analyses (table 5.7) shows that year differences are the most important determinant of food expenditure variations in Aurepalle, which is a draught-prone area. In Kanzara, differences between households are most important. Land-holding categories explains little of food expenditure in Kanzara, because of the small differences in income between land-holding classes. These are due to the relatively equal land distribution in the villages, its favourable ecology, and its abundant non-agricultural employment possibilities. In Aurepalle land has a somewhat bigger influence on expenditure variability.

In both villages, seasonal differences explain only a small proportion of the total variation of per capita food expenditure. This implies that farm households smooth their consumption to a certain extent and that large seasonal variations in agricultural earnings do not influence consumption as such because they are compensated by other streams of income or by savings and dissavings. The latter is supported by the observation that the coefficient of variation of food expenditure is only 63 and 37 percent for Aurepalle and

Kanzara respectively, while the CV of total income is 104 and 208 percent. Moreover, households may have the ability to smooth seasonal food expenditure by adjusting their patterns of food expenditure, for example non-food items can be purchased in high income seasons (table 5.4).

There are difficulties to generalize based only on these aggregate analyses of food expenditure variations. It is not fully possible to single out seasonal effects on food expenditure. The observed aggregated mean differences in food expenditure per capita over seasons can arise from some common cyclical factors like prices and preferences. Therefore, care must be taken when interpreting such kinds of results.

5.6 Seasonal Food Expenditure Effects of Off-farm Income and Credit

The primary interest of this section is to see the contribution of credit and wage income to food consumption in different seasons. The marginal propensity to consume(MPC) is used as an indicator. The marginal propensity to consume with respect to each income sources is estimated using the food expenditure equation (eq. 4.8). Inclusion of one and two seasons lagged savings gives some insight into households' intertemporal allocation. It is assumed that households allocate their income across periods, choosing to consume some of their income now and save some to meet consumption needs in the future. However, one should bear in mind that intertemporal patterns might be expected to vary across landowner classes. Estimates of the MPC for each income source (including lagged savings) are presented in appendix 1. The MPC with respect to credit and wage income are presented in table 5.9. The MPC, for instance, of wage income is equal to 0.43 for the small farmers in Kharif (Aurepalle), which means that 43% of the wage income is spent on food consumption.

As expected, the estimated coefficients significantly vary over seasons indicating that all income sources are not equally important in all seasons. In general, credit is not important (MPCs are not significant) for food consumption in summer for all land-holding classes in

both villages, while wage income show a significant MPC irrespective of land-holdi classes in both villages in summer.

Table 5.8 Summary statistics for variables used in the food expenditure equation.

Mean (standard deviations)

	Aurepalle		Kanzara	
Variable	Mean	St. dv	Mean	St.dv
Monthly food exp. per capita(Rs)	40.3	23.8	30.9	22.3
Monthly crop income(Rs)	421.5	1100	493.0	1174
Monthly wage income(Rs)	40.80	79.8	15.50	38.00
Monthly trade income(Rs)	157.8	432.0	28.00	133
Monthly remittances(Rs)	168.3	1720	4.8	497
Net monthly credit (Rs)	168.5	152.4	108.6	206.7

In Kharif MPC of credit is significant only for small farmers in Aurepalle. On the oth hand MPC of wage is significant in Kharif for all household categories in both villa except for the large farmers in Aurepalle. There are significant MPCs for some oth income sources in this season (see appendix 1). As it is suggested in the mean comparisc analyses (section 5.1), land size holding is an important determinant of household incom Large farmers with higher incomes and resource endowments may have preferential acce to most of the strategies to cope with seasonal income fluctuations. Small farmers who a credit constrained (for any reason) participate in the labour market and allocate the available labour to minimise seasonal food fluctuation. In other words small farmers adju their labour supply between on farm and off-farm in such a way that they can stabili their total income over seasons. The effect of wage income on food expenditure is ver high for small farmers in all seasons. In the Kharif season, there are plenty agricultur wage income earning possibilities because this is the planting and harvesting season. Sou households may recieve payments in the following Rabi season. As a result, wage incom plays an important role in smoothing seasonal food fluctuation among small landowners.

Table 5.9 Parameter estimates for marginal propensity to consume with respect to credit and wage income organised by village and season

Village-Class	Credit			Wage income		
	Summer	Kharif	Rabi	Summer	Kharif	Rabi
Aurepalle						
Small	.03	.49**	.02	.86**	.43**	.47**
Medium	.001	.08	.14**	.39**	.14*	.30*
Large	-.001	.06	.09**	.08*	.12	.18
Kanzara						
Small	.03	.05	.04	.07**	.42**	.90**
Medium	.001	.03	.02	.56**	.21*	.36*
Large	.11	-.20	.13*	.27*	.15*	.18*

Households are differentiated by their credit use in food expenditures. In Rabi MPC of credit is significant only for the large farmers (in the two villages) and the medium farmers in Aurepalle. Large farmers want to finance production during the planting and harvesting season (Kharif) at the beginning of the growing season. This may result in less use of credit for consumption purposes during the Kharif season. Large households are generally wealthier households, they are in a better position to sell farm products, and they are capable of maintaining sufficient food stocks to meet their own-consumption needs. Therefore, they use less credit for consumption purposes during the Kharif season.

Small farmers have a higher use of credit during the Kharif season with a significant coefficient of 0.54. The expectation of an increase in income from harvesting cereals towards the end of this season is probably the main support to a higher use of credit in this period. However, an increase in the use of credit for consumption in Kharif season may lead to a reduction in future income due to dept repayment obligations. By working off-farm activities, households can reduce their reliance on credit during the rest of the year. The marginal propensity to consume out of most of the off-farm income sources during the Rabi as well as Summer season is relatively higher for small farmers. During the Kharif season, especially in the beginning of the planting period and harvesting period when farm

households must spend some time on their own farm, and farmers can not leave their fields for search of off-farm activities, financing consumption out of credit may be the predominant strategy among small farm households. This result support the hypothesis in chapter 1, which suggests that use of off-farm employment as a food security is enhanced by constraints in the financial market.

The credit parameter appeared to be insignificant in Kanzara except for large farmers in the Rabi season while in Aurepalle it is significant for large and medium farmers in the Rabi, and for small farmers in the Kharif. It is noted in Aurepalle that the village market for credit is active, which sometimes take the form of 'in-kind loans' and that supports households to rely on credit. Saving, mainly from Kharif season income is used by medium and large farmers in both villages. This is an expected outcome: large farm size households would have better saving potential and may be able to smooth intertemporal consumption from saving. The marginal propensity to consume crop income and saving is not significant for Aurepalle farm households. Income from products of one harvest of own production may not be enough to last until the next. This is because land and other inputs are expected to be too limited to produce sufficient amount of products for the whole year. As a result small farmers do not rely on farm income for their consumption as they depend on wage, trade and other non-farm income earnings including credit.

However, the MPC pattern of small farmers in the two village is not similar. For example, MPC from wage income is higher for Aurepalle small farmers during the Summer, while for Kanzara small farmers it higher in the Rabi season. The labour requirement of on-farm and off-farm activities in different seasons may be different between this villages. Therefore, the allocation and dependency of farm households on their wage labour for consumption may vary across villages. This implies that important differences between villages with respect to seasonal labour allocation must be taken into account to understand the specific village strategies of seasonal food consumption.

Small farm households in Kanzara have significant MPCs of crop income in two seasons. It is only in the Summer that they can not use crop income. In the summer other income sources (remittance, livestock and wage) are also important. In Aurepalle the coefficients for the marginal propensities to consume out of remittances are insignificant for large farmers in all the seasons. Transfers may sometimes form lump sum incomes which seem to be associated with the purchase of consumer durables or investments while continual forms of income are more likely to be spent on food. Small farmers, particularly in Aurepalle, spent a higher proportion of their remittance on food consumption; because of their very low levels of income, there are less options of spending income on non-farm items.

5.7 The Effect of Farm Household Characteristic on Food Expenditure Elasticity

The relationship between farm household characteristics and the importance of different income sources in food expenditure is analysed by regressing food expenditure elasticity on farm household characteristics. Family size, education level, number of owned bullocks and size of owned land significantly influences the use of wage income for food expenditure (table 5.10). The importance of family size in determining food expenditure elasticity (with respect to wage income) was expected. The more family members there are, the more likely they have abundant labour to supply the market and hence the more likely to be more dependent on wage income for food consumption.

In both villages food expenditure elasticity with respect to wage income significantly decreases as the level of education increases. The sign for education is not as expected possibly because the education level is more important in the role of households' earnings coming from outside the village, for instance through remittances. The village level labour market may not be responsive to education level, therefore, household members with a higher education level migrate outside the village. Farm households with higher education are also expected to be more responsive in their use of technologies to farm production and hence are more likely be dependent on crop income for their food expenditure than wage income.

The relationship between the number of bullocks owned and the food elasticity is notable. As the number of bullocks increases the importance of wage income in food expenditure declines in both villages. Bullocks are very important for income from farm operations. Therefore, having more bullocks may be associated with more farm activities and higher productivity which may lower the role of wage income in food expenditure.

Table 5.10 Regression analyses of food expenditure elasticity
Coefficient estimate (standard error)

Village- Dependent Variable (food exp. elasticity with respect to-)	Age of the head	Age square	Family size	Dependency ratio	Education	Number of own bullocks	Operated land size	Owned land size	R^2	Adj R^2
Aurepalle Wage	-.009	.001	.03*	-.14	-.04*	-.024*	-.006	-.012*	.25	.19
Income	(.009)	(.001)	(.007)	(.68)	(.006)	(-.011)	(.006)	(.005)		
Credit	.004	-.0001	.001	.83*	.01	.06*	.02	-.03*	.23	.22
	(.019)	(.0002)	(.017)	(.224)	(.012)	(.022)	(.016)	(.012)		
Kanzara Wage	-0004	$2*10^{-6}$	-.0001	-.001	-.0009*	-.002*	-.0002	-.0007*	.17	.15
Income	(.0004)	$(5*10^{-6})$	$(2*10^{-4})$	(.003)	(.0001)	(.0005)	$(1.9*10^{-4})$	(.0002)		
Credit	-.12	.002	-.16*	2.01*	.196*	.36*	-.198*	.17*	.13	.10
	(.15)	(.001)	(.07)	(1.16)	(.068)	(.17)	(.067)	(.08)		

* Coefficients significant at 5% significant level.

The operated land size is not a significant determinant in the food expenditure elasticity with respect to wage income while the response of food consumption from wage income declines significantly in both villages as the size of owned land increases. An increase in the size of land may attract farm households to engage more in farm activities than in wage employment or part of the land which is not operated can be leased out. Consequently, the influence of wage income declines as owned land size increase.

The coefficient estimate of child to total family size ratio for food expenditure elasticity with respect to credit is positive and relatively high in both villages. Farm households are more responsive in their use of credit for food consumption as the number of children in family increases. This means that as the number of family members who can not potentially participate in the labour market increases, farm households will rely more on the available credit for their consumption. Credit use is also highly enhanced with higher owned land size in Kanzara. This could be due to the fact that most credit in Kanzara is

from the formal sector, and land may be an important asset to secure credit for fc consumption.

Appendix A.

Appendix-A1 Marginal propensity to consume from farm, off-farm income, credit and lagged saving by land holding class and season-Aurepalle

Land holding class	Variable	Season		
		Kahrif (June-Oct)	Rabi (Nov-Feb.)	Summer (Mar. – May)
Small	Crop income	.11	.03	-
	Livestock income	.36**	.01*	.08*
	Wage income	.43**	.47**	.86*
	Remittances	.16*	.29*	.18*
	Trade income	.31*	.17**	.06*
	Credit	.49*	.02	.03
	One season lagged saving	.01	.004*	.05
	Two season lagged saving	.05	.005	.08
Medium	Crop income	.04*	.09	.02
	Livestock income	.30*	.01	.007
	Wage income	.14*	.30*	.39**
	Remittances	.12	.14*	.33*
	Trade income	.45*	.02	.05*
	Credit	.08	.14**	.001
	One season lagged saving	.006	.10**	.02
	Two season lagged saving	.003	.02	.13**
Large	Crop income	.08*	.04*	.12
	Livestock income	.01*	.02	.07*
	Wage income	.12	.18	.08*
	Remittances	-.03	-.001	-.01
	Trade income	.43*	.24*	.04*
	Credit	.06	.09**	-.001
	One season lagged saving	.005	.03*	.02
	Two season lagged saving	.009	.005	.06*

*Coefficients that are significantly entered in the food expenditure equation at 5% significant level.

**Coefficients that are significantly entered in the food expenditure equation at 1% significant level

Appendix-A2 Marginal propensities to consume from farm, off-farm income, credit and lagged savings by land holding class and season-Kanzara

Land holding class	Variable	Season		
		Kahrif (June-Oct)	Rabi (Nov-Feb.)	Summer (Mar. – May)
Small	Crop income	.04*	.02*	-
	Livestock income	.23**	.87**	.35*
	Wage income	.42**	.90**	.70**
	Remittances	.01	.08*	.06*
	Trade income	.03	.006*	.12
	Credit	.05	.04	.03
	One season lagged saving	.10	.008	.015
	Two season lagged saving	.08	-001	.09
Medium	Crop income	.12*	.04*	.07
	Livestock income	.69*	.35**	.34**
	Wage income	.21*	.36*	.56**
	Remittances	-.14	.03	.008
	Trade income	.004	.05	.12
	Credit	.03	.02	.001
	One season lagged saving	-.01	.05**	.02
	Two season lagged saving	.07	.10	.03**
Large	Crop income	.25*	.20*	.22*
	Livestock income	.10*	.24**	.26*
	Wage income	.15*	.18*	.27*
	Remittances	.03	-.002	.07*
	Trade income	.17	.03	.04
	Credit	-.02	.13*	.11
	One season lagged saving	.002	.02**	.02
	Two season lagged saving	.008	.006	.06**

*Coefficients that are significantly entered in the food expenditure equation at 5% significant level.

** Coefficients that are significantly entered in the food expenditure equation at 1% significant level

Reference

Alderman, H., 1986, *The effect of food price and income changes on the acquisition of food,* Washington D. C. IFPRI

Alderman, H., and Sahn, D., 1989, Understanding the Seasonality of Employment, Wages, and Income, in Sahn, D., (ed.) *Seasonal variability in third world agriculture: The consequences for food security,* Baltimore, Md., Johns Hopkins University Press, pp.81-106.

Anderson, D., and M. W. Leierson, 1978, *Rural Enterprise and Non-farm Employment,* World Bank Paper, Washington D. C.

Bakker, E. J., 1992, *Rainfall and Risk in India's Agriculture: An ex-ante evaluation of rainfall insurance,* Groningen, Wolters-Noordhoff.

Besley, T., 1995, 'Saving, Credit and Insurance,' in J. Behrman and T. N. Srinivasan, (eds.), *Handbook of development economics,* vol. 3a, Amsterdam, Elsevier Science Publishers B.V., 2123-2207.

Besley, T., 1994, "How Do Market Failures Justify Interventions In Rural Credit Markets?", *The World Bank Research Observer,* Vol. 9, No. 1, pp27-47.

Behrman, J. R. and A. B. Deolalikar, 1989, 'Seasonal demands for nutrient intakes and health status in rural south India,' in Sahn, D., ed., *Seasonal variability in third world agriculture: The consequences for food security,* Baltimore, Md., Johns Hopkins University Press, pp.66-80.

Behrman, J. and T. N. Srinivasan, 1995, (eds.), *Handbook of development economics,* vol. 3a, Amsterdam, Elsevier Science Publishers B.V..

Caillavet, F. and H. Guyomard and R. Lifran, (eds.) 1994, *Agricultural Household Modeling and Family Economics,* Amsterdam, Elsevier Science Publishers B.V.

Carriker, G. L., M. R. Langemeier, T. C. Schroeder, and A. M. Featherstone, 1993, Propensity to consume Farm Family Disposable Income from Separate Sources, *American Journal of Agricultural Economics,* 75:(739-744).

Chakravarty, A., (ed.), *The Balance between Industry and Agriculture in Economic Development: Manpower and Transfers,* Vol.3, New York, St. Martin's Press.

Chambers, R., R. Longhurst, and A. Pacey, 1981, (eds.), *Seasonal Dimensions to Rural Poverty.* London: France Printer Publishers Ltd.

Chenery, H. B., and T. N. Srinivasan, (eds.), 1995, *Handbook of development economics,* vol.1, North Holland.

Colman, D., and T. Young, 1989, *Principles of Agricultural Economic: Markets and Prices in Less Developed Countries,* Cambridge, Cambridge University Press.

Corsi, A., 1994, Imperfect labour markets, preferences, and minimum income as a determinants of pluriactivity choices, In Callvet, F. and H. Guyomard and R. Lifran, (eds.), *Agricultural household modeling and family economics,* Amsterdam, Elsevier.

De Janvry, A., Fafchamps, M. and Sadoulet, E., 1991, Peasant households behavior with missing markets: some paradoxes explained, *Economic Journal* (101): 1400-1417.

Deaton, A, 1996, *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*, Washington, World Bank Publication.

Deaton, A. and J. Muellbauer, 1980, *Economics and Consumer Behavior*, Cambridge, Cambridge University Press.

Donald, G., 1976, *Credit for Small Farmers in Developing Countries*, Westview Press, Colorador.

Doss, C. R., 1996, Intrahousehold Resource Allocation in an Uncertain Environment, *American Journal of Economics 78* (December 1996): 1335-1339

Douma, S. and H. Schreuder, 1991, *Economic approaches to organizations*, New York, Prentic Hall.

Dreze, J. and Mukherjee, A., 1989, Labour contracts in Rural India: Theories and Evidence, in Chakravarty, A., (ed.), *The Balance between Industry and Agriculture in Economic Development: Manpower and Transfers*, ,Vol.3, New York, St. Martin's Press, pp.233-265.

Dreze, J. and A. Sen, (eds.), 1990, *The Political Economy of Hanger: Entitlement and Well-being*, Vol. 1, Oxford, Calarendon Press.

Elhorst, J. P., 1994, Firm-household Interrelationships on Dutch dairy farms, *European Review of Agricultural Economics*, 21-2: pp.259-276.

Ellis, F., 1993, *Peasant Economics: farm household and agrarian development*, Cambridge, Cambridge University Press.

Gersovitz, 1989, Savings and Credit, in H. B. Chenery and T. N. Srinivasan, (eds.): *Handbook of development economics,* vol.1, North Holland.

Gill, G. J., 1991, *Seasonality and Agriculture in the Developing world: A problem of the poor and powerless*, Cambridge, Cambridge University Press,.

Gittinger, J. P., J. Leslie, and C. Hoisington, (eds.), 1987, *Food Policy: Integrating supply, Distribution and consumption,* Baltimore, Johns Hopkins University Press.

Haggblade, S., P. Hazzel, & J. Brown, 1989, 'Farm - Non Farm Linkages in rural Sub-Sahara Africa' *World Development* (17), 8: 1173- 1201.

Harriss, B., 1990, The Intrafamily Distribution of Hanger in South Asia in Dreze, J. and A. Sen, (eds.), *The Political Economy of Hanger: Entitlement and Well-being*, Vol. 1, Oxford, Calarendon Press, pp.351-424.

Iqbal, F., 1983, 'The demand for funds by agricultural households: Evidence from rural India' *Journal of Development studies*, vol 20, pp.68-85.

Jacoby, H. G, 1993, Shadow wages and Peasant Family Labour Supply: An Econometric Application to the Peruvian Sierra, *Review of Economic Studies*, 60, pp.903-921.

Koutsoyiannis, A., 1977, *Theory of Econometrics: An Introductory Exposition of Econometric Method*, London, MacMillan.

Longhurst, R. and P. Payne, 1981, Seasonal Aspects of Nutrition, in Chambers, R., R. Longhurst, and A. Pacey, 1981, (eds.), *Seasonal Dimensions to Rural Poverty*. London: France Printer Publishers Ltd., pp.218-223.

Mahendera Dev, 1995, India's (Maharashtra) Employment Guarantee Scheme: Lessons From Long Experience, in J. Von Braun, (ed.), *Employment For Poverty Reduction And Food Security*, Washington D.C., IFPRI

Maitra, P., 1996, *'Is consumption Smooth at the cost of Volatile Leisure? An investigation of Rural India'*, Los Angeles: University of Southern California, Department of Economics.

Martha, A. C., 1991, *Coping with seasonality and drought*, Sage Publications India, New Delhi.

Maxwell, D. G.,1996, Measuring food insecurity: the frequency and severity of "coping strategies", *Food policy*. Vol. 21. N0. 3. pp. 291-303.

Moll, H. A. J., 1989, Farmers and Finance: experience with institutional saving and credit in West Java, Wageningen Agricultural University.

Morduch, J., 1995, 'Income smoothing and consumption smoothing,' *Journal of Economic Perspectives*, (9:3), pp.103-114.

Pal, S., 1996, Casual and Regular Contracts: Workers' self-selection in the Rural Labour Markets in India, *The Journal of Development Studies*, (33:1), 99-116.

Paxson, C. H., 1992, 'Using weather variability to estimate the response of saving to transitory income in Thailand,' *American Economic Review*, 82:15-33

_____ 1993, Consumption and income seasonality in Thailand, *Journal of Political Economy*, (101:1)38-72.

Pindyck, R.S., and D. L. Rubinfeld, 1991, *Econometric Models and Economic Forecasts*, McGraw – Hill, 3rd ed., University of California at Berkeley.

Pinstrup-Andersen and M. Jaramillo, 1989, 'The Impact of Drought and Technological Change in Rice Production on Interyear Fluctuations in Food Consumption: The Case of North Arcot,

India', in Sahn, D. (ed), *Seasonal Variability in Third World Agriculture: The consequences for Food security*. Baltimore: The Johns Hopkins University Press, pp264-284.

Reardon, T. and P. Malton, (1989), 'Seasonal Food Insecurity and Vulnerability in Drought-Affected Regions of Burkina Faso.' in Sahn, D. (ed.), *Seasonal Variability in Third World Agriculture: The consequences for Food security*. Baltimore: The Johns Hopkins University Press, pp.118-136.

Retutlinger, 1987, Food Security and Poverty in Developing countries, in Gittinger, J. P., J. Leslie, and C. Hoisington, (eds.), *Food Policy: Integrating supply, Distribution and Consumption,* Baltimore, Johns Hopkins University Press.

Roe, T., and T. Graham-Tomasi, 1986, Yield Risk in a Dynamic Model of the Agricultural Household, in Singh, I., L. Squire, and J. Strauss, (eds.), *Agricultural Household Models Extensions, Applications, and Policy*, Baltimore, The Johns Hopkins University Press, pp.255-275.

Rosenzweig, R, 1988, 'Risk, Implicit Contracts And The Family In Rural Areas Of Low-Income Countries', *The Economic Journal*, 98: 1148-1170.

Rosenzweig, R. and L. Wolpin, 1994, 'Credit market constraints, consumption smoothing, and the accumulation of durable production assets in low-income countries: investments in Bullocks in India,' *Journal of Political Economy* (101), 2: 223-244.

Rosenzweig R and O. Stark, 1989, Consumption Smoothing, Migration and Marriage: Evidence from India, *Journal of Political Economics*, 97(4): 905-926.

Sadoulet, E. & A. de Janvry, 1995, *Quantitative Development Policy Analysis*, Baltimore The Johns Hopkins University Press.

Saha, A., 1994, "A Two-Season Agricultural Household Model of Output and Price Uncertainty", *Journal of Development Economics*; 45(2), pp245-69.

Sahn, D., 1989, *Seasonal Variation in Third World Agriculture: the consequences for food security,* Baltimore, Md., Johns Hopkins University Press for the International Food Policy Research Institute.

Sahn, D., and J. V. Braun, 1985, The implication of Variability in food production for Nutrition and Household food security, in J., R. Anderson and Hazell, P., (eds.), *Variability in Grain yields: Implications for Agricultural Research and policy in Developing countries*, London: The Johns Hopkins University Press, pp.

Schrieder, G., 1996, *The role of rural finance for food security of the poor in Cameroon*, Frankfurt am Main, Peter Lang GmbH.

Stephen, D. and Henry, p., 1987, *A Manual of Credit & Savings For The Poor of Developing Countries*, Development Guidelines No.1, OXFAM.

Singh, I., L. Squire and J. Strauss, 1986, *Agricultural Household models: Extension, Application, and Policy,* Baltimore, Md., Johns Hopkins University Press.

Singh, K., 1983, Structure of Interest Rates on Consumption Loans in an Indian Village, in Von Pischke, J. D. et al., (eds.), *Rural Financial Markets in Developing countries: Their Use and Abuse*, pp:251-254, Baltimore, The Johns Hopkins University Press.

Singh, R. P., Binswanger, H. P. and Jodha, N. S., 1985, *Manual of instruction for economic investigators in ICRISA'S village level studies*, Andhra Pradesh, India.

Stingltiz, J. E., 1989, "Some Theoretical Aspects of Agricultural Policy", *World Development Research Observer*, Vol.2, No. 1, pp.43-60.

Timmer, C. P., W. P. Falcon, and S. R. Pearson, 1980, *Food Policy Analysis*, A World Bank Publication, The Johns Hopkins University Press, Baltimore.

Townsend, R., 1995, 'Consumption insurance: an evaluation of risk- bearing system in low income economies,' *Journal of Economic Perspectives*, 9, 83-102.

Udry,C., 1994, 'Risk and Insurance in a Rural credit market: An Empirical Investigation in Northern Nigeria,' *Review of Economic Studies* (61), 527-544.

Von Braun, J. and R. Pandya-Lorch, 1991, *Income sources of malnourished people in rural areas: micro level information and policy implications,* Working Papers on commercialization of agriculture and nutrition, no. 5 Washington, D. C.: IFPRI.

Von Pischke, J. D., Adams, D. W. and Donald, G., (eds.), 1983, *Rural Financial Markets in Developing Countries: Their Use and Abuse*, Baltimore, The Johns Hopkins University Press,.

Walker, T.S. and J.G., Ryan, 1990, Village and Household Economics in India's Semi-arid Tropics, Baltimore, The Johns Hopkins University Press.

Chapter 6 Conclusion

Income instabilities and seasonal food fluctuations have been a policy concern in most countries in the world. Macro-level interventions as well as farm level implementations of various programs have been launched as a response to this concern. Households also rely on a number of internal mechanisms to meet food consumption needs throughout the year. Important strategies include income diversification, food/non-food expenditure adjustment, holding stocks, adjusting on-farm and off-farm labour supply, and strategies based on social relationships within the village, such as remittances, and borrowing.

Results show that food consumption is far less variable over seasons than income, which indicates that households have the ability to keep a certain level of consumption during seasons of shortage. The total income of the sample households show less variation than farm income. Seasonal loans of either food or money serve as insurance against food shortfalls during the lean season, but these type of loans may reduce households food inventories after harvest, when debt obligations are to be met. Therefore, small farmers are more dependent on the labour market especially during the dry season of the year. Hence, off-farm income remains a potential means of smoothing food fluctuation, which arise due to the seasonal nature of the agricultural production in the villages. The significant impact of off-farm earnings, however, may be more feasible in situations where farm families have able-bodied family member that can participate in the labour market. The negative effect of the dependency ratio on households use of wage income for food expenditure suggests that farm households with higher dependency ratios can not rely on wage income for their consumption. An increase in dependence ratio on the other hand is associated with higher use of credit for consumption.

Policies to strengthen off-farm employment opportunities, particularly during the non-cropping seasons, and increasing agricultural productivity are the most direct ways to stabilise income and increase income levels. Enhancing employment opportunities or off-

farm income generating components through channeling credit programs is also another option but might not be as cost-effective as direct employment creation. Employment programs can be timed to coincide with food shortage seasons because income from non-agricultural activities are more utilised during such slack seasons. Farm households' consumption is more unstable in Aurepalle than in Kanzara. Farmers in Aurepalle deserve higher government interventions due to their relative lower smoothing ability. And within each of the villages employment programs can be more effective if they are directed towards farmers who have lower asset holdings, because for these farmers are more dependent on wage income to smooth consumption throughout the year.

Policy recommendations must be based on disaggregated studies of seasonality, and not on generalisations of seasonal patterns which may or may not hold true. Information on seasonal constraints can aid policy makers in designing effective policies and programs. A more integrated approach is needed to understand the transmission of seasonal production and income variability into seasonal changes in household food consumption.