THE COMMERCIALISATION OF THE SUBSISTENCE ECONOMY AND ITS IMPLICATIONS FOR HOUSEHOLD FOOD SECURITY IN UGANDA: A CASE STUDY

by

Evelyn Clare Apili Ejupu

Submitted in partial fulfilment of the requirements for the degree

PhD

in the

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CHAPTER 1

INTRODUCTION

1.1 AN ECONOMIC PROFILE OF UGANDA

1.1.1 Background

Uganda is commonly hailed as a beacon of economic hope in Sub-Saharan Africa (SSA), a region where increasing poverty is a major concern. Political turmoil and economic decadence characterised the post-independence era. Since 1986, the return of peace and security in most of the country and economic reform measures, have been key factors in the remarkable turn around of the economy. However, the challenge of implementing reform highlights the need for continuous policy monitoring. The subject of this thesis is one such concern. In Uganda, many households, despite being engaged in food production, seem unable to meet their food needs. The so-called "marketed surpluses" traded both domestically and exported within the region therefore give an inexact appearance of abundance.

Uganda's era of post-independence economic decline (as in many other SSA countries) was partly beyond her control. One reason was the declining international terms of trade for primary agricultural commodities (such as coffee, cotton, tea, tobacco and cocoa) on which the economy relied. Stagflation in the Organisation for Economic Co-operation and Development (OECD) countries and a depression in the world economy contributed to this. In addition, Uganda suffered political instability that started soon after independence and culminated in a military dictatorship (1971-1979) succeeded by several short-lived regimes (1979-1986). This instability fuelled the economic decline, undid most of the developmental gains already attained and led to general societal decay.

1.1.2 Economic recovery measures

An economic recovery programme (ERP) was launched in 1987. It was a second attempt at structural adjustment and stabilisation austerity measures supported by the World Bank and International Monetary Fund (IMF). The ERP sought to address the economic dis-equilibrium and improve the populations welfare through the rehabilitation of the economy and the promotion of an environment conducive to economic growth (Uganda-Ministry of Finance & Economic Planning, 1992b). The three principal objectives were to:

i) Rehabilitate the productive sectors of the economy, in particular critical infrastructure on which those sectors depended, and by so doing promote growth.
ii) Reduce inflation and stabilise the economy by tackling budgetary imbalances.
iii) Address the balance of payments crisis.

The structural adjustment concept is anchored in the neo-classical economic model - free markets in an open economy should lead to the optimal and efficient use of available resources as guided by price structures. Price and market reforms have thus been central to these economic austerity measures. In Uganda, they were intended to move the economy away from its predominantly informal and subsistence nature towards a monetary economy.

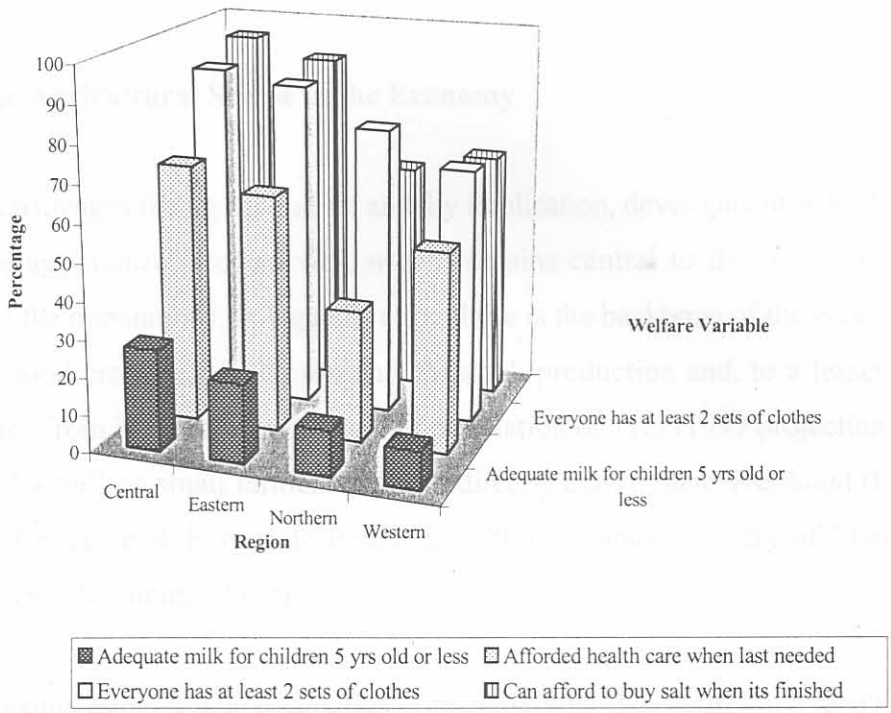
In many respects, the ERP attained its objectives and the country is hailed as one of the structural adjustment success stories. Notably, inflation came down from 207% in July 1987 (Uganda-Ministry of Finance & Economic Planning, 1992b) to single digits, 9.2%, by 1993 and 3.4% in April 1999 (Uganda-Ministry of Finance, Planning & Economic Development, 1999). In 1987 the parallel market had an exchange rate premium of up to 266% over the official fixed rate (World Bank, 1993b). By 1994, the liberalising of the foreign exchange market had cleared this premium. From 1987 to 1998, the Gross Domestic Product (GDP) had grown by 6.7% per calendar year on average. Per capita income estimated at 110,726 Uganda shillings (shs) in 1982 and 109,445 shs in 1987 had grown to 158,210 shs in 1998 (Uganda-Ministry of Finance, Planning & Economic Development, 1999).

In spite of the positive achievements, the debate on whether or not the common person is better-off because of the reform programme is inconclusive. The debate is compounded by the challenge of isolating the effects of reform from those caused by other factors. These factors include insecurity, adverse natural phenomena and the Human Immune Deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) pandemic, all of which are occurring simultaneously with the same impact point. Opio (1996) finds no obvious evidence to confirm that the Structural Adjustment Programme (SAP) has exacerbated poverty. He argues that apart from reduced inflation, other programs have marginally helped to reduce the incidence of poverty while most have not significantly exacerbated it either.

Based on a 1993/94 survey, the poverty line is estimated at 11,500 shs and 16,400 shs per capita per month for food and total expenses respectively (household average of 55,200 shs and 78,720 shs). In 1996 at this poverty line, 45.6% of the population were living below the poverty line (referred to as soft core poor). Those below the food line (the hard core poor) were 26.2% of the population (Uganda-Ministry of Planning & Economic Development, 1997d; Uganda-Ministry of Finance, Planning & Economic Development, 1998; Uganda Bureau of Statistics, 1999). These figures showed a decline from 55.6% for the soft-core poor and 35.2% for the hard core poor in 1992. By rural-urban distribution, 86% of the poor lives in the rural areas compared with 14% in the urban areas. Regional distribution of poverty by head count is as follows; 28% of the population in the Central region, 53.3% of the population in the Eastern region, 65.1% in the Northern Region, and 42.3% in the Western region (Uganda-Ministry of Finance, Planning & Economic Development, 1998).

Following a 1992-1996 trend analysis (Uganda-Ministry of Finance, Planning & Economic Development, 1999) it was found that the poorest 20% of the population had become poorer. Also of concern was the finding that sometimes poverty and its welfare effects were contradictory. For example, indicators of welfare in the western region, one of the less poor regions as indicated in the previous paragraph, performed worse than the poorer eastern region. They compared to the northern region that is largely insecure and considered to be the poorest. This is graphically illustrated in Figure 1.1 by four of the variables followed in the trend analysis:

- Ability to pay for health care when a member of the household last fell sick
- Ability of the household to buy milk for the young children
- Ability of the household to buy something as basic cooking salt
- Whether all household members have a change of clothing.



Source: *Data in Uganda MFPED, 1999*

Figure 1. 1 Selected welfare indicators by region (1999)

However, without delving into the poverty debate, indications of increased participation in the cash economy were observed during the study. Some are noted here:

- Large volumes of public transport vehicles (bicycles, minibuses, buses and lorries) regularly ply different routes from the urban centres to the rural areas and short distances, moving people, goods and food.
- Hammer (grinding) mills are now found located within villages and trading centres and have largely replaced the drudgery of hand grinding previously done by women.

- A variety of consumer goods are available in the various markets, from house wares replacing traditional and locally made wares, to soft drinks and even bottled beer that may now be found served in village trading centres and "bars".
- In Soroti district, which, among others, suffered cattle rustling in the late 1980's, many households now own at least a goat or cow that they purchased through their own efforts.

1.1.3 The Agricultural Sector in the Economy

The main challenges facing agriculture and, by implication, development in SSA, is how to increase agricultural productivity, which remains central to the livelihood of the majority of the populations. In Uganda, agriculture is the backbone of the economy and comprises food crop, non-food crop and livestock production and, to a lesser extent, aquaculture. From it, more than 80% of the population of 21m (1999 projection), on an estimated 3.2 million small farmer holdings, directly derive their livelihood (Uganda-Ministry of Finance & Economic Planning, 1992f; Uganda-Ministry of Planning & Economic Development, 1997d).

As the economy expands and diversifies, especially with the progressive rehabilitation in the industrial and service sectors, agricultural GDP contributions have declined. They were estimated at 42.4% in the fiscal year 1997/98 (Uganda-Ministry of Finance, Planning & Economic Development, 1998) down from about 56% in 1985/86. The food sub-sector is the most dominant, contributing more than 90% of agricultural GDP but non-food crops especially coffee, dominate exports, 90% of which are agricultural commodities. Nonetheless, non-traditional agricultural exports, which include food and fish commodities, have increased in value. In 1991, they were estimated at US$ 140,685,000 and in 1996 they were estimated at US$ 434,116,000. In addition, agricultural commodities provide raw materials for the industrial sector.

Given the dominance of smallholder agriculture, for widespread and sustainable development to take place, resources need to be harnessed from within the smallholder sector itself as there is no other sector from which transfers can be made to make a marked impact on the agricultural sector (IFAD, 1994). Therefore, in conformity with the ERP, policy reorientation within the sector sought to increase smallholder production

of both food and cash crops. The twofold long-term objective was to increase marketed surpluses and recapture the lost shares in international commodity markets. This is expected to contribute directly to increased household incomes (the sector provides the most equitable means of distributing economic gains given that it engages the majority of the population) and foreign exchange earnings. An improvement in the lot of farmers should in turn bring about increased effective demand necessary to spur on growth.

Specifically, sectoral objectives are to:

i) Increase agricultural productivity to ensure food security, self-sufficiency in raw materials for agro-industries and cash crops for export.

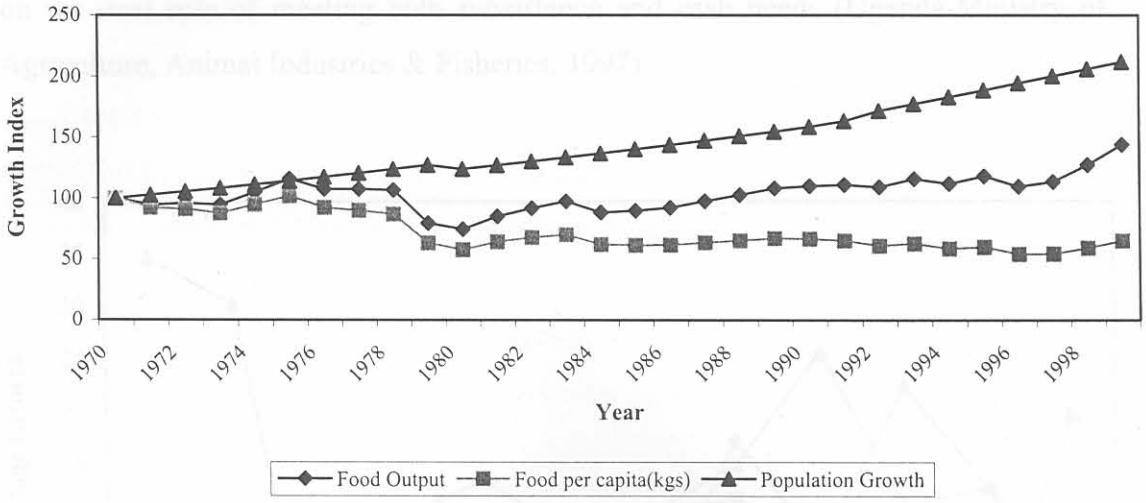
ii) Diversify the country's exports through the promotion of non-traditional agricultural exports (NTAE's).

iii) Increase people's incomes and reduce poverty through increased agricultural exports.

1.1.3.1 The Food Sub-sector

For many SSA countries, food self-sufficiency has been and remains, a priority policy objective. With a longstanding and attained policy of food self-sufficiency, Uganda produces enough food to meet its domestic needs and has the capacity to produce surpluses for export (FAO, 1998b; IFAD, 1994; Nygaard, Paarlberg, Sanyu-Mpagi, Matovu & Babu, 1997; World Bank, 1993a). Given the dominance of the food sub-sector in the livelihoods of most of the population and in the agricultural sector, a national food strategy remains pivotal to articulating the broader process of agricultural led growth.

Although the food sub-sector did decline, subsistence oriented production rendered it resilient to the economic decline suffered by the country through the 1970's and 1980's (Uganda-Ministry of Agriculture & Forestry, 1983a; World Bank, 1993a; World Bank, 1996). However, compared with 1970 levels, per capita production has been declining (see Figure 1.2 below). By 1996 it is estimated that the population had grown by more than 100% of 1970 estimates, food output by less than 50% and per capita food production declined by about 50%. From this illustration, increased per capita food



Source: Data from several issues of background to the Budget & World Bank, 1993a

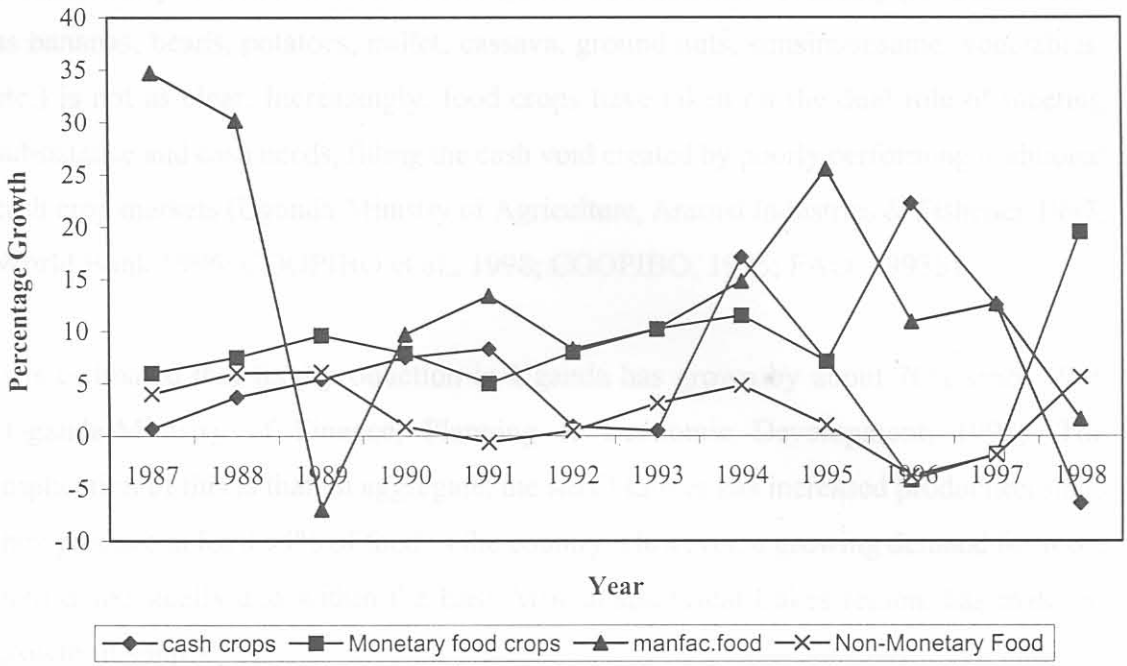
Figure 1. 2: Growth in total food output, per capita food and population compared (1970 = 100)

production to meet domestic consumption is central to the challenge of increasing agricultural productivity.

Production limits are currently set by the low input and unimproved technology, i.e. the use of rudimentary tools such as the hand hoe, panga and axe that characterise production, coupled with increasingly depleted soils. Currently, increases in output are due mainly to horizontal rather than vertical growth and only 12% - 50% of yields under research conditions are attained. Post harvest losses are also high, ranging from 6% for finger millet, to 30% for maize, root crops and pulses, (Uganda-Ministry of Agriculture, Animal Industries & Fisheries, 1996).

To increase and diversify foreign exchange earnings away from coffee, policy has moved to promote non-traditional exports. These range from high value commodities like vanilla, fruits and flowers and more notably, to the commonly grown and consumed food commodities like maize, beans and oil seeds (Uganda-Ministry of Finance & Economic Planning, 1992a). Given that their returns compare favourably with the traditional cash crops (except coffee) food crops are rendered an attractive source of cash income, taking

on the dual role of meeting both subsistence and cash needs (Uganda-Ministry of Agriculture, Animal Industries & Fisheries, 1997).



Source: *Data from several issues of background to the Budget*

Figure 1. 3: Sub-sectoral annual growth Rates at 1991 prices

As illustrated by Figure 1.3, growth in the traditional cash crop sector picked up from 1993 onwards. This was in reaction to favourable world coffee prices that subsequently did not perform as well. On the contrary, monetary food contributions are rising and registered an average annual growth of 7.3% in the last decade. Even root crops, like cassava and sweet potatoes, that are commonly considered non-tradable, are now traded with border towns in neighbouring countries. However, in the same period, non-monetary food contribution to GDP, a reflection of subsistence consumption, has grown by, on average, 1.6% (Uganda-Ministry of Finance, Planning & Economic Development, 1999).

1.2 PROBLEM STATEMENT

Today the long established characteristic dichotomy between the rural cash economy (dominated by coffee, cotton and tobacco) and the subsistence economy (food crops such as bananas, beans, potatoes, millet, cassava, ground nuts, simsim/sesame, vegetables, etc.) is not as clear. Increasingly, food crops have taken on the dual role of meeting subsistence and cash needs, filling the cash void created by poorly performing traditional cash crop markets (Uganda-Ministry of Agriculture, Animal Industries & Fisheries 1997; World Bank 1996; COOPIBO et al., 1998; COOPIBO, 1995; FAO, 1998b).

It is estimated that food production in Uganda has grown by about 70% since 1986 (Uganda-Ministry of Finance, Planning & Economic Development, 1998). The implication of this is that, in aggregate, the small farmer has increased production since they produce at least 94% of food in the country. However, a growing demand for food, both domestically and within the East African and Great Lakes region, has matched growth in supply.

Despite the apparent abundance of food in aggregate and that by the national food balance sheet Uganda has adequate food (FAOSTAT, 1999a), it is estimated that about half of the population lack sufficient food (Bahiigwa, 1999). At a poverty line of 2,200 calories, 61% of the population is chronically food insecure. By rural-urban distribution, 27% of the population in the rural areas are in the lowest quartile and 22% in the top quartile. In the urban areas, 11% and 49% are in the lowest and top quartiles respectively. As pointed out earlier, those who live below the food line are an estimated 26.2% (Uganda-Ministry of Finance, Planning & Economic Development, 1998). Of Uganda's estimated 4.2 million children below five years, 45% are stunted (a measure of long term inadequate consumption) and 25% underweight (Uganda-Ministry of Agriculture, Animal Industries & Fisheries, 1996). By district, the 1995 study by the Export Policy Analysis Unit (EPAU) categorised ten districts as experiencing transitory food insecurity and six districts as suffering chronic deficits. Thus 16 out of the then 39 districts were food insecure (Uganda-Ministry of Finance & Economic Planning, 1995b). A trend analysis shows that the food security situation is deteriorating. It is estimated that about 29% of the population suffered under-nourishment between 1969-71, about 31% between 1990-92 and 34% between 1994-96 (FAO, 1998b).

Adverse climatic conditions, given the dominance of rain-fed agriculture and the low input use, result in low food crop productivity often leading to transitory food insecurity. According to the agro-ecological settings therefore, zones characteristically at risk of food short falls are those in the marginal/ arid areas where nomadic cattle keeping is often the dominant activity. Other areas also suffer productivity shortfalls following poor seasons. Recently the Government labelled food insecurity as a problem of limited land-holdings, soil infertility, insufficient knowledge of modern farming techniques, and lack of access to productive inputs, ultimately a case of low productivity (Uganda-Ministry of Finance, Planning & Economic Development, 1999).

Poverty, though widespread and an important factor in the analysis of food insecurity, has not attracted much attention in the literature on food insecurity in Uganda. This is partly because of the structure of agriculture, that is small family holdings primarily producing food for subsistence purposes and the majority of the population have access to land for farming (World Bank, 1993a). Aggregate food self-sufficiency has also been considered a good proxy for food security.

The promotion of food crop exports as part of the NTAE's assumes households are net sellers of food. As one travels across the country, the trade in food creates the perception of substantial marketed surpluses. However, the concern that commercialisation of the food sub-sector is contributing to the high levels of food insecurity has been raised by the farmers and at various forums (COOPIBO, 1995; Uganda-Ministry of Agriculture, Animal Industries & Fisheries, 1996; Uganda-Ministry of Finance, Planning & Economic Development, 1999; Uganda-NFNC, 1996b). Therefore although seen as a long-term and sustainable intervention in efforts to alleviate poverty, its negative effects on food security require attention.

Commercialisation as a process is driven by various factors. Producers argue that the pressure to sell food is partly due to the costs of social services, mainly health and education. A 1993 survey, (CHDC 1993, 1994) cited in COOPIBO (1996), found that in order to finance health care, 34% of its respondents sold subsistence crops, 17% sold cash crops and 10% sold livestock. It was also estimated that students and their families meet 75.8% of the costs of primary education and 56.8% of secondary education. In general, commercialisation of the food sub-sector has been spurred on by several factors.

They are here categorised as domestic (within the country) and external factors (beyond the country's borders and/or control).

Domestic Factors (changes in both demand and supply):

- Growth in demand has been caused by population growth, improved income levels and increased urbanisation.
- An improved incentive structure caused by the deregulation/decontrol of markets and prices under the ERP (free market conditions).
- Localised food shortfalls in different areas of the country caused by climatic failures and internal insecurity (localised civil strife) necessitating food movements.
- The spread of highly destructive plant diseases, the most notable and recent being the African cassava mosaic disease.
- Pressure has been put on household resources because of competing wants and needs, due both to a policy shift to achieve cost recovery in the provision of social services, and to an increase in the variety of consumer goods.

External Factors:

- The political instability in the Great Lakes Region, particularly Rwanda and Congo, created refugees both in these and neighbouring countries. Some of the food supplied to refugees by relief organisations was procured in Uganda.
- Climatic shocks, especially drought, tend to affect Uganda's neighbours more seriously thus creating opportunities for trade in food.
- The policy of international agencies such as the World Food Programme (WFP) has changed, allowing them to obtain their supplies for refugees and internally displaced persons from within the region. This was a strong incentive to the increased production of maize and beans (Nobera, 1998). In Uganda, the devalued shilling created conditions that were conducive to the policy change (World Bank, 1996).
- The improved political relations between Uganda and some of her neighbours, coupled with policy changes (the liberalisation of trade to varying degrees) by her trading partners especially in Kenya - Uganda's principal trading partner (Ackello-Ogutu & Echessah, 1997; World Bank, 1996), creates an enabling environment for cross border trade.

The regional market is viewed as a growing one as increased deficits in neighbouring countries are forecast (Uganda-Ministry of Agriculture & Forestry, 1984a; World Bank, 1996;). The Business page of the New Vision newspaper (26th of February 1999), for example, reported that about 360 lorries loaded with millet, beans, cow peas and maize were at the border town of Busia. Produce dealers had ferried the produce from as far away as Kasese in the south of the country and Arua in the northwest, while buyers were coming from Kenya, Tanzania and Somalia. It went on to report that ironically, Busia and the neighbouring districts of Tororo and Pallisa were facing food shortages.

An understanding of the nature of food security/insecurity is fundamental to the Modernisation Plan for Agriculture that is in the making and in which food security remains a national priority. Uganda's aggregate food self-sufficiency status, the registered economic successes, and the increasing commercialisation of the food sub-sector, point to surplus production. These factors may also mask a gnawing food insecurity problem, eroding the productive ability of the affected populations.

1.3 THE OBJECTIVES

The principal objective of this thesis is to investigate the extent to which food sales directly or indirectly contribute to food insecurity.

Specifically, it seeks to:

i) Establish who the food insecure households are and the factors rendering them vulnerable to food insecurity.

ii) Determine whether the sale of food is contributing to household food insecurity.

iii) Evaluate how income and expenditure patterns contribute to, or deduct from household food availability.

iv) Compare the degree of food insecurity between the three districts in which the research has been done.

v) Make policy recommendations based on the findings of the study.

1.4 JUSTIFICATION

From a country perspective, commercialisation of the food sub-sector has the potential of meeting many policy objectives. Given that most of the population is engaged in agriculture, the food sub-sector in particular provides the most equitable means of distributing gains from economic growth and enabling widespread growth in income. It also has the potential, not present in any other sector, of drawing many segments of the population into active participation in the cash economy. Income effects should in turn stimulate aggregate growth. Uganda seeks to take advantage of the potential markets for agricultural commodities especially food, within the region. As exports, food should contribute towards much needed foreign exchange earnings.

To move gainfully towards commercialisation, national food security (the prerequisite of which is household food security) is vital. Otherwise, the gains from trade will have to be ploughed back into feeding the food insecure. Because the nature of household food insecurity is not reliably established, remedying strategies tend to be short-term reactions. For sustainability, long term strategies that tackle food insecurity are needed. This calls for more knowledge and understanding of whom and where the food insecure are, the underlying causes and ultimately, the potential remedying strategies.

This study is also of interest given that much of the SSA region has seen a paradigm shift to open economies and free markets. The policy environment is thus different from the 1980's when the International Food Policy Research Institute (IFPRI) commissioned several studies (Von Braun & Kennedy, 1994) to investigate the relationship between commercialisation and food security. Commercialisation then was predominantly a case of cash crops (non-food) versus food crops and therefore a competition for resources. By contrast, the situation today is one in which, due to various factors, increasing numbers of households across much of the region are net food buyers. This has made food an important cash commodity, and particularly among the farming population, food needs have to compete with the need for cash income. Food security concerns emanating from the economic reforms in many countries in the region, is not unique to Uganda. This study contributes to the growing literature on the likely effects of free market oriented policies on food security in the region.

1.5 CONCEPTUAL FRAMEWORK

The conceptual framework below (Figure 1.4) is a simple description of potential pathways through which commercialisation relates to household food consumption and ultimately food security. Cognisance is taken of the observation, based on several studies, that the effects of commercialisation vary with the policy environment and socio-economic conditions and it is therefore difficult to make generalisations (Von Braun, 1994).

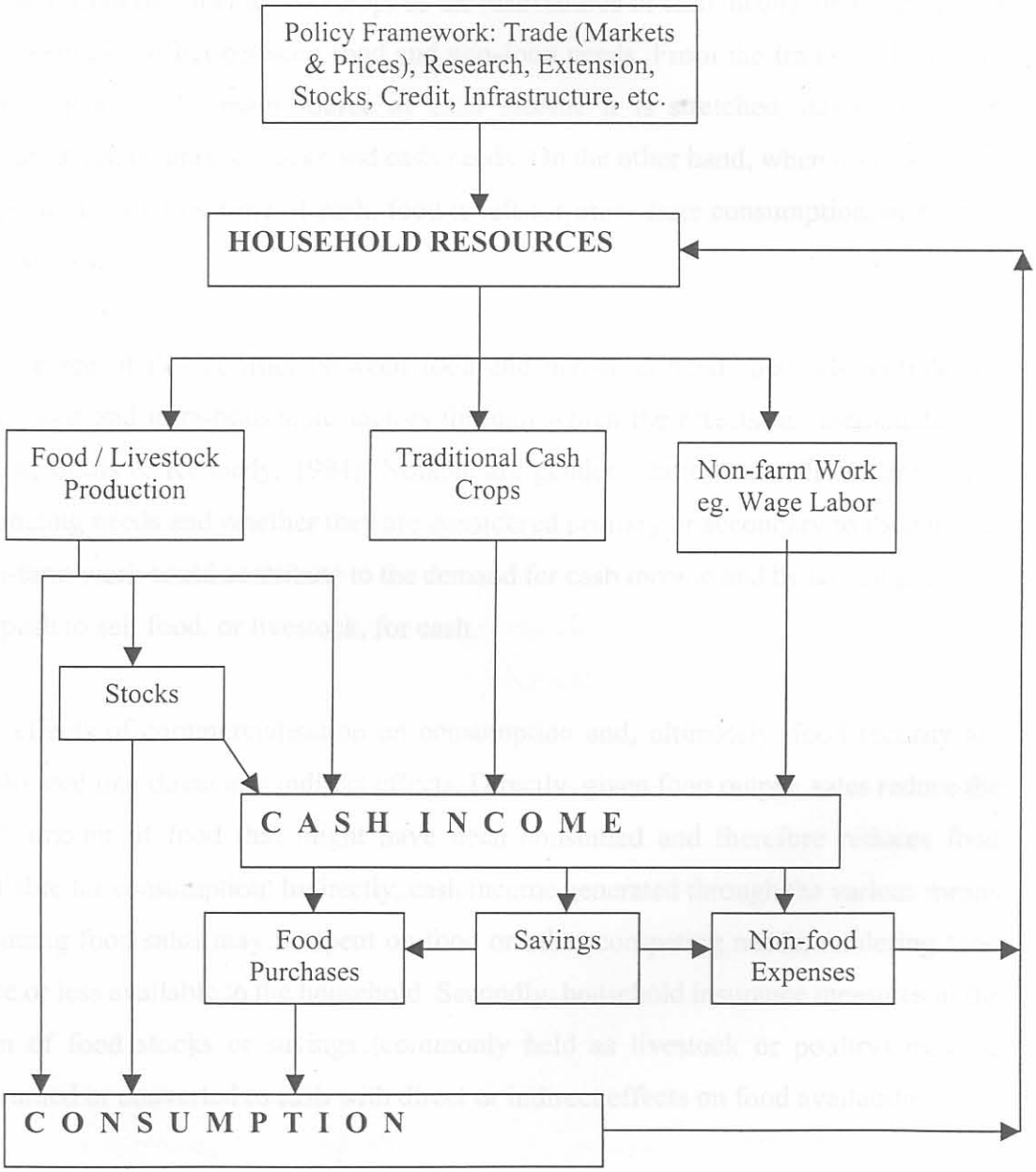


Figure 1. 4: The effects of commercialisation on food security in rural households

Households use their resources in productive activities categorised into livestock production, cultivating food and non-food (traditional cash crops mainly cotton, coffee or tobacco), and/or non-farm work (e.g. wage labour, local artisans, trade, fishing, alcohol sales, etc.). Although opportunities for non-farm work are on the increase (Opio, 2000), they are still limited and often linked to the agricultural sector. Farming is therefore the dominant activity.

Commercialisation mainly entails sale of food or non-food crops (traditional cash crops). The shift from the latter to food crops as the main source of cash income makes profound the potential conflict between food and non-food needs. From the framework (Figure 1.4), if food is the main source of cash income it is stretched, having to cover consumption, insurance stocks and cash needs. On the other hand, when non-food cash crops are the main source of cash, food is left for immediate consumption, or held as food stocks.

The degree of this conflict between food and non-food needs depends partially on household and intra-household factors through which the effects are mediated (Von Braun, Bouis & Kennedy, 1994). Notable are gender relations and the nature of the competing needs and whether they are considered primary or secondary to food needs. Non-farm work could contribute to the demand for cash income and by so doing, reduce the push to sell food, or livestock, for cash.

The effects of commercialisation on consumption and, ultimately, food security are subdivided into direct and indirect effects. Directly, given food output, sales reduce the total amount of food that might have been consumed and therefore reduces food available for consumption. Indirectly, cash income generated through the various means including food sales may be spent on food or other competing needs, rendering food more or less available to the household. Secondly, household insurance measures in the form of food stocks or savings (commonly held as livestock or poultry) may be consumed or converted to cash with direct or indirect effects on food availability.

Within the household, a number of decision levels where the commercialisation effects are determined can be pointed out. First, where food is an integral part of the commercialisation process and the main means of meeting subsistence needs, whether

to trade is a decision that affects food availability (Goetz, 1992). For non-food cash crops, this decision level is inseparable from the decision to engage in production because home consumption is insignificant. The next decision level is the quantity of food left for home consumption as opposed to that sold. Three decision levels then follow this level as suggested by Von Braun, Bouis and Kennedy (1994) - allocation of income between food and non-food expenditure, i.e. the size of the food budget, the nature of food purchases, and last the distribution of food among the household members. In the absence of market failures and where intra-household relations ensure equitable distribution, consumption benefits should be realised by all members of the household (Von Braun, 1994).

Commercialisation effects may be indirect through non-farm income if job creation is part of the process. However, there is hardly any processing done at the village level except small hammer mills processing farmers' day to day cereal needs. It is therefore doubtful that there has been a significant increment in job creation with commercialisation of the subsistence food crops.

Exogenous factors, though not indicated in the illustration, include the climate and population dynamics that affect resource allocation decisions within the household, production levels and ultimately, the commercialisation process. This argument is a simple representation of the complex decision making process and relationships that exist within a household and between the household and the socio-economic environment within which it coexists.

1.6 HYPOTHESES

The main hypotheses of the study are:

i) Increased production positively contributes to food availability.

ii) Food sales negatively contribute to food availability and therefore negate household food security. The higher the proportion of food sold relative to production, the less food secure households are.

iii) Households faced with relatively high non-food expenditure are less food secure than those with relatively lower non-food expenditure.

1.7 MEASURING FOOD SECURITY

Some difficulties in measuring household food security start from the definition of a household. The household size is often a dynamic rather than a static variable. A household may for example include relatives as part of the "extended family" staying for long periods while in some cultures family clusters live together within a homestead. In this study, the household has been defined as a consumption unit, i.e. a social unit eating from a common pot (Ellis, 1989; Casely & Lury, 1987 cited in World Bank, 1991).

The wide variation in consumption habits is another of the difficulties of measuring household food security. Nonetheless, two commonly used methods as described by Maxwell (1996) are:

i) An estimation of food production, purchases and the growth or depletion of food stocks over a stipulated period. It is assumed that whatever has disappeared in the recall period, has been consumed and it is evaluated against the minimum requirements of the household members by age and gender.

ii) Measuring consumption by each household member over a 24-hour recall period and analysing each food consumed for nutritive content, the sum of which is compared against recommended quantities.

Each has its drawbacks; the former fails to assess intra-household differences and therefore individual vulnerability. The latter is subject to respondent fatigue and memory lapses among others, not to mention the costs of collecting the data. Maxwell (ibid) argues that both fail to assess the vulnerability or sustainability aspects of food security, focusing more on sufficiency. However, it is argued that sufficiency is a necessary condition to food security where self-provisioning is the predominant means of entitlement.

Guided by its principal objective and funding limitations, this study used a combination of both methods. Net calorie availability, an indirect measure of calories consumed, estimates household caloric intake. Production, sales, purchases and stock estimates, converted to caloric quantities, have been used to evaluate sufficiency of food quantities of households depending on their demographic structure standardised by conversion to

adult equivalents. For an indication of the nutritional implications of the different dietary habits, a five-day recall period of the foods consumed and the source was included in the survey instrument.

1.8 DATA SOURCES AND ANALYSIS

A qualitative and quantitative approach was adopted in the study.

i) Micro-level secondary data is not available for the 1970's and 1980's and where available, is not specific to the subject of interest. Aggregated data, though often characterised by inconsistencies, is used to complement the primary data.

ii) The problem calls for a clear understanding of what is happening at the household level, which is the most important production and consumption unit in the economy. Three rounds of household primary surveys, spread through the agricultural season, were carried out in 1998. Structured questionnaires were the instruments of data collection across the three districts selected as a case study. The survey instrument included sections on household structure, farm land area and use, cropping patterns, output, sales, livestock inventory, labour and input use, income and expenditure flows, consumption, household food inventory.

iii) Discussions with district staff and local leaders at different levels gave insight to district specifics on the subject.

iv) Community-based focus group discussions were held to complement the household survey findings. Some of these discussions were carried out with gender segregated groups and others were mixed groups, but all consisted of a wide range of ages. For a good response, prior notice was given to the area's local leaders who mobilised the people. These discussions were not necessarily held among the sampled households or villages. The choice of having gender segregated groups and including non-sampled areas, was in a bid to reduce some of the biases that are common in rural development studies. One is the person biases with particular reference to the male bias (Chambers, 1983). Second is that of the effects of the investigator on the observed situation (Casley & Kumar, 1988) i.e. most of the discussions in the non-sampled areas were carried out by the enumerators.

Various analytical tools were applied to elucidate the problem of food insecurity, which being a multi-factorial problem may differently affect different segments of a population. Descriptive statistics, data reduction techniques (cluster analysis) and regression analysis (Logit) are variously applied in the thesis.

1.9 HOUSEHOLD SELECTION

The sample size was in part determined by the survey budget. By way of purposive sampling, the case study area was drawn from the three districts of Mbale, Soroti and Apac. The district selection criteria were:

i) The food security status as determined by the EPAU 1995 Food Security Study (Uganda-Ministry of Finance & Economic Planning, 1995b).

ii) The agro-ecological zone in which the district falls. This is to ensure diversity in production systems. Mbale is in the Montane (coffee/banana) system, Soroti in the Teso (cotton/millet) system and Apac in the Northern (cassava, millet, cotton) system.

iii) The districts then being looked at by other institutions doing concurrent surveys on varying aspects of food security.

iv) The three districts were almost contiguous for ease of management of the study.

Discussions were held with district officials to inform them about the study and for them to convey their assessments of food security in their respective districts. In Mbale District, concern was raised over the wide diversity in agricultural practices. Three counties rather than two were therefore made part of the study in Mbale District, which is sub-divided into five counties and a municipality. It is worth noting that Mbale District has a highly commercial horticultural sub-sector that was not part of the sampled areas but would warrant a future study for comparative purposes. In Apac district, owing to security limitations, only the two counties in which security could be guaranteed throughout the year were included in the study. Apac District is sub-divided into four counties. Within the district of Soroti, the counties were subjected to random sampling. Soroti district comprises five counties and a municipality. The sub-counties, villages and households were randomly sampled in all the three districts. Each unit was randomly allocated a number. Random selection was applied to allow participation from the local

leadership who randomly picked ballots numbered to represent the different units. Otherwise the systematic selection method where the interval between selected units is determined on the basis of the fraction N/n (N is the total number of units in the sample frame and n is the desired number of units) was applied (Casley & Kumar, 1988).

Ten households per village, i.e. 160 households were sampled from each district. The list of villages was got from the sub-county headquarters while the household sampling frame consisted of a household list from the respective area Local Council I Chairperson. This list was preferred to that of tax paying households as the latter would have excluded non-taxable homes like the female-headed and elderly. The same households were visited in each of the three surveys. By the end of the study period, some households were out of the study or were not available. For example, by the second survey, a household in Budadiri County had migrated to another county. In Alwa Sub-county, at the third survey, two households were in hiding as they were implicated in acts of thuggery. However, loss of sampled units is common particularly in such surveys in which the same units are retained for a number of surveys (Deaton, 1999). Data capture also resulted in some households being left out. It was desirable that households retained in the analysis had a complete set of three questionnaires for analysis. The number of households in the sample used in the analysis decreased from 480 to 453. Appendix 1 is a list of the villages included in the study.

The study was designed to run in tandem with the agricultural cycle, i.e. pre, mid and post-season, in effect getting production estimates for 1997 and first season of 1998. The first survey was run in April, the second in July and the third one October to November. At the village level, the political leadership was sensitised about the objectives of the study. Before sampling the households, the farmers in a village were collectively informed about the study; its objectives, duration and their role.

1.10 ENUMERATION

Two agricultural assistants in Soroti District and one each in Mbale and Apac supervised and co-ordinated the survey and group discussions. The success of the survey relied on the relationship between the enumerators and the respondents. Preference was given to the local extension workers and then teachers residing in the sampled villages or the

neighbouring villages. This strategy had its own short-comings as there were times the survey was slightly held up because of their duty schedules. Enumerator training was carried out by district.

1.11 LIMITATIONS

1.11.1 Diversity within the Country

Uganda has a diversity of agro-ecological, socio-economic and cultural settings, which differentially interact to expose different populations to food security or insecurity. Micro-level time series data would have been necessary to estimate causal-effect relationships between food security and these other factors but does not exist. Nevertheless, a cross section study like this allows for a relative comparison between the sampled units. Country-wide generalisations cannot therefore be equivocally made from a limited study such as this, which looks at responses in a slice of time. The aim of the study is to confirm or reject the raised concerns for national policy considerations and to provide indicators that may be used by other districts/regions in monitoring food availability. Use of secondary data is limited because of irregularities and because they are aggregated, based on average household conditions that may omit variations that are important to food security.

1.11.2 Variation in units of measure

Units of measure vary across and within localities. The most common units of measure are glasses, mugs, baskets, tins, sacks, bundles, heaps, basins and granaries of varying sizes, to mention a few. The conversion tables that were developed by the Statistics Department of the Ministry of Finance & Economic Planning were used as a guide in making the conversions. Conversion of local measures may therefore introduce some degree of error into the quantities used in the analysis.

Estimates of the output of cassava,[1] sweet potatoes and bananas, all of which are harvested on a piece meal basis, are based on the average yields per acre (defined by the Department of Statistics). These subjective estimates were limited in the translation of areas less than an acre (one garden) and in distinguishing yields as they differ across areas and season. Relativity rather than absolute values were therefore awarded more importance in the analysis. For bananas, farmers also made weekly estimates of how much was harvested. This is because of the nature of the crop, it is highly perishable and if mature must be harvested for consumption or sale.

1.11.3 Lack of records

The majority of respondents did not keep records. The data that involves a recall period is therefore highly dependent on an individual's ability to remember. This is not made any easier considering that transactions (payments and receipts) are frequently made in small instalments. As such, although income and expenditure data were a vital component of this survey, their relative rather than absolute values are considered the more indicative.

1.11.4 The human factor

Respondent fatigue is common in surveys in which repeated visits to the same household are made and this study was no exception. By the second survey, some households were reluctant to continue participating and by the third survey, there was even the question of being paid to participate. This is also an indicator of the growing demand for cash in the rural economy. Enumerator fatigue was also a factor especially in sparsely populated villages that required the traversing of wide areas on foot or bicycle.

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1 *While cassava can be harvested ad libitum continuously if allowed to regenerate, it is here assumed that the area is constantly reduced by the quantity harvested in the course of the study, having observed this to be the more common practice. It is also assumed cassava planted in the survey year would only mature early in the next year (early maturing varieties take about 9 months).*

1.12 OUTLINE OF THE THESIS

The thesis is organised into seven chapters. The first chapter has given the general socio-economic setting within which the study was conducted and the factors that motivated it. The second chapter briefly reviews the concepts of food security and commercialisation and defines the two concepts as applied in this thesis. An overview of the food insecurity problem in the Sub-Saharan African region underscores that it is a complex interaction of many factors. A more detailed review of the pre-and post reform environment in Uganda and the food security implications follow in chapter three. It gives the historical context of the food insecurity concerns today and the a priori conditions that guide the specification of the model applied. The model to estimate the relationship between commercialisation and food security is then specified.

Chapter four profiles the case study area by the agro-ecological environment, demographic structures, agricultural practices and the socio-economic setting. Chapter five applies a cluster analysis to the data set for grouping the households by those factors that enhance or negate food availability. Logistic analysis is applied to selected cluster groups to establish demographic and/or socio-economic factors that predispose certain segments of the population to belong to any particular group. Last, consumption habits across the groups are compared to establish the variation with the commercialisation process. Chapter six applies logistic analysis to estimate the statistical relationship between food security and commercialisation. The degree of the problem across the three districts is compared by means of a food insecurity index. Chapter seven draws up the conclusions and makes policy recommendations following the findings of the study.

CHAPTER 2

FOOD SECURITY AND COMMERCIALISATION: DEFINITIONS AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

Parallels can be drawn between food security and agricultural commercialisation. The lack of food security contributes to reduced work performance and therefore loss in productivity. In school going children, it contributes to lower school performance (Von Braun, Bouis, Kumar & Pandya-Lorch, 1992). Food security is therefore an integral part of development. On the other hand, agricultural commercialisation is generally associated with increased production, improved welfare and modernisation (Hinderink & Sterkenburg, 1987; Makhura, Coetzee & Goode, 1996; Von Braun, Bouis & Kennedy, 1994), i.e. economic development.

Despite both being important factors in the development process, the potential conflict between them has been and remains a concern. On the one hand, the conflict between non-food cash crops versus food crops focuses on the competition for resources. Land, for example, is the major constraint to expanding agricultural production in Kenya. Less than 20% of the land area is of medium to high agricultural potential and 60% of the remainder is desert area with limited potential. A serious competition between cash and food crops for land is therefore a major concern for food security (Shapouri, Missiaen & Rosen, 1992). Nyangabyaki (1995) reported that in Uganda the famines of 1908, 1914-15, 1917-19 and 1928 were partly due to labour constraints aggravated by the promotion of export crops at the expense of food crops.

On the other hand, as food increasingly becomes a means of earning cash income in the SSA region, this conflict is shifting to include a competition between needs, i.e. non-food needs versus subsistence needs (Mbiha & Kashuliza, 1994; Shapouri et al., 1992). Maize, for example, uses 70% of the land under cultivation in Zambia. It is the staple food but also provides 90% of cash receipts of small-scale farmers (Mckenzie & Chenoweth, 1992). In Kenya, maize occupies about 25% of planted area, remains the most widely

eaten staple food and accounts for about 50% of the value of marketed production (Shapouri et al., 1992).

This chapter reviews both concepts of food security and agricultural commercialisation and how they are defined in the literature. Each concept is then defined within the context of this study, i.e. food availability and the proportion of food sold relative to production respectively. The two concepts are then reviewed in relation to each other and with examples drawn from studies done within the SSA region. However, commercialisation is not the only factor that contributes to food insecurity and some factors that have rendered people in the SSA region vulnerable to food insecurity are highlighted.

2.2 DEFINITIONS OF FOOD SECURITY AND COMMERCIALISATION

2.2.1 Defining food security/insecurity

Food insecurity as a development issue came to the fore following the world wide food shortages of the early 1970's. From a focus on aggregate (national or regional) supply shortfalls, it has since evolved to a focus on individual and household needs (Maxwell, 1996; Staatz, Agostino & Sundberg, 1990; Von Braun, 1990). A widely used definition of food security is:

> ... *"access by all people at all times to enough food for an active, healthy life. Its essential elements are the availability of food and the ability to acquire it"* (World Bank, 1986:1).

On the flip side, food insecurity is the lack of access to enough food. Chronic food insecurity arises from a continuously inadequate diet caused by the inability to acquire (either producing or buying) enough food. Transitory food insecurity is a temporary decline in a household's access to enough food. It results from instability in food prices, food production, or household incomes and in its worst form it produces famine (World Bank, 1986).

From a more aggregate perspective, Eicher & Staatz (1985: 216) defined food security as:

> ...*"the ability of a country or region to assure, on a long term basis, that its food system provides the total population access to a timely, reliable and nutritionally adequate supply of food".*

A food system is the combination of agro-ecological and socio-economic processes determining the production, marketing and consumption of food (Maxwell, 1991). To ensure that food security at any level is attained, many factors therefore need to be taken into consideration. Often, they can be categorised into whether they affect supply and/or demand. Supply is a function of production, storage and trade and although availability of food is a necessary condition for food security, it does not necessarily ensure accessibility. Demand depends on income and resource control and ultimately determines one's ability to access food, i.e. one's entitlement according to Sen (1998).

2.2.2 Levels and measures of food insecurity

Food security can be evaluated at different levels and different indicators are needed to assess the different dimensions of food security. Food self-sufficiency is a fair proxy for national food security but may not give a fair representation of food insecurity among the population. An example is South Africa, though considered food self-sufficient, it was estimated that 21% of the urban population and 63% of the rural population lived below the minimum subsistence level. The country was therefore characterised as having surpluses and exports amid food shortages (Van Zyl & Kirsten, 1992). Similarly, in Uganda despite national food self-sufficiency, many in its population suffer from food insecurity. Household food security best indicates the distribution of food in a population.

Food security may be distinguished on the basis of the source of entitlement. In predominantly agrarian economies, in rural areas where agricultural production is the main source of entitlement, the levels of output largely determine food security. Access to factors of production is therefore crucial to food security. In the urban areas where food is mainly purchased, employment and levels of income are the more important. The

distinctions between urban and rural food security have important policy implications, e.g. extension, research priorities, transport, employment, marketing, etc.

An adequate intake of food is better considered for specific socio-economic groups as nutritional needs vary across population groups, gender, age and activity. Nonetheless, for an individual their food security situation is evaluated by caloric consumption levels or by data about their weight, height and age, i.e. anthropometric measures (FAO, 1999b; Von Braun et al., 1992). These are the basis of two distinct and useful measures of food security, under nourishment and under nutrition respectively.

An important age bracket to which anthropometric measures are often applied, is children up to 5 years old who, because they are in a period of fast growth, are highly vulnerable to nutrition deficiencies (Kennedy & Cogill, 1987; Pacey & Payne, 1985). However, ratios calculated from anthropometric measurements indicate the outcome of not only inadequate food intakes, but also of poor health and sanitation conditions that may prevent people from deriving full nutritional benefits from what they eat. In Sudan, it was found that the direct effects of per capita cereal consumption (food shortages) on child nutrition though small, was statistically highly significant. Second to food shortages was the diarrhoea variable (Teklu, Von Braun & Zaki, 1991).

Similar findings were made in Rwanda (Von Braun, De Haen & Blanken, 1991). The calorie-consumption effect was positive and highly significant. A 10% increase in the level of calories consumed (2,000 calories per adult equivalent) *ceteris paribus*, was related to an 8% increase in weight-for-height, a 2.3% improvement in the height-for-age and a 2.9% improvement in the weight-for-age in children. However, the health and sanitation-related variables showed more sizeable effects. Access to a clean toilet, representing improved household sanitation conditions, was related with a 33% improvement in both height-for-age and weight-for-age indicators. Worm infestation in the children was associated with a 17% reduction in the long-term nutritional indicator, height-for-age. A study done in Zimbabwe (Chisvo & Jayne, 1992) found that the major contributory factors to child malnutrition were: early weaning due to pregnancy, diarrhoea, shortage of foods to balance the starchy foods, poor management of financial resources, alcohol abuse, poverty and inadequate health services.

The relationship between food intake, under nourishment, under nutrition and health, sanitation and care, has been illustrated by FAO (1999b) and is shown in Figure 2.1.

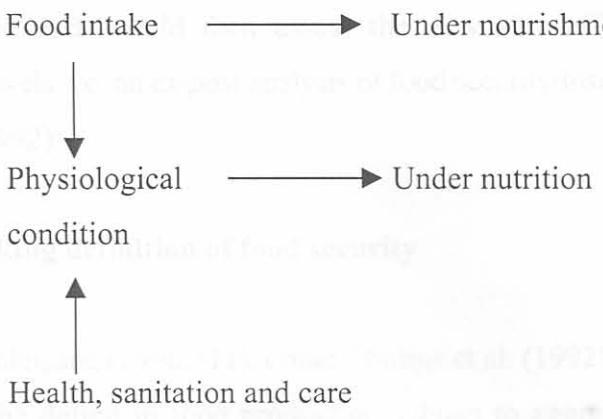


Figure 2. 1: The relationship between food intake, under nourishment and under nutrition

A high correlation also exists between nutritional status and wealth. A study done in Sudan found that children in urban areas, with access to a more balanced diet than their counter parts in rural and nomadic areas, were both heavier and taller (Amin & Grobler, 1991). They also found that children from households consuming sorghum and wheat were heavier on average than households consuming millet. Children from households where wheat was the staple food were taller than children from households where millet was the staple food. Wheat is more expensive than either millet or sorghum.

The same study (ibid.) also found that the relationships between levels of thinness and six conditions (diarrhoea, vomiting, acute respiratory infection, fever, measles and night blindness) were highly significant. Other factors associated with nutritional status were the mothers' education, parental literacy and fathers' occupation. Conclusively, the findings were that under nutrition in Sudan is both a structural and food deficit problem; the result of ignorance, lack of purchasing power, the non availability of subsistence food, and the high prevalence of communicable diseases (ibid.). Under nutrition, because it too is multi-factorial, on its own is thus not conclusively an indicator of food insecurity.

Given all these valid arguments, combining different dimensions of food security for a complete evaluation is often necessary. Household surveys for example may capture the adequacy of food being produced and/or consumed, i.e. the existing household situation. Anthropometric data would then assess the downside effects of the households' consumption levels, i.e. an *ex-post* analysis of food security/insecurity (Payne, 1987; Von Braun et al., 1992).

2.2.3 A working definition of food security

Mekuria & Moletsane (1996:311), citing Phillips et al. (1992) defined food security by the value of the deficit in food production subject to aggregate income available to purchase food. In a study of household food insecurity in the Northern Province of South Africa they postulated that:

$$FPDhh \leq ILAhh$$

Where:

- FPDhh is the value of a household's food production deficit (the difference between the value of production and consumption).
- ILAhh is the sum of income and value of liquid assets available to purchase food.

In their analysis, Mekuria & Moletsane (1996) focused on maize because it is widely consumed in the study area and implied that it is produced for subsistence purposes only. Maize meal would be bought to meet production short falls depending on income availability otherwise the household is rendered food insecure. The inapplicability of this definition to this study arises from a number of issues.

i) Food production is assumed to be for household consumption whereas food, this study argues, has a variety of uses including generating cash income.

ii) Cash income may be spent on meeting competing non-food needs and not necessarily on food needs. Furthermore, power relations within the household, i.e. who in the household controls the resources (including income) determines

whether the welfare of the household including its food needs is catered for. Income controlled by women has been shown to benefit the welfare of the household more than that accruing to men (Von Braun et al., 1992; Von Braun, Johm & Puetz, 1994).

iii) The nature of the food basket differs across the study area and assuming that income was mainly spent on food, whether the deficit is met would depend on the foods that are bought.

Income would therefore provide a poor estimate of food deficits or surpluses in this study. For that reason, a working definition of food security involving the calories available to the household for consumption is proposed. On average, it measures the food available to a person compared against the minimum requirements (FAO, 1998b). However, by focusing primarily on household food availability as a measure of food security, the study abstracts from the two important inter-linked factors, the role of health, sanitation, and care and intra-household distribution in food security (it says little about an individual's intake).

Calorie availability has other shortcomings. Schiff & Valdes (1990) argue that by comparing calorie and other nutrient intake with requirement standards to estimate the number of hungry and undernourished people, the impact of the input of attributes that are of a non-nutrient nature, and household preference are not considered. Furthermore, that the problem of adequacy may or may not reveal as a nutrition problem and a nutrition problem may not be a result of inadequate food supply. It is also argued that the caloric measure cannot be uniformly representative given the diversity in human physiology and socio-economic and agro-ecological circumstances all of which affect the requirements of an individual (Maxwell, 1996; Pacey & Payne, 1985). Nonetheless, because of the inconclusive relationship between food intake and under nutrition discussed earlier, per capita dietary energy supply is considered the most important single indicator for estimates of food adequacy levels (FAO 1998b). It has variously been applied in the literature (Chisvo & Jayne, 1992; Strauss, 1984; Tshirley & Weber, 1994).

Sadoulet & De Janvry (1995:134) in reference to a study they had done in India and with a focus on national food security, used the concept of food availability to characterise food security. They defined it as:

Net Availability = net production + imports - increase in stocks.

Availability being:

> *..."an aggregate concept of final consumption, sometimes called "apparent consumption" or "disappearance" as opposed to a measure taken directly from the observation of consumption itself"...(*ibid.: 130).

Translating this to the household level, and drawing from the conceptual framework in the previous chapter, food purchases are analogous to food imports and the increase in stocks to household food stocks. Food that is in-store is still potentially available to the household but may not necessarily be consumed as some may be sold. Since consumption is assumed to have occurred, food in-store is not included in the food availability equation. Food that has been sold ceases to be available for household consumption except through income effects, i.e. if income generated is used to purchase food. Household food availability is therefore estimated as follows:

> *Household Food Availability = (food produced + food bought) - (food sold + post harvest losses + food in-store)*

Availability could have been evaluated in terms of actual food quantities, but given the diversity in dietary habits the caloric measure is preferred because it allows for standardisation across different foods. Coupled with adult equivalents as the unit of consumption, standardisation across household demographic differences is possible. The caloric measure also allows for an evaluation of the spread and the depth of food insecurity, enabling the distinction between different levels of food security/insecurity. This would be comparatively less straight forward with actual food quantities because of the diversity in foods that are regularly eaten.

According to respondents of the study, as advocated for by Maxwell (1996), having insufficient own-produced food, or relying on neighbours, relatives or the market for food (especially their staple food), all constitute a state of food insecurity. Grain purchases often show that a household has run out of food to meet family consumption requirements or is at risk of doing so. Theoretically, their ability to purchase food would

place them among the food secure. Their own definition takes cognisance of the unreliability of the market given existing market failures, but more important, of the fact that they are often income constrained.

2.2.4 Defining agricultural commercialisation

The definition of the commercialisation process varies. The most commonly used is the orientation of agricultural production, i.e. the extent to which production for sale prevails over that for self-consumption. From this perspective, several indices may be used to characterise a commercial farmer. These include the value of output sold in proportion to the value of total output and the importance of purchased inputs in production (Von Braun, Bouis & Kennedy, 1994).

Cited in Makhura (1994), Wessels-Bayer (1990), in a study done in Swaziland to establish characteristics that distinguished commercial maize farmers from the rest, defined commercial farmers by output relative to requirements. Those producing more than 200% of their consumption requirement were considered commercial, those producing between 100 to 200% of their requirements as sufficient, and those producing less than 100% as deficit or subsistent. Also cited in Makhura (1994), Steward (1985), in a study done in Zambia, defined commercialisation by the proportion of cultivated area under marketable crops, making adjustments for dual-purpose crops. Latt & Niewoudt (1988) in a study in Kwazulu in South Africa, defined commercialisation as any market-related activity directly related to the agricultural production activities of the household.

Other aspects of commercialisation focus on the qualitative characteristics of the producer in relation to their attitudes, motivations and behavioural patterns. These are evaluated against that of "ideal-type" subsistence and commercial farmers. For example, it is often said that subsistence farmers are resistant to change. Yet, others focus on the characteristics of the community, emphasising socio-cultural rather than behavioural characteristics. Others look at it as a process associated with social change (Hinderink & Sterkenburg, 1987).

The definition of a commercial farmer is therefore circumstantial. This study, following Hinderink & Sterkenburg (1987: 19) broadly looks at the commercialisation process as:

> ... *"involving a deliberate action on the part of agricultural producers - of their own free will or by means of coercion - to use the land, labour, implements and annual inputs in such a way that a greater or smaller part of the crops produced and/or animals raised is for exchange or sale."*

2.2.5 Working definition of commercialisation

Although this study focuses on commercialisation within the context of food crops, the commercialisation has been an on-going process. Several projects/schemes were established across the SSA region introducing new crops or promoting particular crops for purposes of generating foreign exchange, providing raw materials for industrialisation programmes, creating a taxable economic base and improving the livelihood of the producers. In Uganda, the main cash crops grown by small holder farmers were coffee, cotton and tobacco. To de-link the performance of the economy from the effects of the international commodity markets, non-traditional agricultural exports (NTAE's) many of which are food crops, have been promoted. The commercialisation of the food sub-sector through the promotion of NTAE's is also an integral component of the poverty eradication programme for among others equity reasons (Uganda-Ministry of Finance and Economic Planning, 1996).

The promotion of the use of food for cash generation seems to rest on two assumptions with potential implications for food security thus:

i) Increased production beyond household needs, allowing the maintenance or improvement of the food security status and generation of cash income.
ii) Production levels remain the same but the increased cash income allows households to meet their food needs through increased food purchases.

Not only do incentives for farmers to engage in producing food for the market exist, but food crops compete favourably with the traditional cash crops (Bibagamba, 1996) as seen in Table 2.1. Returns to family labour from improved maize and beans, matooke (green

cooking bananas, a staple food in many parts of the country), sweet potatoes, cassava, millet, groundnuts and simsim (sesame) all outweigh that from either cotton or tobacco.

Table 2. 1: Gross margins and returns to family labour - July 1994

Crop	Farm-level crop output to input ratio	Returns to family labour (shs/ha/ manday)	Gross margin (shs/ha)
Coffee-unimproved	3.78	5,612	625,347
Coffee-improved	4.60	11,723	1,617,758
Tea – out growers	0.97	864	179,906
Flue cured tobacco	1.31	1,874	637,313
Fire cured tobacco	1.05	1,075	270,967
Cotton – hoe & spraying	0.87	746	94,018
Cotton ox-plough	0.93	716	52,246
Vanilla	6.62	8,348	2,512,854
Passion fruit	5.73	15,952	1,754,748
Pineapple	3.38	5,888	1,677,956
Matooke (bananas)	1.65	2,842	517,220
Groundnuts (local seed)	1.18	1,266	194,191
Maize – improved	1.14	2,244	132,412
Maize – unimproved	0.80	632	90,412
Beans – improved	1.76	3,425	208,924
Beans – unimproved	1.01	968	125,834
Simsim	1.15	1,180	134,482
Sweet potatoes	2.20	3,464	405,301
Cassava	1.54	2,133	392,544
Millet	0.99	928	127,100
Sorghum	0.98	918	122,040
Rice (Paddy)	1.37	2,150	294,482

Source: *Agricultural Secretariat, cited in Uganda–Ministry of Agriculture Animal Industries & Fisheries, 1997*

Given that subsistence needs remain predominantly produced by the household, food needs are either way rendered dependent on how much food is left or bought back for consumption. Theoretically it is argued that production and consumption decisions are separate and only linked by the profits from sales when prices are exogenous (Sadoulet & De Janvry, 1995). The implication being that the producer does not necessarily have to take into consideration his consumption needs when deciding what to produce because the income that is generated can be used to buy food. In contrast, subsistence oriented producers have to take into consideration their consumption needs when deciding what to produce.

While prices undoubtedly are exogenous to the producer, the price gradient between the rural and urban markets would favour urban rather than rural consumers who depend on the market. The producer's decision to sell and how much to sell, are subject to meeting the household's food requirements. Even with market integration, a situation of non-separability between quantity sold and that left for consumption exists given that sales implicitly determine consumption. This is similar to that between production and consumption under conditions of self-sufficiency. A balance between food needs (proportion left for consumption) and the competing needs, is therefore critical for food security. The negative impact of food sales on food security therefore potentially exists.

Against this background, the working definition of commercialisation in this study is in terms of marketed output relative to total output. The higher the quantity of food sold relative to output, the more commercial a household is regarded to be, *ceteris paribus*. This definition is akin to one by Von Braun, Bouis & Kennedy (1994:12) and applied by Strasberg, Jayne, Yamano, Nyoro, Karanja and Strauss (1999).

On the output side, Von Braun, Bouis and Kennedy (1994) postulate that:

$$\text{Commercialisation of agriculture} = \frac{\text{Value of agricultural sales}}{\text{Value of agricultural production}}$$

The duration of the study is relatively short, i.e. one year, and average prices of the different commodities are therefore assumed constant. Quantities rather than values are therefore considered the more appropriate in this analysis. A commercialisation index, HCI, was generated on the basis of the caloric equivalents of the quantities of food produced and sold by a household.

$$\text{HCI} = \frac{\text{Sum of caloric equivalents of food sold}}{\text{Sum of caloric equivalents of food produced}} * 100$$

However, ratios have a limitation in that they are scale neutral and do not distinguish between levels of production. A farmer producing 4 bags of maize and selling 2 is as commercial as that one producing 30 bags and selling 15 bags.

As commercialisation progresses, a shift towards the use of traded inputs is expected (Pingali & Rosegrant, 1995) and the comparative use of traded inputs can therefore be used as an indicator of commercialisation (Von Braun, Bouis & Kennedy, 1994). They postulated that on the input side:

$$\text{Commercialisation of agriculture} = \frac{\text{Value of inputs acquired from the market}}{\text{Agricultural production value}}$$

Limited use of purchased inputs was observed during the study and has been reported as the case for agriculture in Uganda in general (Uganda-Household Agricultural Support Programme, 1997). This, therefore, is considered inappropriate as an indicator of commercialisation in this study. Furthermore, the emphasis on purchased inputs excludes intensification in production that may arise from improved agronomic practices, or even the use of other yield enhancing inputs not necessarily purchased from the market, e.g. organic manure.

2.3 FOOD SECURITY AND COMMERCIALISATION

Being a necessity for life itself, it is only rational to assume that people will go to extra lengths to ensure that their food needs are met and that "food first" guides the allocation of household resources. In this context, Roumasset's argument that the risk of food insecurity (RFI) is the probability that the value of production deficiency (VS) is greater than the relevant exchange entitlement (EE) is applicable (Roumasset, 1982).

$$RFI = \text{Probability } (VS > EE)$$

$$VS = P\,(Rc - Rp)$$

Where:

P = gross import price of grain (includes internal and external marketing costs)

Rc = grain consumption requirement

Rp = grain production

EE = the sum of liquid assets and other income that can be used in exchange for grain.

The risk of food insecurity in rural areas is equated to a deficiency in production because subsistence oriented production is assumed. By evaluating this deficiency against EE, a "food first" principle in the use of household resources is also assumed. While subsistence orientation remains an important aspect of agricultural productivity in much of the developing world, purely subsistence households are hard to come by. Many farming populations, even those commonly categorised as subsistence farmers, consume goods and services provided by the market. They may therefore be considered to be at different stages of transition to commercialisation, an integration of agriculture in which they are mainly engaged, into the rest of the economy. The transition from subsistence to commercialisation encompasses gradual changes in production systems, producer objectives, and the contribution of the agricultural sector to household income. As a means by which households can derive additional utility from consumer goods, commercialisation spurs on economic growth (Henderick & Sterkenburg, 1987).

The factors that may trigger the commercialisation process are rapid technological change in agricultural production, improved infrastructure, diversification in food demand patterns, economic growth and urbanisation. These changes are illustrated in Table 2.2, adapted from Pingali & Rosegrant (1995).

Table 2. 2 Characteristics of food production systems with increasing commercialisation

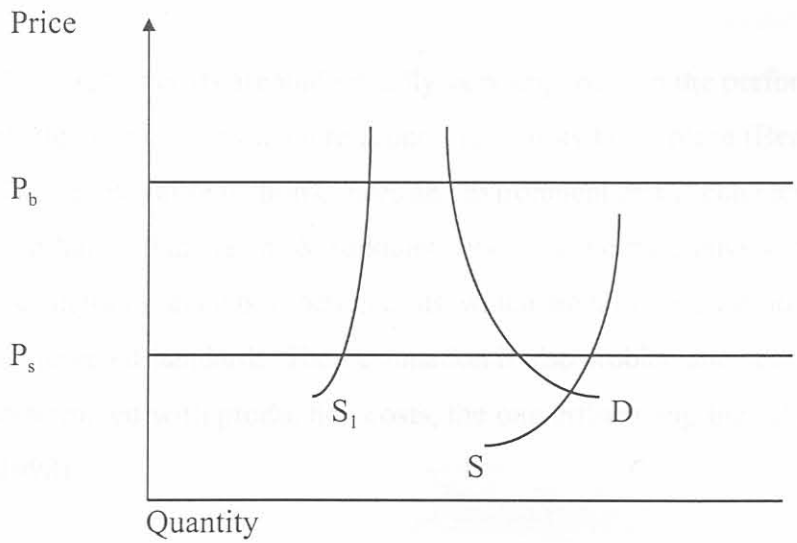
Level of market orientation	Farmers' objective	Sources of inputs	Product mix	Household income
Subsistence systems	Food self-sufficiency	Household generated (non-traded)	Wide range	Agriculture is predominant
Semi-commerical systems	Surplus generation	Mix of traded & non-traded inputs	Moderately specialised	Agriculture and non-agricultural
Commercial systems	Profit maximisation	Mainly traded inputs	Highly specialised	Mainly non-agricultural

Source: *Adapted from Pingali and Rosegrant, 1995*

In the early stages where there is little specialisation, markets are imperfect for local produce and few mechanisms exist to cope with risk of crop failure that would threaten consumption. A high degree of correlation in levels of output exists between households facing the same climatic and socio-economic conditions (Roumasset, 1982; Sadoulet &

De Janvry, 1995). The market implications are that prices principally depend on local supply and demand conditions as illustrated in Figure 2.2 below.

When a household/individual decides to sell their surplus (S - D), i.e. supply in excess of demand, in an average year they face a market price P_s. In a less than average year where shortfalls in production are realised, S_1, and households are rendered buyers, prices are driven up by local demand to P_b. However, the local demand, cannot be met from the supply and some intervention by the market (food imported into the area) or the public sector is necessary to meet the demand. It is to circumvent such price differences that households are inclined towards food self-sufficiency.



Source: *Adopted from Roumasset 1982*

Figure 2. 2: Prices under local supply and demand conditions

As production evolves from subsistence to commercialisation, market integration opens rural markets to supply and demand conditions beyond the local area. By limiting the extent to which local supply and demand conditions adversely affect prices and availability, the need for self-sufficiency is reduced (Fafchamps, 1992; 1998). Wealth or increased profitability should enable consumption smoothing, also reducing the need for self-sufficiency. Implicitly, food security as a primary objective of the household can then be ensured either through own-production or an increased use of the market as a source for food.

However, with increasing commercialisation, farmers have to learn to cope with market related risk that is of little concern to subsistence farmers (Timmer, 1997). Localised shortfalls may be due to low production or market-induced, pushing the prices to P_b, affecting both sales and consumption decisions (Roumasset, 1982; Von Braun, Bouis & Kennedy, 1994). In Zimbabwe, for example, 75% of grain-deficit households interviewed in selected rural areas, bought the more expensive urban-milled meal because grain was not available locally (Jayne & Chisvo, 1992). The more risk-averse households would be more subsistence oriented, insulating themselves from such market-induced risks (Fafchamps, 1992).

2.3.1 Commercialisation, transaction costs and food security

Transaction costs are undoubtedly very important in the performance of any economy; the lower they are the more economic activity takes place (Benham & Benham, 1998). Their removal/reduction creates an environment that is conducive to commercialisation (De Janvry, Fafchamps & Sadoulet, 1991). Economic analysis must therefore make some assumptions about transaction costs, which are however, variously defined with a variety of accepted standards. Their estimation is also problematic because they are often jointly determined with production costs, the one influencing the other (Benham & Benham, 1998).

In marketing, transport costs and mark-ups (rent seeking by different actors in the marketing chain), form the bulk of explicit transaction costs. In Siaya District of Kenya, because of poor infrastructure, maize prices were estimated to be 12% above market price. Without transport costs, households would be more export oriented, i.e. grow cotton and use the income to meet their food needs. Because of the costs, they withdraw from the maize market and engage in maize production. In so doing, they fore-go income (Kshs 1,244) that would be generated by the highly paying cotton crop but is offset by the implicit savings (Kshs 1,957) on food expenditure (Omamo, 1998).

Economic reform programmes in the SSA region have given due emphasis to improving efficiency of production and marketing systems by the reduction of transaction costs and barriers to entry. In Uganda, this focus has mainly been on the improvement of transport

systems and removing/reducing barriers to market competition. Reducing transaction costs should in turn increase production, incomes and ultimately demand.

Studies examining the degree of market integration, a measure of market efficiency, show a trend towards long-term market integration and the increasing efficiency in price transmission. Urban markets are often found to be better integrated than rural markets which are segmented in the short term, largely due to poor market information and transport infrastructure (Kherallah, Delgado, Gabre-Madhin, Minot & Johnson, 2000). In Malawi, prices in maize markets exhibited a stable long-term relation and were therefore co-integrated. The number of markets that were integrated increased after market liberalisation in 1987 (Goletti & Babu, 1994 cited in Kherallah et al., 2000). However, they found that price transmission between the markets was low, calling for more investments in market infrastructure. This finding was contrasted to that of Benin (Lutr, van Tilburg & van der Kamp, 1995, cited in Kherallah et al,. 2000) where the maize market was not affected by government interventions and therefore the effects of market reform.

However, the effects of the market reform are relative to other factors in the economy, drought, war, enterprise substitutability etc. and it is difficult to draw generalised conclusions. In Ethiopia grain price liberalisation had the effect of increasing the producer share of the retail price and the real average prices in terminal markets declined as did the co-efficient of variation in grain prices (Negassa & Jayne, 1996, cited in Kherallah et al,. 2000). However, despite increased market integration in Malawi, production has not risen primarily because real producer prices have not risen. Rather, an inverse relation between maize production and the relative price of cash crops was observed (Sahn & Arulpragasam cited in Kherallah et al,. 2000). Nonetheless, it is estimated that the transport and marketing of food grains can cost up to 70% of product values (Ahmed & Rustagi, 1987 cited in Kherallah et al,. 2000) and a lot more remains to be done in reducing the costs of marketing transactions.

However, while emphasis has been paid to reducing the explicit transaction costs mainly entailed in the marketing system, it is noteworthy that transaction costs may also be implicit. These implicit transaction costs include the costs of information, the opportunity cost of time spent searching and negotiating, and costs that arise from the participant's

social status in its community, e.g. gender, ethnicity & political links. These therefore make the transaction costs more area or individual specific.

However, Benham & Benham (1998) argue that in addition to transaction costs it is necessary to take into consideration the opportunity costs of a transaction and the different needs of those involved. To understand the choices made, this needs to be established not only where a transaction takes place, but also where it does not. Some opportunity costs like that of the time spent in carrying out a transaction or that of post harvest losses due to poor storage or pest damage, can be quantified. However, quantifying others such as the inconvenience caused by using living quarters for storage or of inadequate food today compared with the short and long-term effects of health or education, is difficult. It is certainly difficult given the nature of the commodity, food, which is life itself. What is its opportunity cost? It is also important to take into consideration that farmers are often price takers whose choices are limited by the market opportunities.

While transaction costs focus on factor or product commodities, the market is also a means of social interaction and information exchange, often as intrinsic components of the commodity transactions. Besides making a commodity purchase or sale, a common response to why they went to the markets, was to meet other people (Group discussions, 1998; Questionnaire responses). These intrinsic components of a transaction are however, difficult to price.

The effects of commercialisation on different segments of the population, e.g. men and women, would also differ because of differences in resource accessibility and control (Von Braun, Bouis and Kennedy, 1994). Contrary to unitary decision making models, men and women are known to generate and control income separately, i.e. non-income pooling (Smith & Chavas, 1997). This implies that different members of the household may face different transaction costs.

Against this background, the law of one price does not apply across households. At any given price, some households will carry out transactions and others will not, depending on the household's transaction and opportunity costs for a specific transaction (Benham & Benham, 1998; De Janvry et al., 1991). De Janvry et al. (1991) posit that the decision

to participate in the market as a buyer or seller is guided by an endogenous price band within which each household operates. Goetz (1992) finds that improved market information increased the probability that households selling coarse grain participated in the market. On the other hand, a higher price of coarse grains significantly raised the probability that a household participated in the market as a buyer; higher prices could signal impending food scarcity that would require the stocking up of food.

While theoretically a price band may exist, the determination of the bounds in practice must take into consideration the price variable, transaction costs and the opportunity costs to which food sales may be tagged, e.g. health, education, leisure etc. It has been argued that people are often quite prepared to endure considerable degrees of hunger to ensure their existence in the long term or if the opportunity cost is an investment for a better tomorrow (De Waal, 1991). Preserving seed for planting, avoiding the sale of an animal, or investing in education are some examples. In a study done in Sudan, despite having eaten once in a day or two days, famine migrants often sold the food they were given and used the proceeds to do something they considered more important. These were things like fodder for an animal or transport back home to cultivate their gardens.

It is therefore necessary to look at food needs as one of many that contribute to a livelihood. Within the broader context of livelihood security, people are concerned about food and non-food needs and their life's aspirations (Maxwell, 1991). The principle of "food first" therefore does not necessarily apply, partly explaining why households, contrary to expectations, would sell food and subject themselves to the risk of running out of food for their subsistence needs. This was the thrust of many discussions during the study. Besides food consumption, other concerns constantly raised were education and health needs. Mothers, for example, reported that between hunger and health care for their children, the latter would undoubtedly take precedence.

2.3.2 Effects of commercialisation on food security

Studies on the commercialisation of agriculture and its impact on food security have been inconclusive. Between 1961 and 1985, 60 countries whose non-food production increased also showed an increase in per capita supply in basic food, while 23 countries showed a decrease in per capita food supply (Islam, 1994). Islam (ibid.) argued that the

relative rates of growth in food and non-food production were not the dominant factors determining the overall supply of food. Rather, that food supply in countries faced with inadequate production depended on access to food imports, which are subject to the instability of international prices.

A number of studies commissioned by the International Food Policy Research Institute (IFPRI) found that commercialisation generally had a positive income effect on calorie consumption although to varying degrees (Kennedy & Cogill, 1987; Von Braun, de Haen & Blanken, 1991; Von Braun, Johm & Puetz, 1994). Cash crop production in developing countries was often accompanied by an expansion in staple food production (on a per-unit-of-land basis) and per capita food production was often maintained or even increased. This response was attributed to market and production risks (Von Braun, 1994). Even while responding to incentives and trying to allocate their resources efficiently, households' food concerns seem to remain paramount. For example, participants in a sugar cane scheme in Kenya used more of their land in growing subsistence crops, mainly maize, compared with non-participants. Von Braun argued that the negative impact of commercialisation on food security could be where market failures or intra-household imbalances existed, or where farmers were displaced without compensation as governments enforced the growing of cash crops.

However, cognisance is taken of the fact that areas where some of these studies were done were part of production schemes or under project conditions. Government market interventions, therefore, had a major impact on the outcome of many variables, e.g. factor and input use, profitability, and decision making. In Rwanda, a study was done in an area where Government was promoting tea production in an effort to diversify export earnings away from coffee (Von Braun et al., 1991). In Kenya, a study was done in an area where sugar-cane growing was promoted by Government as a strategy to improve the general health and well-being of low-income farm households (Kennedy & Cogill, 1987). In the Gambia, a study was done in a project to promote technological change. Rice production technology was to be upgraded with the introduction of a large-scale irrigation project. A special attempt was to be made to maintain the traditional user rights of female farmers to rice land (Von Braun, Johm & Puetz, 1994).

Under similar conditions in a study in Kenya, Strasberg et al. (1999) suggested that commercialisation improves food crop productivity in various ways.

- It provides a source of cash that allows the household to overcome credit-related constraints to purchasing inputs.
- The creation of positive spillover effects on food production from improved access to production inputs distributed to farmers growing the cash crops.
- Cash income from commercialised production patterns facilitated the purchase of draft oxen or traction equipment that could promote food crop production.

The effect of commercialisation on food security can also be indirect through the effects of other factors. A preliminary study examining the effects of cash cropping on food security in Swaziland found that cotton farmers were relatively more food secure; their food output was higher than that of non-cotton farmers and income from cotton enabled them to purchase food. They had better access to extension services and generally, were headed by younger men assumed to be more innovative (Sithole, 1992).

An analysis of cotton and non-cotton farmers in Mozambique found that underlying an apparent positive correlation between cash crop production and calorie availability was land availability. The area of land under production was found to be more important in determining calorie availability. For both cotton and non-cotton farmers using 0.45 to 2.33 ha of land, calorie availability was higher than the FAO requirement of 2,500 per adult equivalent, on average. While both cotton and non-cotton farmers in the lowest land area quartile were nutritionally at risk, the cotton farmers were more vulnerable (Marrule, Mugabe, Santos, Varela, Tschirley, Weber, Finan & Langworthy, 1992).

The above discussion underscores the difficulty of making generalisations about the effects of commercialisation on food security. Strasberg et al. (1999) posit that the effects of commercialisation depend on a number of factors. These include organisation of a scheme, access to inputs, market outlets, price levels and price risks. They found that the degree of commercialisation differed within and across zones. It was not uniformly associated with land holding or area cultivated and had a positive impact on food crop fertiliser use and productivity. The effects of different cash crops differed by region independent of the effects of commercialisation.

2.4 OTHER FACTORS RELATED TO FOOD INSECURITY IN THE SUB-SAHARAN AFRICA REGION

Despite the emphasis on commercialisation and food security, it is noteworthy that food security issues are often a result of a complex interaction of various factors besides commercialisation. They include the policies that have been adopted, the vagaries of nature, political instability and poverty. In this section, a brief review of food insecurity across the region, highlights this.

In categorising the food insecure in Africa, Maxwell (1992) identified five main categories, similarly identified as vulnerable groups by FAO (1999). All of these categories characterise poverty.

i) Families that are poor in assets and productive resources, but live in surplus agricultural areas
ii) The resource-poor and those living in drought-prone or other marginal areas
iii) Poor pastoralists
iv) The urban poor
iv) Refugees, displaced persons and others affected by war.

Poverty steadily erodes the quality of life and waters down efforts put into nurturing economic growth. Agriculture, because of its central role in the livelihoods of the majority in the region, remains pivotal in any poverty alleviation measures. Its increased productivity should contribute towards meeting domestic food needs or to increase foreign exchange earnings to allow for food importation. Despite its role, agriculture and its related industries has often been neglected by African governments. For example, the policies adopted suppressed agriculture or were at the expense of support to the smallholder farmers who dominate the agricultural sector. Relatively low investments have been made in agricultural research that was inherently biased towards the non-food cash crops at the expense of food crops (Eicher, 1990; Eicher & Staatz, 1985). In so doing, economic systems that generate sufficient real income for the poor have not been developed. Coupled with the declining terms of international trade against primary commodities and the increasing costs of industrial and petroleum imports, insecurity and

political instability and rapid population growth, this has had long term effects on food security in SSA (Eicher and Staatz, 1985).

2.4.1 Climatic failures

Given that much of the agriculture is in rain fed production systems, climatic failures especially drought, have a direct bearing on production, income levels and food availability. Because of low productivity marginal areas are often home to the poorer segments of the population and poverty only aggravates the negative effects of the climate. Drought conditions for example led to widespread famine in the mid 1980's, particularly affecting countries in the horn of Africa; Somalia, Ethiopia, and Djibouti, Sudan, parts of Kenya and Uganda (Maxwell, 1991; Teklu, Von Braun & Zaki, 1991; Webb, Von Braun & Yohannes, 1992). Under drought conditions, it has been shown that the poor were even more vulnerable to the impact of famine. In Ethiopia, results from several survey locations revealed that relatively more wealthy households (the top third of households with an average annual income of US$ 100 per capita), were better able to cope than the poor (the bottom third of households with an annual income of US$ 42 per capita). Consumption decreased to less than one meal a day in 63% of the poorest households compared with 43% of the wealthier group. In 1985, the wealthier households on average achieved a higher drought year cereal yield, 300 kg per hectare or 38 kg per capita, while the poorer households had 111 kg or a paltry 9.5 kg per capita (Webb et al., 1992).

2.4.2 Political instability

Political instability/war conditions in the SSA region have devastated large areas of land often rendering them unproductive, disrupted economic activity and displaced people from their land and ultimately creating refugee populations. Many examples abound. Output in Somalia has suffered the effects of long-term civil war coupled with little rainfall. In an area of the country known for its sorghum production, it is estimated that output in 1999 was only 20% of the pre-war levels achieved in the 1980's. In Angola, renewed fighting in December 1998 meant that the favourable weather conditions were wasted. In contrast, West Africa's food prospects were reportedly good, largely because

of "lack" of war coupled with the favourable weather (US. Department of Agriculture, 1999).

In Mozambique, two-thirds of the population live in the countryside and about 75% of them depend on agriculture for their livelihood. Following a protracted war situation it is estimated that 63% of the population is undernourished and food availability has fallen below 1,800 calories per person per day (FAO, 1999). Because of the war, many people were forced to abandon the very land off which they live (46% of respondents in a study by Tschirley & Weber, 1994).

2.4.3 Structural imbalances

Structural imbalances are pronounced where large-scale farming replaced indigenous populations who were often displaced to marginal land. Large tracts of land were, for example, set aside for settlers in Zambia, Zimbabwe and South Africa in the Southern Africa region and Kenya in East Africa (Jayne, Takavarasha & Van Zyl, 1994; Kherallah, Delgado, Gabre-Madhin, Minot & Johnson, 2000). Because of low productivity, the displaced populations were deprived of production as a means to a livelihood and entitlement, often having to resort to the market for both. They were thus rendered vulnerable to market failures.

In South Africa, it was estimated that the area under commercial agriculture (predominantly owned by "white" farmers) is about five times more than that of the small farmer (predominantly "black") agriculture. It was also estimated that food insecurity was predominantly a problem amongst the "black" population, i.e. 86.7% of about 2.3 million people, many of whom rely on the market for their food and potentially need nutritional assistance (Van Zyl & Kirsten, 1992).

In Zimbabwe, about 5,000 commercial farmers occupied about one third of the land in areas with the most reliable rainfall and good soils. In contrast, more than one million families in the communal areas where rainfall is inadequate and the soils are of low quality, controlled 40% of the land. Changes in land use reduced the number of large commercial farms by about 30% in the 1980's. It also influenced changes in cropping patterns with the commercial farmers shifting away from maize to industrial crop

production. The loss in food production from this shift was critical for national food security and those who relied on the market for their food, e.g. drought prone areas where child stunting is reported to have increased during the 1980's (Shapouri et al., 1992).

2.4.4 Stabilisation and structural adjustment interventions

To address their economic imbalances, many countries in the region have had to undertake reforms within the context of the market based, stabilisation and structural adjustment programmes. Economic stabilisation measures that are generally demand management strategies, notably devaluation and inflation management, were introduced to redress the macro-policy environment. Structural adjustments entailing policy and institutional reforms, were to redress the non-optimal use of resources, increase economic efficiency, expand growth potential and increase resilience to shock (World Bank, 1991).

Recently, food insecurity in for example Zambia, Malawi and Uganda has partly been alluded to be because of these economic reform measures (Chilowa, 1998; COOPIBO-Uganda, 1996; Kherallah et al., 2000; Seshamani, 1998). Structural adjustment reforms within the food sub-sector were primarily to provide the incentives to expand marketed surpluses through price instruments. Food security is at the tertiary impact level, affected by marketing effects such as price transmission, market integration, size of price margins, price stability or through the broader impact on production levels (Kherallah et al., 2000). The evidence as to whether people are more food insecure because of the economic reforms is so far inconclusive. Cognisance is taken of the difficulty of matching specific policies to specific effects. For example, it is difficult to isolate the effects of reform on food security from those of other factors such as political instability and climatic failures concurrently affecting these economies (Chilowa, 1998; Maxwell, 1991; Opio, 1996; Semogerere, 1995).

A common concern, for example, is that incremental production of tradables attracts resources away from locally traded and consumed subsistence crops, creating food shortages. In Zambia, small-scale farmers switched to cultivating drought resistant crops, away from those like maize, which had been accorded an artificial comparative advantage when market controls were in place. Aggregate production of maize therefore

declined. While a switch to drought resistant grains like millet and sorghum would contribute to ensuring food security, a switch towards cultivating cotton is expected to compromise food security as more people would have to rely on the market for food.

On the other hand in Zambia, there are situations indicating that the food security situation of those people previously disadvantaged by the marketing structure, improved. The reforms brought about benefits to the producers and consumers by increasing competition in the purchasing and processing of grain. Large-scale millers lost their monopolistic market shares to small-scale hammer millers and as a result, the marketing costs fell and a wider range of mealie meal products could be offered to consumers. The marketing restrictions had created a circuitous flow of grain; from the rural areas, grain was moved to the urban areas to be milled at specified processors and then back to grain deficit consumers in the rural areas. Consequently, the final product was highly priced (Seshamani, 1998).

In Malawi too, the impact of liberalisation created losers and winners. Generally, there was a positive supply response to the better prices but not enough to ensure national self-sufficiency. Food deficits increased in turn encouraging the sale of many subsistence crops. However, the food security of rural households, characteristically deficit producers, was more precarious following the reforms because of the high and unpredictable maize prices. Households that were characteristically net food sellers should have benefitted from the higher prices. However, they often have not because of the tendency for private traders to offer lower prices than the official prices. Their income therefore did not necessarily improve (Chilowa, 1998).

With specific regard to women, empirical findings indicate that structural adjustment programmes in general have had negative effects on rural women (FAO, 1998a). Although no conclusions can be drawn from this, because of women's role in ensuring food security, a negative effect is assumed.

Reforms in the food marketing system in particular aimed to improve the performance of the small holder sector through increased producer prices. Considering that some segments of the small holder sector are net food buyers, higher food prices should however, reduce their real income and thus negate their ability to access food. In general,

it can be surmised that where the population is further impoverished by these reform programs, their food security status would be compromised (Maxwell, 1991). On the other hand, to the extent that the disincentives to increase productivity are addressed, food security should be enhanced. The effects will depend on the pre-reform production strategies and policy environment and the reform process itself.

2.5 THE IMPLICATIONS FOR FOOD SECURITY

More than 50% of the population of SSA depend on agriculture, which contributes about 35% to the region's GDP and about 40% of total export earnings (United States Department of Agriculture, 1999). Between 1980 and 1990 the overall growth-rate in the agricultural sector has shown a decline from 1.9% to 1.5% between 1990 and 1995. On the other hand, the population growth rate is estimated at 2.33%, more than double that in other regions. If there is any region where the Malthus predictions may be proven, it is here. Between 1994 and 1996, it is estimated that 39% of the population in SSA were undernourished, an increment of about 14 million people from the 1990-92 estimates (FAO, 1999b).

As evident in Table 2.3, between 1990-1992 compared with 1969-1971, the world had an estimated 80 million fewer undernourished people. However, it is estimated that in SSA, the number of food insecure people doubled from about 103 million to 215 million, that is from about 38% to 43% of a growing population (Pinstrup-Andersen & Pandya-Lorch, 1997). West Africa, despite having the largest sub-regional population, has the lowest figures of undernourished people and has recently shown the most marked improvement in the region. In comparison, East Africa with a smaller population has twice as many undernourished (FAO, 1999).

Per capita food production in the mid-1990's was less than it was at the beginning of the 1960's when many of these countries were gaining independence. Between 1992 and 1994, of the 42 countries in the world that were unable to meet the minimum needs (on average 2,200 calories per person per day) 29 of them were in Africa. This was despite an improvement in the world food situation with aggregate world food output able to feed every human being sufficiently (Pinstrup-Andersen & Pandya-Lorch, 1997). Current projections show a further widening of the gap between food production and food needs.

Table 2. 3: Chronic Under-nutrition in the developing World: 1969 -1971, 1990-1992, 1994-1996

Population Variable	No. of Chronically Under Nourished people (millions)			Share of a Region's Population (percentage)			Share of Total Under Nourished Population (percentage)	
Region	1969-1971	1990-1992	1994-1996	1969-1971	1990-1992	1994-1996	1969-1971	1994-1996
East Asia	475	268	258	41	16	15	52	31
South Asia	238	255	254	33	22	21	26	31
Sub-Saharan Africa	103	215	210	38	43	39	11	25
Latin America/ Carribean	53	64	63	19	15	13	6	8
Middle East & North Africa	48	37	42	27	12	12	5	5
All Developing Countries	**917**	**839**	**828**	**35**	**21**	**19**	**100**	**100**

***Source**: Extracted from FAO, 1996; FAO, 1998b; Pinstrup-Andersen & Pandya-Lorch, 1997.*

Food aid which has played a significant role in SSA (United States Department of Agriculture, 1999) is on the decline both in absolute terms and in relation to total food imports. Estimated at 8.1 million tons (about 50% of total food imports) in the early 1980's, it was estimated at 2 million tons (13% of food imports) in 1998.

It is projected that by 2009, 60% of the region's population will be food insecure, an increment from the estimated 54% consuming less than their nutritional requirements in 1999 (United States Department of Agriculture, 1999). This analysis does not take into account the ravaging HIV/AIDS pandemic, most prevalent among the economically active segments of the population and bound to affect production levels negatively. The implication is twofold, food is increasingly going to be a traded commodity and the market will increasingly become the source of food for many who, with the levels of poverty, stand to be priced out of the competition for food (Pinstrup-Andersen & Pandya-Lorch, 1997).

2.6 CHAPTER SUMMARY

The chapter starts by defining the concepts of food security and commercialisation within the development process in general and within the confines of this study in particular. The different levels and complex nature of food insecurity and therefore the need for a combined approach in its analysis is highlighted. The working definition of food security is in terms of food availability, an estimate of food consumed based on the quantities of

food produced, sold, stored and bought. Food security is however, not just about calorie availability, rather close links exist between food security, nutrition and health. Nonetheless, despite its shortcomings calories are the measure of consumption applied in the study.

The working definition of commercialisation is in terms of the proportion of aggregate farm output sold to aggregate production, standardised by the respective caloric equivalents. Although the definition of commercialisation is often circumstantial, it nonetheless plays an important role in the development process, contributing to the transition out of subsistence economies. It also allows the expansion of the consumption boundary beyond what a household produces and therefore has the potential of contributing positively to food security.

That food insecurity is often a result of an interaction of many factors that include natural phenomena such as climatic failures, political instability, structural imbalances that denied segments of the population of a means to a livelihood and economic reform measures, they are briefly reviewed. The implication for food security and commercialisation are then highlighted, emphasising the need for more attention and planning around the forecast that food sales are likely to increase.

CHAPTER 3

THE SOCIO-ECONOMY, FOOD DEMAND AND THE SPECIFICATION OF THE ANALYTICAL MODEL

3.1 INTRODUCTION

A food system does not operate in isolation of the broader economy and the supply and the demand for food are therefore, subject to policy and socio-economic changes in the economy. In the previous chapter, that food security/insecurity is often a result of a complex interaction of many factors, was discussed. It is hypothesised that the increased sale of food following growth in domestic and regional demand is one of the factors negating food security in Uganda. However, Von Braun (1994:38) argues that implications of commercialisation must take into consideration the process, the economic, socio-cultural and structural characteristics of the area in which it is being evaluated. Further, that:

> ...*"the effects at the household level cannot be comprehensively assessed in a vacuum of time and space: the historical context matters".*

The remarkable economic growth attained in Uganda following the commencement of the reform programme can be explained in part by the very low levels of deprivation to which much of the population had sunk. These low levels served as the springboard for the reform programme (Economic Policy Research Centre & Action Aid Uganda, 1997; IFAD, 1994). The commercialisation of the food sub-sector in part manifests the expansion in demand with economic growth and cannot be looked at in isolation of other socio-economic developments in the economy. To place the food security concerns in context, this chapter relates how developments in the economy at large affected the farming sector particularly the supply and demand for food. In so doing, the *a priori* conditions that have guided the model specification later in the chapter are implicitly discussed. It review's the socio-economic developments before reform and the implications for domestic demand and supply. It then reviews socio-economic

developments as part of the reform process, specifically focusing on changes in the demand for food, an important factor in the commercialisation of the food sub-sector.

3.2 AN OVERVIEW OF UGANDA'S ECONOMY BEFORE REFORM

3.2.1 Agricultural production

During the colonial period, direct settler involvement in agricultural production was not pronounced. Nonetheless, policy decisions taken then have had far reaching consequences on the structure of agriculture today and implicitly, on food security. An attempt was made to encourage large-scale commercially oriented farming (plantations of rubber and coffee). However, the collapse in international prices in 1920, the high costs of production given labour scarcity and various vested interests that preferred the expansion of cotton growing in Africa, left British farmers bankrupt (Bibagambah 1996; Hinderink and Sterkenburg, 1987). This marked the end of plantation farming in Uganda and many of these farms reverted to bush. The few that remained were auctioned and later turned into sugar plantations.

Following the collapse of plantation agriculture, the Colonial Office in London took a policy decision, to bar non-Africans from participating in the production of non-plantation crops (cotton). Non-Africans were only to participate in the processing and marketing of cotton. This decision has had extensive consequences for the structure of agriculture in Uganda which to date, consists predominantly of small holders. Their role in the economy is underscored by the fact that agriculture makes the largest contribution to GDP, as noted in the first chapter. Because food production is the largest sub-sector and food needs are predominantly met from own-production, the structure of agriculture thus has a direct bearing on household and aggregate food self-sufficiency.

The role of the food sub-sector became more pronounced during the 1970's and 1980's when Uganda's fast economic growth was halted by the political crises and economic mismanagement during the dictatorial regime that took power in 1970. Through statutory marketing boards that enjoyed monopsony powers over export marketing and participated in setting producer prices, Lint Marketing Board (LMB) for cotton and Coffee Marketing Board (CMB) for coffee, the state exploited the farmer. Farmers faced

low producer prices and payments were often deferred, i.e. farmers were given "I owe you slips" for produce "bought". With little incentive to produce cash crops (Bibagambah, 1996), farmers are for example known to have roasted cotton seed before planting to ensure the crop did not germinate. Coffee trees were cut down and replaced by bananas in some places. Overall, the economy largely reverted to a subsistence mode (O'Connor, 1988). In 1982, non-monetary contributions to GDP (at 1966 prices) were 33.7%, having grown from 26.1% in 1971 (Uganda-Ministry of Planning and Economic Development, 1983) in a contracting economy.

In 1981, volume in total exports was estimated at 150,000 tons, having declined from 500,000 tons in 1971. In the same period, production of the main cash crops declined as follows:

- Seed cotton from more than 270,000 to 16,000 tons.
- Coffee from more than 200,000 to 130,000 tons.
- Tea from 18,000 to 1,400 tons.
- Tobacco from 5,000 to 3,000 tons.
- Sugarcane from 1,700,000 to 165,000 tons.

Coffee increasingly became the most important export, accounting for more than 95% of agricultural exports and 90% of exports in the late 1980's (Uganda-Ministry of Agriculture and Forestry, 1984a; World Bank, 1996). Given that more than 90% of the foreign exchange earnings were from cash crops, the ramifications were economy wide. At the macro-level, balance of payments difficulties increased. The supply of many consumer goods and basic production inputs like hoes steadily declined as their production gradually ground to a halt owing to, among others, the lack of spare parts for machinery. Basic commodities like sugar, salt, soap, etc. became rare commodities consumed by only the relatively better off in urban areas. Their consumption ceased altogether in the poorer rural areas because of lack of effective demand and the unavailability of the goods.

Price controls for producer and consumer goods were later introduced, as was a fixed exchange rate. The latter led to an overvalued shilling. Consumers suffered a decline in

real income due to high inflation and a restricted variety in consumer goods. The political instability ultimately led to war, not only disrupting production, but often displacing and impoverishing those directly affected.

Table 3.1 shows a comparison between the peak year performance of selected sectors with that in September 1981 (commencement of the first attempt at economic recovery). Between 1970 and 1980, overall performance declined and GDP showed a 25% fall. By 1979, per capita GDP had declined by 14.2 % (1966 prices) from what it was at independence in 1962 (Edmonds, 1988).

Table 3. 1: Sectoral peak year performance compared with performance in 1981 (value in million shillings and at 1966 prices)

Sector	Peak year	Value	Value in 1981	Percentage decline
Monetary Agriculture	1973	1,795	1,221	32
Agro-Industry	1970	114	31	73
Misc. Manufacturing	1971	482	206	57
Commerce	1971	940	491	48
Food Manufacturing	1972	63	10	84
Mining & Quarrying	1970	119	6	95
Total Monetary	**1971**	**5,252**	**3,822**	**27**

Source: *Uganda-Ministry of Planning and Economic Development, 1984.*

3.2.2 Food marketing

Because more emphasis was placed on the use rather than exchange value of food, its markets were generally free even with the establishment of the Produce Marketing Board (PMB) mandated to stabilise food prices and manage a food reserve (Bibagambah, 1996; Nsibambi, 1988). Though granted monopsony powers in the 1970's, the PMB never really took an active part in the market as a buyer or seller. It exported beans and maize only to a small extent (Uganda-Agricultural Policy Committee, 1990). The dietary diversity would have required it to act to satisfy different market segments, pushing up operational costs because of lower economies of scale.

Although the activities of the PMB did not disrupt the food sub-sector much, non-tariff barriers did. Licensing requirements restricted inter district movement of food. While this restriction was removed in 1986 to allow free movement within the country, a valid

licence was still required to move more than one bag (100 kg) of produce (Uganda-Agricultural Policy Committee, 1990). Roadblocks (legal or illegal) provided opportunities for extortion (Nsibambi, 1988).

Few lorries and rail wagons for moving produce contributed to high transaction costs in especially food marketing (Uganda-Agricultural Policy Committee, 1990). Besides, being landlocked, the costs of fuel are higher than in neighbouring Kenya. Consequently, an implicit tax is imposed on the economy and the overvalued shilling encouraged illegal fuel re-exportation, aggravating fuel shortages. The overvalued shilling also contributed to the lack of vehicle spare parts. The deteriorating transport infrastructure did not help the dire situation (Nsibambi, 1988).

3.2.3 Social policies

Besides the declining performance in the agricultural sector, between 1970 and 1986, Uganda's social indicators deteriorated to become among the worst in the world (World Bank, 1993c). By 1990, infant mortality rates for example had shown a 2% decrease from the 1965 level. In comparison, there was an overall decrease of 32% for all of SSA countries in the same period and a 40% decrease in Kenya, Uganda's neighbour as shown in Table 3.2.

Table 3. 2 Infant mortality rates (per 1000) for selected countries

Country	1965	1990	Percentage decrease
Uganda	119	117	2
Kenya	112	67	40
Zimbabwe	103	49	52
Ghana	120	85	29
All SSA countries	157	107	32
All low income countries	124	69	44

***Source**: World Development Report 1992, Adapted from World Bank, 1993c*

In 1985, Government expenditure on health and education was about 27% and 9% respectively, in real terms of the 1970 level (World Bank, 1993b). Poor remuneration in the public sector led to a decline in service delivery. Because the health and education sectors are labour intensive, the deterioration in service delivery was more apparent

there. The costs of education shifted to parents who for example contributed 65-90% of the total funding of primary schools. Secondary school enrolments were estimated at 13% only, with parental financing amounting to 25-90% of the costs. The education system thus had the inequitable effect of pricing out the children of poor families (World Bank, 1993c). In hospitals, pilferage of drugs and medical equipment and direct payment for services rendered became common.

3.3 TRANSFORMING THE AGRICULTURAL SECTOR

3.3.1 The agricultural sector

Timmer (1997) proposed a development paradigm in which he discusses three different but closely related processes of agricultural change: transformation, commercialisation and diversification. Transformation in agriculture is part of structural transformation in an expanding economy. Diversification and transformation are manifest at three levels of an economy; individual farms, the agricultural sector and the economy as a whole, and can be measured and evaluated by among others, the diversity in food products consumed by representative households at each level. In the early stages of transformation, at the farm level, there is a wide diversity in production as each household is preoccupied with meeting its subsistence needs. As markets develop and farmers are better able to contain risks, they begin to specialise in production of a few crops. The market, as discussed in the previous chapter, enables the farmer to separate production decisions from consumption decisions. As specialisation takes place in production, consumption is not necessarily restricted as a wide diversity of food is made available through the market. Diversity in the agricultural sector as a whole is likewise maintained.

It can be argued that the overall objective of reforms in the agricultural sector in particular, is its transformation from the subsistence mode to which it had largely reverted, to commercialisation. While markets, infrastructure and overall economic growth are some of the forces that drive commercialisation and were targeted by the reform programme others are population change, new technologies and ultimately, the policy framework in which these forces operate (Von Braun et al., 1991; Von Braun,

Bouis & Kennedy, 1994). Each of these forces is, to varying degrees, manifest in Uganda's economy since the implementation of economic reform commenced.

Specifically, priority was given to reviving the traditional cash crops (mainly coffee, cotton, tea, tobacco) and promoting non-traditional crop exports. Markets, price structures and infrastructure were important factors in ensuring that these objectives were met and in promoting private sector activity. According to Uganda-Ministry of Finance and Economic Planning (1992b), specific sectoral reforms included:

- Price liberalisation, where Government moved out of price control leaving it to the forces of demand and supply.
- Market liberalisation entailing the removal of marketing restrictions/regulatory barriers that had promoted monopolies such as marketing boards at the expense of the private sector and the cessation of subsidies on inputs.
- Liberalisation of export trade with emphasis on the diversification of the export base and thus foreign exchange earnings, away from the traditional cash crops dominated by coffee. It was necessary to de-link the economy's performance from the unstable and declining terms of trade of especially coffee. Non-traditional agricultural exports, which include food crops, were promoted.
- Liberalisation of foreign exchange trade was necessary to support all the above measures. Exchange bureaux were licensed and restrictions on the movement of hard currency in and out of the country were relaxed.
- Liberalisation of interest rates.

The devaluation of the shilling (shs) by 77% in May 1987 and by 41.2% in 1989 (Opio, 1996) was a major boost for the agricultural sector, which, as earlier noted, provides the bulk of exported commodities. The recovery of the traditional cash crops in Uganda relied mainly on reforms in marketing (liberalisation), the development of supportive infrastructure (rehabilitation of processing and marketing infrastructure) and the improved delivery of research and extension services. All monopsony powers have to date been withdrawn and the private sector actively participates in domestic and export trade. Transactions are on a cash basis and advance payments may even be made when demand is at its peak in a season. The resultant competition pushes up prices in favour

of the producer. Farm gate prices in the coffee sub-sector, for example, are about 80% of the realised world price, compared with 20% before liberalisation (Uganda-Ministry of Finance, Planning and Economic Development, 1999). Unfortunately the down side of competition is also manifest; the deterioration in quality especially given a weak monitoring system (Economic Policy Research Centre & Action Aid Uganda, 1997).

Between 1987 and 1997, growth in the different sub-sectors has been realised (Uganda-Ministry of Finance, Planning and Economic Development, 1998).

- Coffee exports grew from 167,067 to 210,123 tons
- Tea from 3,511 to 18,260 tons
- Tobacco from 1,214 to 4,809 tons
- Cotton exports for 1997 was 18,975 tons.

However, these traditional cash crops are cultivated by agro-ecological orientation depending on where they are best adapted. Because they have not experienced uniform recovery, rural benefits are relatively localised. New technologies promoted as part of non-traditional agricultural exports include floriculture, high value products like vanilla and other horticultural crops. However, by their very nature, they pose several barriers to entry, i.e. the products are highly perishable and proximity to the markets (mainly urban centres or for export) is necessary especially given the lack of the infrastructure (cold chains) needed to reduce post harvest losses. Conditions under which they are grown are also constraining because they require relatively complex technology and are capital intensive. Their benefits therefore also accrue to limited segments of the farming population.

Changes in the food sub-sector, the most dominant in the agricultural sector, therefore have the potential of affecting more of the farming population. Between 1987 and 1997, food output is estimated to have grown by 70% and area by 35%. Trade in food has grown and is partly due to changes in demand, which in turn can be attributed to population changes, economic growth and improved market conditions and the supporting infrastructure.

3.4 FACTORS CONTRIBUTING TO GROWTH IN FOOD TRADE

3.4.1 Expansion in domestic demand

That domestic demand has grown is implicit in the growth of the population especially of urban areas. It is estimated that by 1991 the urban population had grown from 8% of the population in 1980 (12,636 million), to 11.4 % of the population in 1991 (16,583 million). Urban populations are an important segment of the domestic market and restricted growth had in turn restricted market opportunities for the producer. Between 1969 and 1979, Kampala city, projected to grow by 8% per annum, only grew by 3% per annum, half the rate of growth of Dar es Salaam in Tanzania or Nairobi in Kenya (O'Connor, 1988). In 1983, only five urban centres had a population estimate of more than 30,000 people. The relatively slow urbanisation was partly due to the deterioration in the industrial and commercial sectors, reducing employment opportunities. People may have been forced to return to the rural areas by the high cost-of-living. Jinja, the main industrial town, for example, registered a decline in its population (O'Connor, 1988; Uganda-Ministry of Planning and Economic Development, 1984; 1986).

Besides population growth, a surge in consumption was expected as effective demand that had been eroded by inflation, improved with economic growth. The general deprivation, due to the economic difficulties of the 1970's and 1980's, constrained the demand for food as it did for demand overall. Between 1977 and 1980, per capita income had declined by 25% to a level 68.9% of its 1963 value (Edmonds, 1988). For example, public servants' wages could hardly meet their food needs for two weeks (Nsibambi, 1988) and yet they are an important consumer segment in any urban setting and in the country. They accounted for about 80% of formal sector employment and about 43% of the urban labour force (World Bank, 1993b). Expansions in both informal and formal employment and improvement in the remuneration structure, served to increase demand. Between 1994 and 1998, for example, employees in manufacturing establishments, most of which are urban based, increased from about 13,600 to 16,800 persons. Growth in the informal sector has matched the growth in the urban population earlier pointed out.

With decentralisation, the public sector establishment in the districts also doubled between 1994 and 1997 (Uganda Bureau of Statistics, 1999). The implication is that

increased demand for food is not limited to Kampala and the dietary diversity in the country supports the commercialisation process because of the different demand segments for most foods produced. However, consumption habits are influenced by factors other than changes in income. Notable is culture. This may explain the less apparent diversification in consumption habits in the rural areas where traditional cultural practices remain strong.

Despite the increased demand, it is estimated that production levels are still able to meet the growing demand for food. Surpluses are realised in most of the food crops as shown in Table 3.3 that reflects food sufficiency at the district and national levels. Shortages do however occur in foods that meet the protein needs of the population, e.g. beans. The shortages in cassava in Apac and Soroti have been addressed with the spread of mosaic resistant cassava varieties.

Table 3. 3: Estimates of supply and demand of selected crops ('000 metric tonnes), in the three districts and at national level – 1994

DISTRICT	APAC			SOROTI			MBALE			NATIONAL		
Crop	SS	DD	Bal	SS	DD	Bal	SS	DD	Bal	SS	DD	Bal
Beans	13	7	6	5	9	-4	14	17	-3	378	380	-2
Millet	51	6	45	36	10	26	32	16	16	610	301	309
Sorghum	12	8	4	19	4	15	5	7	-2	390	163	227
Cassava	54	53	1	33	63	-30	65	105	-40	3100	2322	778
S. Potatoes	56	20	36	41	45	-4	73	77	-4	2129	1479	650
G. Nuts	6	1	5	4	2	2	5	4	1	142	91	51
Simsim	8	1	7	2	2	0	0	1	-1	70	24	54
Bananas	77	4	73	3	63	-60	638	105	533	8836	3830	5006
Maize	44	6	38	20	11	9	49	18	31	900	416	484

***Source**: Adapted from Uganda-Ministry of Finance & Economic Planning, 1995b*
SS = Supply, DD = Demand, Bal = Balance

Timmer (1997) argued that diversity in agro-ecological endowments enables farmers with different resources to specialise differently, creating greater diversity at the aggregate levels. Removal of trade barriers makes a wider diversity of commodities produced across different borders available to consumers. He therefore posits that as commercialisation progresses, there is specialisation in production but diversification in consumption.

The different agro-ecological endowments in Uganda should therefore encourage specialisation according to resource availability (including human capital, i.e. specialising in crops where they have the experience). Farmer discussions suggest a reduction in crop diversity compared with 10 to 20 years ago, inferring that households are cultivating fewer crops and therefore beginning to specialise (Group discussions, 1998). That it is common for a food to be identified with its source, e.g. Kumi potatoes, Ngora ground-nuts, Mbale posho, bogoya (sweet bananas) or matooke, etc. is further indication of a specialisation process taking place. It is only in a few areas that a new crop has been introduced to become a cash crop, e.g. rice in Pallisa District. However, it is noteworthy that although the market may have contributed to this process of specialisation, other factors have also played a role. For example, labour constraints limit the production of millet and cotton that are labour intensive crops (Uganda-Household Agricultural Support Programme, 1997; Group discussions, 1998). The prevalence of crop disease was another reason particularly for lack of cassava in certain areas, especially in Mbale District, where resistant varieties are not yet widely available. The non-improved pigeon pea has a long growing period and therefore occupies land for a long time, while the high costs of seed and the prevalence of pests in some areas are disincentives to the growing of groundnuts. These are crop specific examples for the reduced prominence of some crops.

3.4.2 Reduced non-tariff barriers

A study done in Bangladesh (Ahmed & Hossain, 1990) underscores the role of infrastructure in spurring on economic growth. It found that the impact of rural infrastructure development was an increase in household income by 33%. About 24% was from agriculture, 78% from livestock and fisheries, wage income doubled while business and industries rose by 17%. The functionally land-less and small farmers made larger gains in increases from crops, wages, livestock and fisheries. The large landowners captured the increase in business and industries.

As part of an incentive framework for the growth of the private sector the Government gave the rehabilitation and development of economic infrastructure, most especially the road network, priority listing. Restrictions on the transport sector were also relaxed. The overall objective being increased accessibility to the productive rural areas. Since 1989,

GDP contributions emanating from the road network have increased almost ten-fold from 28,563 million shs to 260,000 million in 1998 (Uganda-Ministry of Finance, Planning and Economic Development, 1999) growing by an average 8.6 percent per year. In 1998/99 alone, 740km of feeder roads were rehabilitated. As indicators of the changes that have taken place, between 1989 and 1998, the number of heavy commercial vehicles on the road increased by 313%, pick-ups/vans by 519%, minibuses by 657% and buses by 124% (Uganda Bureau of Statistics, 1999).

However, transport costs remain relatively high in Uganda because it relies on road transportation for even bulky products because of the non-functional rail network. Even with efforts put into rehabilitating the infrastructure, many roads are seasonal. The use of low tonnage vehicles contributes to the high costs of transport, as advantage is not taken of economies of scale (Uganda-Ministry of Agriculture, Animal Industries and Fisheries, 1997). Transport costs were estimated to range from about 4% to 17% of the final consumer price, depending on the crop (Uganda Co-operative Alliance, 1993 cited in Uganda-Ministry of Finance and Economic Planning, 1995b). This contributes to relatively low prices in the food sub-sector with farmers, for example, receiving about 17% of the retail price of maize (Uganda-Ministry of Finance, Planning and Economic Development, 1998).

Nonetheless, improvements in the transport infrastructure supported by the lifting of restrictions on inter-district trade, has eased trade across the country. Domestic urban markets are integrated with most of the rural areas and across the country, trade in food is vibrant and highly competitive. There are no restrictions on the quantities handled or who can participate. Food is traded at the farm gate, roadsides, village and occasional markets and in the urban markets. Lorries, trucks and pick-up vehicles loading food are a common sight in villages and along roadsides. Appendix 4 shows the main pathways of the food trade; from the producer to the final consumer who may be within the villages, in the urban areas or even further afield, if the food is exported.

Farmers trade in their own food and may serve as agents of traders and therefore act as collection points within the villages. During a farmer discussion group in a sampled village in Bugobero Sub-county, children were observed exchanging mugs of beans for *chapati*, a snack food made from a dough of baking flour and flattened to a few

millimetre thickness, with a middleman. Although the beans had been picked from the harvest residue, the discussion group mentioned that instances where children stole food to exchange for cash were on the increase given the readily available market. Institutions like schools send their agents out to the villages to avoid marked-up prices from middlemen. Overall, food trade has attracted a wide range of participants from petty traders whose handling capacity is limited by capital and storage infrastructure to established companies with sizeable storage capacity or the ability to rent storage space (World Bank, 1996).

Price changes in Kampala where the largest concentration of demand occurs, are reflected in most of the country with varying time lags and price differentials (Nobera, 1998). Figures 3.1a and 3.1b are graphical illustrations of monthly average price trends from January 1998 to January 1999 for dry maize and beans from rural collection markets (Kagaa and Otuboi) to district and regional markets (Soroti and Mbale) and Kampala city. This information was generated from a combination of primary and secondary data. Prices for the rural collection markets, Kagaa and Otuboi, were data collected as part of the study. The two are markets within the sampled areas in Soroti district. To reflect the flow of food towards urban markets, secondary price data was collected from the district and national Market News Service for the urban markets (Uganda-Ministry of Trade and Industry, 1999).

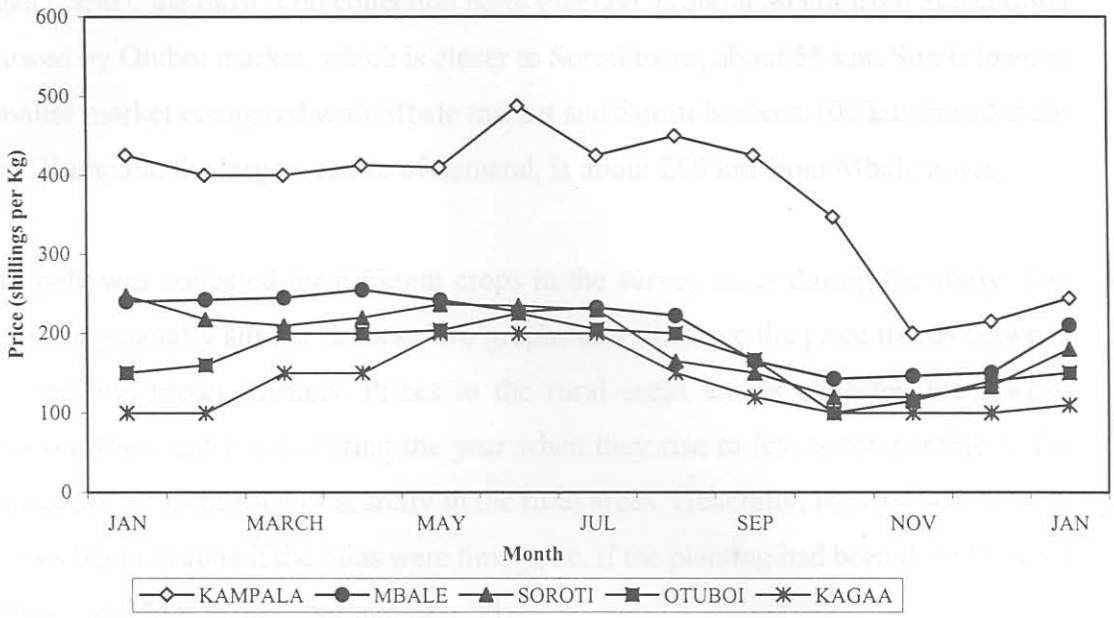


Figure 3. 1a: Maize price trends in selected rural and urban markets Jan'98-Jan'99

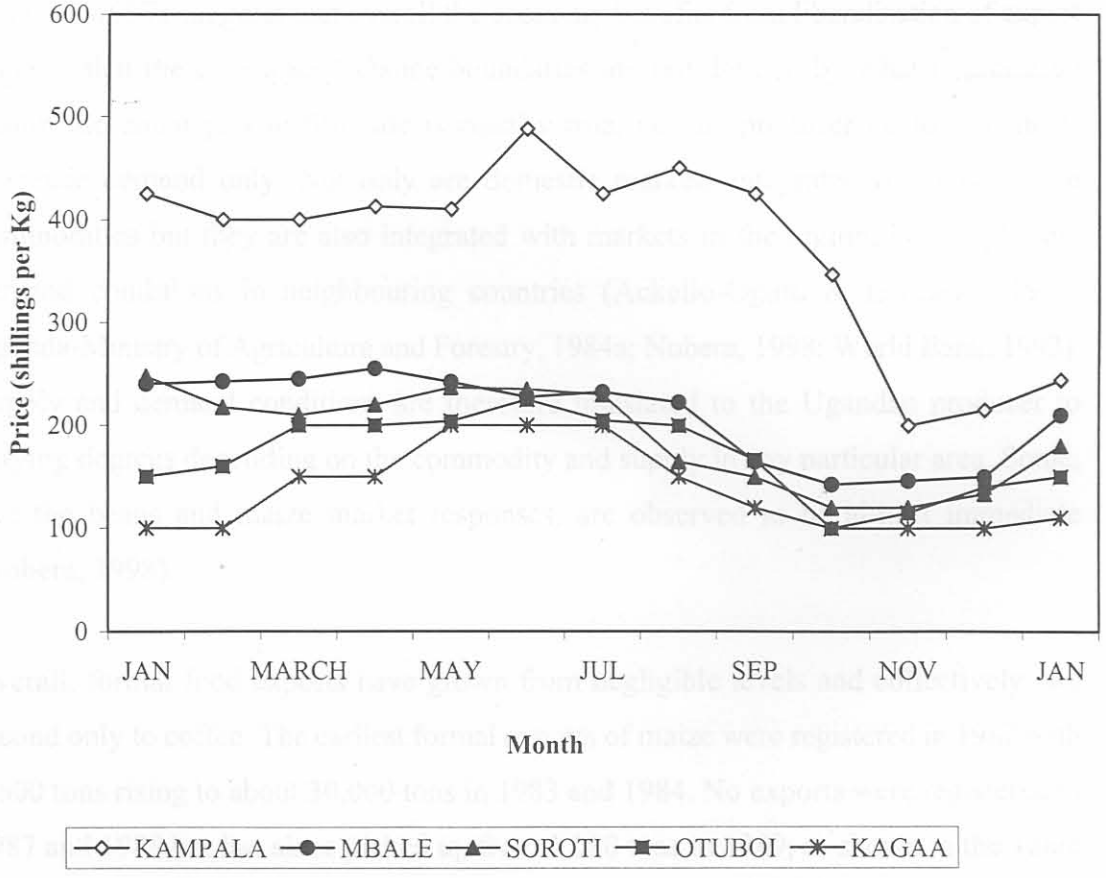


Figure 3.1b: Beans price trends in selected rural and urban markets Jan'98-Jan'99

Kagaa market, the most rural collection point graphed, is about 80 km from Soroti town followed by Otuboi market, which is closer to Soroti town, about 55 km. Soroti town is a smaller market compared with Mbale market and Soroti is about 100 km from Mbale town. Kampala, the largest centre of demand, is about 200 km from Mbale town.

Price data was collected for different crops in the survey areas during the study. The trends are generally similar to these two graphs that illustrate the price trends between the rural and urban markets. Prices in the rural areas are as expected the lowest. However, there are points during the year when they rise to levels comparable to the urban areas, an indication of scarcity in the rural areas. Generally, the first season crop harvests begin in June if the rains were timely, i.e. if the planting had been done between February and March and continue into July.

3.4.3 Regional demand-formal/informal food trade

Timmer (1997) suggests that overall the economy benefits from liberalisation of export trade in that the consumers' choice boundaries are not defined by what is produced within the country. The flip side is equally true, i.e. the producer no longer meets domestic demand only. Not only are domestic markets integrated for most of the commodities but they are also integrated with markets in the region, i.e. supply and demand conditions in neighbouring countries (Ackello-Ogutu & Echessah, 1997; Uganda-Ministry of Agriculture and Forestry, 1984a; Nobera, 1998; World Bank, 1993). Supply and demand conditions are therefore translated to the Ugandan producer to varying degrees depending on the commodity and supply in any particular area. Some, like the beans and maize market responses, are observed to be almost immediate (Nobera, 1998).

Overall, formal food exports have grown from negligible levels and collectively, are second only to coffee. The earliest formal exports of maize were registered in 1982 with 1,600 tons rising to about 30,000 tons in 1983 and 1984. No exports were registered in 1987 and 1988 but has since picked up from 1,080 tons in 1989, as shown in the Table 3.4 below. Prior to 1990, no other food crop was recorded as formally exported (Uganda-Ministry of Planning and Economic Development, 1987).

Table 3. 4: Exports by quantity 1990-1997('000 metric tonnes)

Crop	1982	1983	1984	1989	1990	1991	1992	1993	1994	1995	1996	1997
Maize	1.6	30	30	1	26.7	33.1	29.6	160.4	99.5	86.1	86.1	52.8
Beans	-	-	-	-	9.3	14.4	9.3	47.5	37.5	38.8	38.8	27.8
Simsim	-	-	-	-	9.2	17.8	12.9	8.4	4.1	9.3	9.3	1.5
G-nut	-	-	-	-	-	0.2	0.1	0.6	0.4	0.4	0.4	0.1
Bananas	-	-	-	-	1	1.8	2	0.3	2.5	1.2	1.2	0.1
Soybean	-	-	-	-	-	2.4	-	7.1	1.7	4.0	4.0	0.4
Fish	-	-	-	-	1.7	4.7	4.9	6.1	6.6	16.1	16.1	11.8

Source: *Compiled from Uganda-Ministry of Planning & Economic Development, 1997; Uganda Bureau of Statistics, 1999. NB. Between 1985 and 1987, Uganda experienced political instability hence the lack of data for especially maize which is the only crop recorded as formally exported before 1990. A "-" indicates no figures are available.*

Varying and erratic circumstances have presented opportunities to the Ugandan farmers and traders to market NTAE's. As seen in Table 3.4, maize increased from about 30,000 metric tonnes in 1992, to 160,000 metric tonnes in 1993, and decreased to about 100,000 metric tonnes the following year. Beans and simsim too, showed wide inter-year variations. A notable cause of these increases has been the war in the Great Lakes Region. World Food Programme (WFP) procured substantial quantities of maize and beans to supply the displaced people and refugees. WFP also purchased food for internally displaced persons in Uganda (mainly in the North of the country). A surge in demand for simsim due to drought in Sudan, a major producer, resulted in it receiving the status of "white gold", in the regions where it is grown. A slump followed the normalisation of conditions in Sudan.

Statistics of formal/recorded trade however, understates the extent of food trade across Uganda's borders by the quantities traded informally. Cross-border trade has long existed with commodity flows depending on the supply and demand conditions and relative terms of trade (World Bank, 1996). A study of unrecorded cross border trade between Kenya and Uganda (Ackello-Ogutu & Echessah, 1997) made the following estimates for the period August 1994 to July 1995 (see Table 3.5).

Table 3. 5: Estimates of unrecorded food exports from Uganda to Kenya

Commodity	Quantity (tonnes)	Value (US $ million)
Maize	84, 250	12.44
Beans	9, 270	5.37
Other grains[a]	12, 670	4 930
Bananas & other fruits		540
Roots & Tubers		1,850
Other agricultural Commodities[b]		490
Fish	89,780	30.18

Source: *Ackello-Ogutu & Echessah, 1997*
Other grains[a]= (sorghum, simsim, green-grammes, millet, g-nuts and rice)
Other agricultural commodities[b] = (tomatoes, eggs, onions, tea, cabbage, poultry and banana trees).

On the other border fronts, a study commissioned by USAID-FEWS (Nobera, 1999), listed sorghum, beans and cassava as the main exports to Southern Sudan. Fish, eggs, milk, goats and simsim oil were the main exports to the Democratic Republic of Congo (DRC). Matooke, beans, maize, vegetables, milk and eggs were exported to Rwanda, and eggs, broilers and milk to Tanzania. However, the study carried out before the ongoing war, suggested that Uganda on the other hand imported more agricultural produce than it exported to DRC and Tanzania. This was in part due to the better market conditions and infrastructure in Uganda. In comparison, infrastructure linking the eastern region (which is potentially that country's breadbasket) of DRC to the rest of that country and likewise the northerly points of Tanzania to the rest of the country, are in poor states. The transaction costs involved in trade with Uganda are therefore lower. Foods imported into Uganda included cassava, maize, beans, groundnuts, rice, fruits and vegetables and were transported to Kampala and beyond (some transits through to Kenya). The trade direction may have changed now because of the war.

As regional markets are integrated, policies in trading partner countries also affect food supply and demand in Uganda. For example, stagnation in production and high population growth renders Kenya a net maize importer in most years (Kherallah et al., 2000). However, production has been dampened by the low producer prices that are a result of price controls and market restrictions (Nownwu, 1994).

3.4.4 Social policies and their implications

The focus of Timmer's proposed development paradigm is the agricultural sector. However, transformation in the agricultural sector does not take place in isolation of other sectoral policies and programmes. As part of the ERP, anti-inflationary demand management meant a cut back on budgetary expenditure, often with negative effects on social services. Although Government has remained committed to improving their provision, a number of changes have been instituted to ensure the cost-effective use of the limited funding.

Expenditure on primary health care and prevention have been prioritised over that on curative care which had drawn the larger share of budgetary health expenditures and was concentrated in urban areas. Government moved to concentrate its resources on the provision of essential public goods like immunisation, family planning and health education (Uganda-Ministry of Finance and Economic Planning, 1992b). According to the White Paper on Health (cited in World Bank, 1996) providing essential drugs remain a priority. However, cost recovery/sharing in the provision of curative services, categorised as private consumption, was encouraged (Uganda-Ministry of Finance and Economic Planning, 1992f; World Bank, 1993c). However, for an individual, curative services bring immediate benefits that may out weigh the long run benefits of investment in such public goods. Furthermore, it was often the poorer segments of the population who were the main beneficiaries of public services.

The costs of purchasing health services are a barrier to most of the population (Uganda-Ministry of Finance, Planning and Economic Development, 1999). Findings are that 51% of the national population do not seek medical attention when ill. As indicators of the price limitations, a 3,000 to 3,500 shs fee levied for maternity services was largely unaffordable, while a 500 shs fee for child immunisation was a barrier to participation.

A similar situation exists in the education sub-sector. A lopsided subsidisation of, especially, tertiary education though benefiting a few, continued until recently. For example, in 1989/90 it was estimated that within the education budget, on a per pupil basis, expenditure on secondary and tertiary education was 15 and 225 times as much as that on primary education, respectively (Uganda-Ministry of Finance and Economic

Planning, 1992b). To redress the situation, a policy shift redirecting emphasis to primary education through the programme of Universal Primary Education (UPE) has been effected. Government meets the tuition fees (public schools) of four children per family. Started in 1998, an immediate doubling to 5.3 million primary school going children was realised (Uganda-Ministry of Finance, Planning and Economic Development, 1999). This is an indication of the limitation the costs of education pose for most of the population although during this study, farmers maintained that the non-tuition costs were still considerable. Nonetheless, education is highly valued and parents are willing to denude themselves of their savings, such as livestock and sell food to ensure that their children go to school.

The following figures, estimates for Mbale town, are indicative of school tuition fees of primary and secondary school education per term (Uganda Bureau of Statistics, 1998).

	1st term, May 1998	2nd term, June 1998
Primary school (day)	26,669 shs	27,040 shs
Primary school (boarding)	80,443 shs	89,843 shs
Secondary school (day)	34,109 shs	35,769 shs
Secondary school (boarding)	155,386 shs	155,386 shs

The respondents frequently referred to the costs of accessing health and education services as prohibitive, with particular reference to cost-sharing. Production and consumption decisions remain closely intertwined with decisions regarding economic and social welfare and therefore have a direct bearing on food security. This is pronounced because food is an important source of income for many and respondents indicated that they often had to sell food to meet some of these costs.

3.4.5 Internal insecurity

Besides policy, another factor that has been important in determining supply and demand of food in Uganda is insecurity. While security is an enabling factor for both production and trade, the converse is equally true; insecurity has often hindered production and trade. Insecurity has severely affected different parts of the country at different times over the last three decades, impoverishing, displacing and curtailing production. Parts

of the Northern region, which has been politically unstable for most of the last decade and a half, is a case in point. Despite the agricultural potential, production in Gulu and Kitgum districts in particular has been constrained and they have become net food importers (COOPIBO et al.,1998)

During the study, a sampled county in Mbale District was part of an area that suffered an incidence of cattle raiding by the Karamojong, a nomadic tribe from a neighbouring district. While none of the sampled households may have been directly affected, they are indirectly affected by the disruptions and fear induced in the community. Rushed movement and/or sales of livestock result in farmers incurring losses. Food and assets were also lost to the raiders, or to those taking advantage of the situation, and farming activities were disrupted.

Recovery is often slow given limited Government support and opportunities for employment outside agriculture. Parts of the Eastern and Northern regions, and "Luwero triangle", are examples of the slow recovery that follow war. The Eastern and Northern regions in particular suffered insecurity in the late 1980's. The livestock sector was largely destroyed, and with it, long term savings and means to production since ox-ploughing was well rooted in Kumi and Soroti districts. Because of the importance of livestock to their very livelihood, households now prioritise investment particularly in cattle and oxen for ploughing. It is common for farmers to accumulate the smaller stock, mainly goats, which are later sold or exchanged for an ox. There has been limited support in restocking and given that cotton, the main cash crop in this region is just being revived, food crops have implicitly provided the main source of finance.

3.5 MODEL SPECIFICATION

Against this background, food availability is a function of agricultural production and other factors beyond agricultural production and these must therefore be taken into consideration in analysing the food security situation in the country. The specification of the model therefore seeks to place the issue of food availability and commercialisation within the context of the socio-economic environment in addition to factors that directly affect agricultural production. The following section specifies the model that is likely to

describe the existing situation. The main hypothesis underlying the model specification is that:

i) Increased production positively contributes to food availability. Cultivated land area as an important limiting factor to production, is used as a proxy to production levels.

ii) Food sales negatively contribute to food availability and therefore negate household food security. The higher the proportion of food sold relative to production, the less food secure households are.

iii) Households faced with relatively high non-food costs, reflected by whether they have children who are six years or less or children attending post primary education, have less food available than households without children in these brackets.

The dependent variable is the average daily calories available per adult equivalent[2] evaluated against the minimum requirements per adult equivalent. The household mainly obtains food through production and food purchases. Production is adjusted for sales, post harvest losses, quantities used in beer making (for mainly cereals and cassava) and seed[3]. This gives the net amount of calories potentially available as further losses may be incurred through the mode of preparation. FAO conversion tables for use in Africa (FAO and US Department of Health, Education and Welfare, 1968; Uganda-Ministry of Finance & Economic Planning, 1995c) were used to determine calorie equivalents for the different foods.

Whether the household can meet its food requirements for the period of analysis, is determined by how the net available calories translate into average daily calories available per adult equivalent (to control for differential food requirements by age and gender of each member of the household). This is compared against the minimum daily

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[2] *The Adult Equivalent standardises the family size by gender and age and is used to estimate the calories available per household, on average. It is based on FAO consumption requirements for "normal" activity levels and is defined as: males 10 years or older = 1AE, females 20 years or older = 0.72 AE, females 10-19 years old = 0.84, children less than 10 years old = 0.60 (cited in Marrule et al., 1992).*

[3] *It is estimated that 25% of the food is used as seed, feed and goes to waste. In addition 10% correction is applied to compensate for loss of calories in foods used in brewing alcohol, which are mainly the cereals and cassava (Ministry of Agriculture & Forestry, 1984a).*

requirements per adult equivalent, about 2,419 calories, a Sub-Saharan Africa standard also applied by the EPAU study (Uganda-Ministry of Finance & Economic Planning, 1995b). The relatively more food insecure households would have less than the minimum requirements and the food secure households would have more than the minimum requirements.

The food available to the household[4]: $FSSTAT = (\Sigma C_iXp_i + \Sigma C_iXb_i) - (\Sigma C_iXs_i + \text{post harvest losses} + \Sigma C_iXg_i)$.

Where:

FSSTAT	=	The food available for consumption per household.
ΣC_iXp_i	=	Sum of quantity of food (calories) produced (CALPROD)
ΣC_iXs_i	=	Sum of quantity of food (calories) sold (CALSOLD)
ΣC_iXb_i	=	Sum of quantity of food (calories) bought (CALBUY)
ΣC_iXg_i	=	Sum of quantity of food (calories) in store (CALSTO)
C	=	Calorie equivalent of food i
X	=	Quantity in kilograms
i	=	different foods
p	=	produced
s	=	sold
b	=	bought
g	=	incremental stocks

$$CALORIAE = \frac{FSSTAT}{TOTAE\ HH}$$

Where:

CALORIAE	=	Average daily calories available per adult equivalent
TOTAE HH	=	Total number of adult equivalents in a household.

4 *Food available refers to estimates of food actually consumed.*

Cognisance however, is taken of the fact that calorie availability abstracts from the implications of health or intra-household distribution, as earlier discussed. It also does not take into consideration poor utilisation of food that may occur due to inadequate micro-nutrients in the diet.

It is postulated that:

Average daily calorie per adult equivalent = f(household characteristics, production, commercialisation, non-food expenditure, wealth).

The choice of independent variables is guided by the above discussions and by the literature (Kennedy & Cogill, 1987; Makhura, 1994; Maxwell, 1996; Strasberg et al., 1999; Von Braun, Bouis & Kennedy 1994). The hypothesised relationships are shown in Table 3.6. Ordinary least squares and logit regression analyses have been widely used in similar studies (Bahiigwa, 1999; Chisvo & Jayne, 1992; Kennedy & Cogill, 1987; Teklu et al., 1991; Von Braun et al., 1991; Von Braun, Johm & Puetz, 1994). They are likewise applied in this study as the main analytical tool.

Hypothesised relationships in the study largely depend on how they potentially affect either supply or demand according to the above discussions and as supported by the literature.

Table 3. 6: Variable description and hypothesised relation to food security

Variable	Definition	Expected sign
AGE_HHH	Age of household head	+
OCC_FARM	Main Occupation of household head is farming	?
EDU_NONE	Household head has no formal education	+
GEN_HHH	Gender of household head is male	-
CHI_SIX	No. of children 6 years old or less	-
CHI_PS	No. of children in Primary School	-
CHISES_D	Has at least a child in post-primary school-	
LND_USED	Cultivated land area (acres)	+
CATTNO_D	Own cattle?	
GOAT_NO	Number of goats	?
AVHCI	Index of proportion of food produced that is sold	-
SUMINCOM	Sum of non-food and cash crop income ('000 shs)	?
AV_NFEXP	Non food Expense ('000 shs)	-
MKT_DIST	Average market distances (km)	+

NB. The expected sign hypothesises the relation of the variable in question with food security, (+ = positive and - = negative contribution to food availability security, ? = could be either negative or positive to food availability).

For segments of the population that produce most of their food, food availability is largely a function of the availability of production factors and technology in use. Land, a basic factor of production, is one of the factors. In a study to examine the extent to which household grain availability explains stunting among under-fives in Zimbabwe relative to other factors in communal areas, net grain availability (production, purchases and food receipts, less sales and changes in storage inventory) was calculated as an indirect measure of actual grain consumption. Findings were that land positively contributed towards the amount of grain available for consumption by the child, as did those factors that contribute positively to production. A positive association between grain availability and nutritional status at the 10% and 15% level of significance was observed (Chisvo & Jayne, 1992).

A study done in three districts in northern Mozambique (Tschirley & Weber, 1994), found that land area under cultivation was the main determinant of calorie production, in turn the primary determinant of overall calorie availability. Cash income (off-farm or from cash crops) had minimal effects on consumption. Reasons were that scarcity of off-farm employment opportunities and widespread failure of food markets for purchases encouraged a reliance on own production to meet subsistence needs.

Household characteristics are important determinants of household behaviour or decision making and have been known to have an impact on food security. Besides wealth, the capacity to cope in a food crisis has also depended on human capital accumulation. In Sudan, following the famine of the mid-1980's, children in rural households where the parents especially the mother had attained some formal education, were nutritionally better off than other children (Teklu et al., 1991). Likewise in Kenya, households with at least one member having completed primary school, enjoyed a 10% jump in food crop productivity over those where no member had achieved this level of schooling (Strasberg et al., 1999). They attributed this to better management skills imparted with higher education. A similar relationship would therefore be expected with food security given the generally hypothesised positive relationship between food productivity and food security.

While a high dependency ratio should constrain the ability of a household in meeting its welfare needs, the household size itself seems to pose similar problems. In Rwanda, Von

Braun et al. (1991) found that in the larger households, an additional person reduces average calorie consumption by about 3.3% (85 calories). In Senegal, Goetz (1992) found that larger households raised the likelihood that a household participated in the market as a coarse grain buyer.

Female-headed households had a higher propensity to spend income on food and where women in the household earned a higher share of cash income, there was an incremental effect on food-energy consumption. Similarly, a shift in the control of rice, which was traditionally a woman's crop, to the compound head reduced calorie consumption, holding income constant (Von Braun, Johm & Puetz, 1994).

Findings in Kenya were that much of the incremental income earned by sugar farmers is spent on non-food expenditures. Merchants and sugar-producing households, assumed to be in the upper income brackets, spent more on housing and education than other households in the sample (Kennedy & Cogill, 1987). In the short run, the effects of such expenditure did not appear to produce a nutritional benefit on the pre-schoolers. Nonetheless, income positively affected household calorie consumption and that from sugar in particular had an additional positive effect above the pure income effects. A percentage increase in sugar cane income was related with an increment of 24 calories in household energy intake.

The variable, number of children six years or less, is a proxy for the costs of health care (general respondent complaint in the study). As earlier discussed, this age group is considered to be highly vulnerable to both nutritional deficiencies and ill health. It is hypothesised that given widespread poverty, households with children in this age group would face high costs for health care. Because food is a common source of cash income, health care should indirectly have a negative effect on food availability.

Like health, because of the widely expressed complaints over the costs of education it is expected that they too reflect in reduced food availability. Because the costs of post-primary education are on average more prohibitive than that of primary education, children attending post-primary education, is the preferred indicator.

3.6 CHAPTER SUMMARY

The chapter gives an overview of socio-economic developments in Uganda that have had a bearing on food production and domestic demand. The structure of agriculture has remained predominantly smallholder partly because the failure of plantation farming. The structure of agriculture is an important factor to household and aggregate food self-sufficiency given that the majority of the population produces their own food. During a period of political instability and economic decline, the role of the food sub-sector became more pronounced as the cash crop sector declined. However, like the rest of the economy it too suffered the effects of negative growth during the two decades of overall decline.

The chapter argues that the low level of deprivation imposed on the population by the economic decline affected demand for all goods and services, including food. Inflation and the over-valued shilling had eroded effective demand, thus constraining market demand. The distribution system was also highly subject to the negative effects of non-tariff barriers and poor infrastructure.

Economic growth and the relaxation and/or removal of non-tariff barriers have contributed to the transformation of agriculture, manifest in the commercialisation of the food sub-sector. Coupled with the domestic factors are political developments within the East African and Great Lakes Region which, because of increased market integration and the procurement of food aid from Uganda, have contributed to growth in demand for food. Against this background and with findings from other studies, the model to be used in examining whether commercialisation of the food sub sector is contributing to food insecurity, is specified. It is postulated that:

Average daily calorie per adult equivalent = f(household characteristics, production, commercialisation, non-food expenditure, wealth).

CHAPTER 4

THE STUDY AREA: HOUSEHOLD AND DISTRICT PROFILES

4.1 INTRODUCTION

Uganda is a landlocked East African country lying astride the equator. Almost 80% of the country is at an altitude ranging from 620 - 5,100 m above sea level, moderating the climate to a temperature range of 17° to 32°C. Of its 241,038 km^2, land covers 81% (197,097 km^2), water and swamps cover 16% and forests cover 3%. It experiences both equatorial and savannah climatic conditions with most of the country receiving rainfall in the range of 1,015 to 1,525 mm per annum. A few places receive about 500 mm of rainfall per annum while the Lake Victoria Crescent receives more than 2,000 mm of rainfall per annum. In the south, a bi-modal and well-distributed rainfall pattern allows two crop seasons. This tends towards a uni-modal pattern in the north where the range of crops grown is thus limited. Overall, the climate allows the production of a variety of tropical, sub-tropical and even temperate crops (wheat, Irish potatoes and pyrethrum).

Administratively, the country is partitioned into districts, each of which encompasses a hierarchy of administrative levels (Local Councils) starting at the village level. With the decentralisation process, devolution of power from the centre, the lowest level with some degree of financial autonomy is the sub-county, i.e. Local Council II (Uganda-Decentralisation Secretariat 1994). The decentralisation process is important to the policy making process because it is at the lower levels that policy is interpreted and implemented depending on the allocation of the resources.

Because agriculture is the main economic activity and means to a livelihood for the majority, the chapter discusses different factors that have a direct bearing on the agricultural sector. This includes the agro-ecological characteristics, land and labour availability, cropping patterns, input use and resource control. Demographic characteristics and infrastructure, both of which have a bearing on agricultural activities, are also discussed. Anthropometric data give an indication of the food security situation

in the three districts. Both secondary and primary data are used in this descriptive analysis.

4.2 AGRO- ECOLOGICAL CHARACTERISTICS

The country is classified into several broad agro-ecological zones. However, variations in classifications exist. Opio-Odongo (1992) presents an 11-zone classification in which the montane and the banana/coffee systems discussed below are further sub-divided. To present an overview of the variation in the agro-ecological dispositions, it was decided to use the 7 broad agro-ecological zones[5] as referred to in Uganda-Ministry of Finance & Economic Planning (1996) and Opio (2000). They are briefly discussed below. Of interest to this thesis are the Teso, Montane and Northern systems. A summary is presented in Appendix 2.

4.2.1 Teso system

In the Eastern part of the country, north of Lake Kyoga, the Teso system includes Soroti, Kumi, parts of Pallisa and the recently created Katakwi districts. The main characteristics of this zone are:

- It receives between 1,065 and 1,774 mm of rainfall per annum in a bimodal pattern; the first rains are from March to June and the second rains from August to November with a pronounced dry season from December to March
- It has light, moderately productive sandy-clay-loam soils, most suitable for ox-cultivation
- The main annual food crops grown are finger millet, sorghum, groundnuts, simsim, sweet potatoes, cassava and beans. Inter-cropping, rotations and fallow periods have been common practices to maintain fertility and reduce soil loss
- Cotton was the dominant cash crop and its production is only being revived

[5] *Because of recent changes in the number of districts and district boundaries, this description does not accurately represent the existing district structure.*

- It has good potential for beef cattle (before cattle rustling in the late 1980's, together with Karamoja Teso had 40% of the national herd), goat rearing, poultry and bee keeping (apiary).

Areas in this zone have suffered several shocks in the recent past, turning it from a net surplus food producer to one regularly facing transitory food insecurity. Cotton growing declined greatly because of a number of factors ranging from poor marketing to the fact that is very demanding on labour. Cattle rustling in the latter half of the 1980's almost wiped out the livestock sector. More recently, the African Cassava Mosaic Virus destroyed vast areas of cassava although the introduction of resistant varieties has contributed to the crop's recovery.

4.2.2 The Montane systems

This zone as the name suggests, covers the mountainous areas in the eastern and south-western parts of the country. It is similar to the banana/robusta coffee system, varying in altitude and relief. In the east, it includes Mbale and Kapchorwa districts, and in the south-west it includes Kabale, Rukungiri, Kisoro, Bushenyi, Kasese, parts of Mbarara and Kabarole districts. Kabale and Kisoro districts face relatively poorer rainfall distribution that is comparable to the equatorial zones. Population densities are relatively high in this zone. Its main characteristics are:

- It receives rainfall ranging from 809 to 1,427 mm per annum
- It's soils are good to moderate and of a volcanic nature
- The main food crops grown are bananas, maize, beans, sweet and Irish potatoes, finger millet and rice. Sorghum is the main food crop in Kabale and Kisoro where the distribution of rainfall is poorer relative to much of the zone
- The traditional cash crops grown are arabica coffee at higher altitudes (1,500 to 2,300 m), while robusta coffee and cotton are grown at the lower altitudes. Tea is grown in the south-west montane areas
- It is suitable for dairy cattle, goat rearing and poultry keeping
- The high altitude permits the production of temperate fruits, vegetables and Irish potatoes.

4.2.3 The Northern system

The districts that make up this zone are Apac, Lira, Gulu and Kitgum. Communal cultivation is a common practice in this zone. Although tobacco is grown in some areas, this zone also suffered the decline in the growing of cotton as its main cash crop. Cassava has suffered destruction by the mosaic virus, although it is recovering because of the use of resistant varieties. Agricultural productivity has, in the last decade and a half, suffered because of instability. Gulu and Kitgum districts have been faced with insecurity, which spills over into Apac and Lira districts.

The main characteristics of this zone are:

- It receives 1,204 to 1,822 mm of rainfall per annum in a less pronounced bi-modal pattern
- It has moderate to poor alluvial soils
- The main food crops grown are simsim, sorghum, finger millet, groundnuts, beans and cassava
- Cotton (being revived) and tobacco are the traditional cash crops
- It is suitable for beef cattle, goat rearing and poultry keeping.

4.2.4 West Nile system

This zone covers the districts in the north-west of the country, Nebbi, Arua and Moyo. Its main characteristics are:

- It receives 1,246 to 1,670 mm of rainfall in a pattern that restricts cultivation to one season
- It has good to poor sandy-clay-loam soils
- Tobacco, cotton and arabica coffee are its traditional cash crops
- The main food crops grown are cassava, finger millet, sorghum, simsim and groundnuts
- Suitable for dairy and beef cattle, goat rearing and piggery
- Other common enterprises are bee keeping and fish-farming.

4.2.5 Banana/coffee system

This system covers the high rainfall areas in the Lake Victoria crescent. It includes the districts of Mpigi, Kampala, Jinja, Iganga, Mukono and Masaka, parts of the western region covering Bundibugyo, parts of Hoima and Kabarole districts, and parts of Luwero and Mubende districts. The proximity of the concentration of demand (the main urban areas) presents many opportunities for food trade. Horticultural crops are also a growing sub-sector. The practice of letting land lie fallow is minimal. Its main characteristics are:

- It receives rainfall in the range form 940 to 1,438 mm per annum, well distributed throughout the year especially around Lake Victoria and in a bi-modal pattern in the rest of the zone
- It's soils are deep, sandy-clay-loams with medium to high productivity
- The main food crops grown are bananas, sweet potatoes, maize, beans, groundnuts and cassava. It is a common practice for the annuals to be inter-planted within the perennial crops
- Robusta coffee is the main cash crop often inter-cropped with bananas and there are pockets of tea, sugar cane, and vanilla growing
- It is suitable for dairy cattle, piggery and poultry keeping
- Other enterprises are bee keeping and sericulture.

4.2.6 Banana/finger millet /cotton system

This zone covers parts of Masindi and Luwero districts, Kamuli, Pallisa and Tororo districts. The main characteristics are:

- It receives 1,056 to 1,595 mm of rainfall in a bi-modal pattern
- It's soils are partly low productive alluvial-sandy soils and sandy-clay-loams with low to medium productivity
- The main food crops grown are maize, finger millet, sweet potatoes and beans
- The traditional cash crops grown are cotton and robusta coffee
- It is suitable for dairy and beef cattle, goat rearing, piggery and poultry
- Other enterprises are bee keeping, fish farming, mushroom growing and floriculture.

4.2.7 Pastoral system

This system is found in the relatively more arid areas of the country, stretching from the north-east of the country through parts of the centre to the mid-south. It covers the districts of Kotido, Moroto, parts of Luwero, Mubende, Mpigi, Kiboga, Masindi, Mbarara, Masaka, Rakai, Kasese, Bundibugyo districts. Nomadic cattle keeping, is a prominent activity. The main characteristics of this zoned are:

- It receives the least rainfall in the country ranging from 768 to 1,115 mm per annum
- It has moderate to poor soils comprising sandy-clay-loams and black-clays of low productivity
- Its main annual food crops are finger millet, sorghum, cassava, beans and maize
- It is suitable for beef and dairy cattle, goat rearing and poultry keeping
- Other enterprises include bee keeping and fish farming.

4.3 HOUSEHOLD DEMOGRAPHIC CHARACTERISTICS

About 90% of the national population dwell in the rural areas with an average household size estimated at 4.9 persons (Uganda-Ministry of Finance & Economic Planning, 1994). The female/male ratio in the national population is 1:1. National literacy rates are higher for men (63.5%) than for women (44.9%). Literacy rates in the rural areas are 60.5% for men and 40.6% for women.

From Table 4.1, the household demographic structures are similar across the three districts as illustrated by the different variables. Female headed households, range from 9% of the sampled households in Mbale District, to 12% in Soroti District. The head of the household is older in Mbale District, on average. This may be due to the land constraint, i.e. lack of land for farming may push young adults away from the rural areas in search of a livelihood.

Table 4. 1: Average household demographic variables by district

Variable/District	APAC	SOROTI	MBALE
Sample Size	153	149	151
Age Head of Household	43 (14.6)	42 (13.9)	49 (13.5)
Gender Head of Household			
Male	89%	88%	91.5%
Female	11%	12%	8.5%
Education Level of Household head			
Male – Primary	57.4%	61.8%	60.2%
Male – Post Primary	34.6%	26.7%	31.9%
Female – Primary	56.9%	51%	70.3%
Female - Post Primary	2.9%	2%	11.3%
Household size (Number of people)	6.0 (2.7)	6.3 (2.8)	6.3 (2.9)
Dependency Ratio	0.40 (0.21)	0.40 (0.22)	0.39 (0.22)
Total Adult Equivalent (AE)	4.60 (2.06)	4.88 (2.19)	4.96 (2.54)
Children 6 years old or less	1.7 (1.4)	1.6 (1.5)	1.9 (1.6)
Children in Primary School	2.0 (1.8)	2.3 (1.9)	2.4 (1.9)
Children attending Post-Primary School	0.3 (0.7)	0.2 (0.6)	0.6 (1.2)
Households with no child in Post-primary school	84%	85%	72%

Source: Primary Survey data (standard deviation in parenthesis)

Most household heads, both male and female, have attended some formal education, i.e. primary and/or post-primary education. Between primary and post primary education, most household heads, men and women, have attended primary education but fewer have some form of post-primary education. Between men and women, more men, i.e. 35%, 27% and 32% in Apac, Soroti and Mbale districts respectively, have attended some form of post-primary education. In comparison, 3%, 2% and 11% respectively of the women have attended post-primary education.

On average 2 children per household were attending primary school education. In contrast, households having post-primary school going children are only about 15% of the sampled households in Apac and Soroti districts and 27% of the households in Mbale District. This is indicative of the prohibitive costs of education discussed in Chapter 3.

4.4 INCOME DIVERSIFICATION

Uganda has been described as predominantly rural and agrarian (IFAD, 1994). The finding that the main occupation of the head of the sampled households is farming reflects the predominance of agriculture, as seen in Table 4.2. Though more households in Apac and Soroti District were engaged in fishing than are reflected in the table, they still consider agriculture their main occupation.

Table 4. 2: Main occupation of the head of the household

Main Occupation of the Household Head	APAC		SOROTI		MBALE	
	No.	%	No.	%	No.	%
Farming	130	85	120	80.5	131	86.8
Public service	8	5.2	14	9.4	13	8.6
Local artisans	8	5.2	6	4	3	2
Fishing	1	0.7	5	3.4	0	0
Trade	6	3.9	3	2	2	1.3
Others	0	0	1	0.7	2	1.3

***Source**: Primary Survey Data*

Income diversification is one measure commonly adopted to reduce variations in income that are particularly prevalent in the agricultural sector owing to productivity fluctuations. In the sampled areas, as in most of rural Uganda, opportunities for income diversification are limited and farm output is the main source of cash income. It was only in one sub-county, Olio in Serere County where an agricultural research station offers opportunities for wage labour. Besides farm output, wage labour is the most common source of income. However, the opportunities for wage labour are highly correlated to activities in the agricultural sector and are therefore seasonal and the demand for labour is constrained by the limited variation in production levels. Opio (2000), citing data from Integrated Household Surveys, notes that the most common non-farm job opportunities, namely wage work in construction, petty trade and preparation of food for sale, generally provided lower returns per year than agricultural wage work.

Nonetheless, some degree of income diversification exists. The study found that besides wage labour, many households engage in other activities such as trade, bicycle repairs, carpentry, brick making, construction, "boda boda" (bicycle or small motor-cycle used to transport people and/or goods on a hire basis) etc. Besides wage labour, women were

commonly engaged in making and selling beer, running market and/or roadside food/snack stalls. In support of this observation, findings from a recent study are that general service and retail shopping are becoming common employment avenues in rural areas. They account for about 13.3% and 12.8% of household labour use respectively. Beer brewing was estimated to account for up to 20.8% of household non-farm labour use (Opio, 2000). He suggests a strong positive association between non-farm rural employment and infrastructure development and so a variation between districts depending on the state of infrastructure.

Data on household income and expenditure were collected but absolute values are interpreted with caution. As an example, in Bumbo and Bugobero sub-counties in Mbale District informal cross border trade is an important economic activity. However, because of Government's efforts to reduce smuggling, respondents were very cautious with their responses regarding income generating activities in which they are engaged. Of income generated from non-farm activities, in Apac District, on average women control about 45%, in Soroti District they control about 37% and in Mbale District about 29%. Through the group discussions it was often said that women are losing control over even food where previously their control largely contributed to their ability to ensure that their households had sufficient food. Control over and/or access to resources, land and income, are other factors that help them in ensuring food sufficiency for their households. Observations from the study were that opportunities for women to generate income were more limiting in Mbale District. Men predominantly sold their labour but women did not participate as much in selling labour, which could partly be attributed to the land constraint. Table 4.3 shows sum averages of the different sources of cash income and expenditure[6]. This compares favourably with Opio (2000), who in a study done in four other districts of Uganda, found that over 60% of farm households earn 500,000 shs or less.

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[6] *The difficulty of collecting income/expenditure data is widely acknowledged in the literature. Differences between average income and expenditures are a pointer to these inaccuracies and the data is therefore interpreted with caution. More emphasis is therefore given to the relative values rather than the absolute values.*

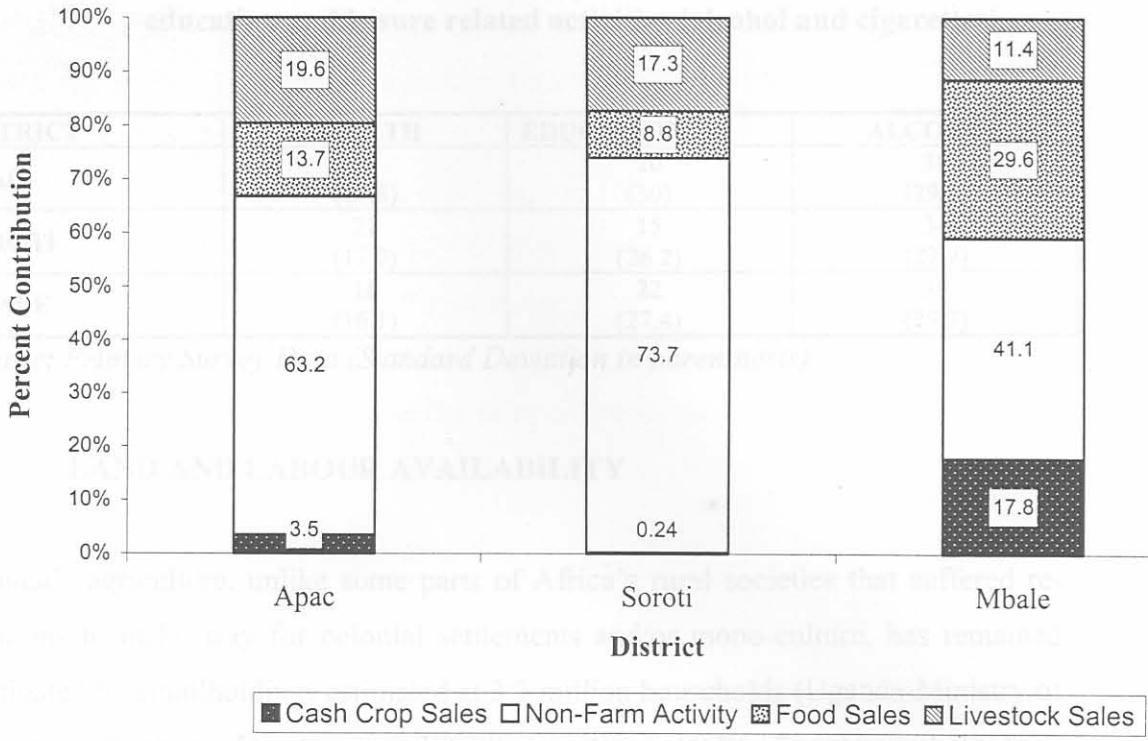
Table 4. 3: Average household income and expenditures (shs)

District	Total Annual Income	Income from different Sources				Expenditure[e]	
		Cash Crop Sales[a]	Non-farm Activity[b]	Food Sales[c]	Livestock Sales[d]	None food items	Food Items
APAC	**537 913**	17 215	41 242	66 788	33 070	24 914	8 152
	(437 710)	(34 299)	(35 583)	(84 954)	(66 356)	(27 603)	(3 918)
SOROTI	**498 463**	1 915	39 563	33 398	22 801	20 791	9 226
	(402 691)	(10 343)	(36 944)	(42 325)	(36 813)	(18 147)	(4 766)
MBALE	**770 210**	129 095	36 370	205 560	24 619	19 563	11 485
	(527 354)	(134 148)	(41 041)	(159 694)	(39 786)	(18 756)	(5 784)

Source: *Primary Survey Data (standard deviation in parenthesis)*

NB [a]Cash crop income is on an annual basis, [b]Non-farm income is monthly, [c]income from food sales is summed up for total quantities sold, [d]livestock income is on a three monthly basis, [e]Expenditure is monthly.

Despite that the primary data on income and particular is cautiously interpreted, they reflect the wide variation that exists in the data and implicitly between the households in the sample. The coefficient of variation in income from food sales in Soroti district is for example 1.27, that from cash crops in Mbale District is 1.04. In addition to wide intra-district variation, there are inter-district variations as well. Cash crop income is observed to vary widely across the three districts. Soroti has the lowest average and this is mainly because cotton, which was the traditional cash crop grown in the region, is only being revived. Although cotton is similarly being revived in Apac District, in some areas, e.g. Inomo Sub-county, tobacco is also grown. On average incomes generated from non-farm activities and the sale of livestock are more homogenous across the three districts. Income generated from food sales however, varies widely between Mbale on the one hand, and Apac and Soroti on the other.



***Source**: Data from Primary Survey*

Figure 4. 1: Percentage contribution to annual income by sub-sector

Relatively more cash expenditure is on non-food than on food purchases. During the study, farmers often complained about the costs of health care and education and reported that they are a reason for selling food, even if the ultimate result is food insecurity. However, breaking down the non-food expenditure into expenditure spent on health, education and alcohol and cigarettes, the largest proportion on average goes to alcohol and cigarettes in each of the three districts (see Table 4.4). Travelling through the villages, bars are apparent and drinking groups often follow market activities and Sunday service. Ultimately, it can be argued that fewer members in the household benefit from household income as it is mainly adults who engage in drinking. Other non-food expenditure is on basic commodities like soap and paraffin, clothing, and to a lesser extent transport.

Table 4. 4: Average proportion (%) of non-food expenditure spent on health, education and leisure related activities (alcohol and cigarettes)

DISTRICT	HEALTH	EDUCATION	ALCOHOL
APAC	19 (17.8)	20 (30)	30 (29.1)
SOROTI	21 (17.7)	15 (26.2)	34 (27.9)
MBALE	16 (16.1)	22 (27.4)	30 (29.3)

Source: *Primary Survey Data (Standard Deviation in parenthesis)*

4.5 LAND AND LABOUR AVAILABILITY

Uganda's agriculture, unlike some parts of Africa's rural societies that suffered re-locations to make way for colonial settlements and/or mono-culture, has remained dominated by smallholdings estimated at 3.2 million households (Uganda-Ministry of Planning & Economic Development, 1997d). An estimated 97% of rural households have access to farmland (Nygaard et al., 1997; World Bank, 1993a) with holdings of on average 5 acres per household. It is estimated that 62.2 % have access to ≤ 2.5 acres, 85% ≤ 5 acres and 95.5% ≤ 10 acres. By region, land ownership on average ranges from 2.5 acres or less in the central and south of the country, to larger parcels of 22.5 acres northwards. Land availability is not yet considered a constraint to production but in the high population density districts of Kabale and Mbale (World Bank, 1993a). This is reflected in Table 4.5 showing that the population density according to projections based on the 1991 census in Mbale is about 367 persons per km^2 compared with 83 and 63 persons per km^2 for Apac and Soroti districts respectively.

Table 4. 5: Land distribution and population densities by district[7]

District	Total area (Km^2)	Farm land (Km^2)	Projections for 1998	
			Mid-year population	Population density/Km^2
APAC	6 541	4 345	544 300	83
SOROTI	10 016	4 968	628 100	63
MBALE	2 467	1 531	905 100	367

Source: *Compiled from Statistical Abstracts, (Uganda-Ministry of Planning & Economic Development, 1997a; Uganda Bureau of Statistics, 1999)*

[7] *District administrative boundaries have since been changed and these projections are of the old boundaries in which the newly created Katakwi District was part of Soroti District.*

The average farm size in Mbale District is about 4 acres per household and in Apac and Soroti districts' it is about 10 acres per household (see Table 4.6). In Apac and Soroti districts, the majority of the farm holdings are 5.1 to 10 acres, i.e. 41% and 45% respectively and slightly more than 20% of the farm holdings are more than 10 acres. In Mbale District the majority of farm holdings, i.e. 58% of farms, are 2 to 5 acres and about 20% are less than 2 acres in size. Those within the bracket of 5.1 to 10 acres, are 17% while about 5% are more than 10 acres.

Table 4. 6: Land distribution in the sampled areas (acreage and proportion of households within defined acreage)

District	N	Mean area	<2 acres	2 – 5 acres	5.1 – 10 acres	>10 acres
APAC	153	10.3 (16.4)	3%	31%	41%	24%
SOROTI	149	10.4 (14.3)	1%	32%	45%	22%
MBALE	151	4.2 (3.5)	20%	58%	17%	5%

Source: *Primary Survey Data (standard deviations in parenthesis)*
NB. The percentages may not add up to 100 because of rounding off

The difference between land owned and cultivated land reflects the finding that land is often a slack variable for many households in Apac and Soroti districts. From Table 4.7, most households, i.e. 74% in Apac District, 73% in Soroti District and 62% in Mbale District, were using between 2 to 5 acres of their farms in production. While less than 10% use less than 2 acres in both Apac and Soroti districts, in Mbale District about 20% of the households use less than 2 acres in production. Only 2% in Mbale and 1% in Apac and Soroti districts were using more than 10 acres in production. The average acreage per adult equivalent (AE) is 0.96 in Apac District, 0.94 in Soroti District and 0.83 in Mbale District.

Table 4. 7: Cultivated land (mean acreage and proportion using defined acreage)

District	N	Mean Area	<2 acres	2-5 acres	5.1 – 10 acres	>10 acres	Area Per AE
APAC	153	4.0 (2.4)	9%	74%	16%	1%	0.96 (0.52)
SOROTI	149	4.0 (2.1)	7%	73%	19%	1%	0.94 (0.67)
MBALE	151	3.6 (2.5)	21%	62%	15%	2%	0.83 (0.62)

Source: *Primary survey data (standard deviations in parenthesis)*

Localised differences do exist. In Apac for example where communal grazing land still exists, the pressure on farm land is on the increase as was reported in Ibuje and Inomo sub-counties. In Mbale District, land pressure is more felt on the slopes of the mountains such as in Budadiri County compared with the low-lying areas like Muyembe Sub-county. In Muyembe Sub-county however, where farm holdings are larger compared with much of the district, many land-less households thriving mainly on wage labour, are a result of land transfers to the large farmers (Group discussions, 1998).

While land is generally considered available, labour is a growing constraint to production (Uganda-Household Agricultural Support Programme, 1997). Generally, family labour is the only labour used in production across the country. According to World Bank (1993a), 68.3% of farms use no hired labour at all. Lately, if is found that a husband and wife team often provide the only labour in a household (Uganda-Household Agricultural Support Programme, 1997).

In Apac District and the Northern agro-ecological zone in general, the labour constraint is alleviated through self-help groups within which labour is shared on a rotational basis (Uganda-Ministry of Agriculture & Forestry, 1984a). The Teso zone widely adopted ox-cultivation for opening the land and shared labour for the subsequent activities. However, following the depletion of oxen due to cattle rustling, labour exchange and wage labour paid for in cash or kind, have become dominant practices. Inter-cropping is a common practice in all the three districts and serves to alleviate the land or labour constraint.

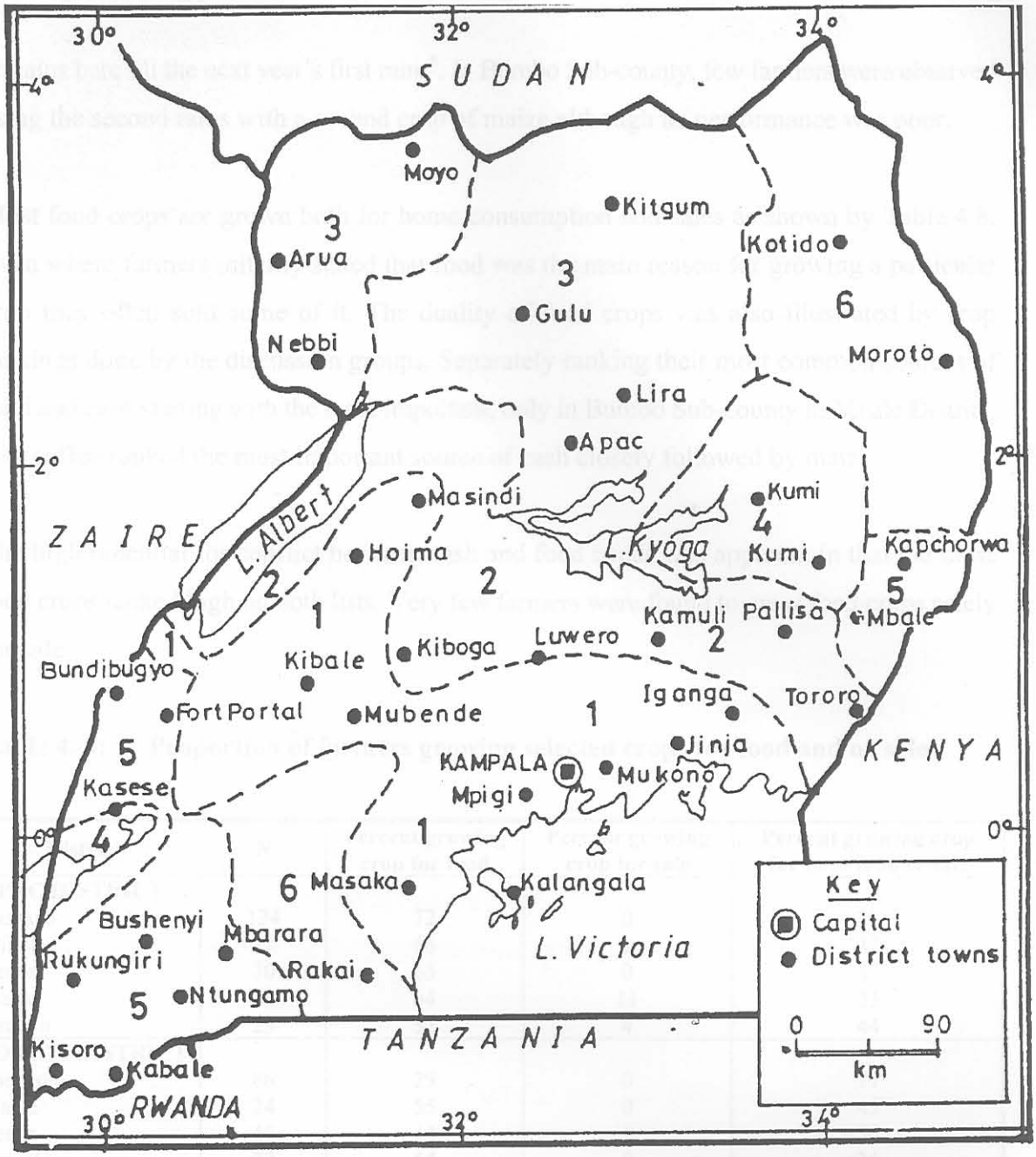
4.6 CROPPING PATTERNS

A diversity of crops best adapted to the agro-ecological conditions as described earlier in the chapter, are grown within each agro-ecological zone. The growing of a range of crops safeguards against the failure of one crop adversely affecting the household and ensures dietary diversity. The crops suitable to the different zones have also had a role to play in the socio-economic development in the different areas. Most notable is that while unfavourable market conditions forced farmers into subsistence production, those growing coffee remained active in the cash economy to a large extent, albeit mainly through the parallel market. This was because of crop specific attributes.

- Coffee is a perennial crop and once established its demands on labour, except at harvest time, is relatively low. It will fruit even with minimal attention albeit at sub-optimal output levels. In allowing resources like labour to be used else where it does not necessarily negate farm productivity except in as far as it occupies land. Annual crops like cotton, which is labour intensive, are more resource demanding in the short term and the decision to plant or not to plant is more subject to the existing market conditions.
- The nature of the harvested coffee crop, i.e. beans, which can be packaged in small quantities in contrast to the bulky cotton, allowed a parallel market to thrive.

Agriculture in Uganda is predominantly rain-fed with less than 1% under irrigation. Although most of the country receives a bi-modal rainfall pattern, in effect, few annual and short maturing crops, e.g. beans and vegetables are double planted in an agricultural year. The main staples, e.g. millet or maize are usually planted in the first (long) rains. In Mbale, maize which is the main annual, is a first season crop. In Soroti District, millet, a staple food, is mainly grown in the first season. In Apac although millet is grown to a lesser extent than in Soroti, it is also grown in the first season.

In Soroti and Apac districts, the practice of crop rotations enables them to put the second rains to good use. Sweet potatoes, sorghum and simsim in some places are for example planted in the second rains in Soroti. In Mbale District, the land constraint makes timing the second rains for maize, the main annual, difficult. Therefore, after the harvesting of the first season maize crop, short maturing crops like beans and sweet potatoes are grown otherwise the land



Agricultural commodity zones

1. Banana, Coffee, Sugar, Tea and Dairying.
2. Banana, Millet, Cotton system.
3. Millet, Maize, Simsim, Tobacco and Cotton
4. Millet, Maize and Cotton.
5. Banana and Coffee - Montane system
6. Cattle herding -pastoral systems.

Source: Adapted from Bibagambah, 1996

Figure 4. 2: Geographical distribution of the production of agricultural commodities in Uganda

remains bare till the next year's first rains[8]. In Bumbo Sub-county, few farmers were observed using the second rains with a second crop of maize although its performance was poor.

Most food crops are grown both for home consumption and sales as shown by Table 4.8. Even where farmers initially stated that food was the main reason for growing a particular crop they often sold some of it. The duality of food crops was also illustrated by crop rankings done by the discussion groups. Separately ranking their most common sources of food and cash starting with the most important, only in Bumbo Sub-county in Mbale District, was coffee ranked the most important source of cash closely followed by maize.

The high potential for conflict between cash and food needs was apparent in that the same food crops ranked high on both lists. Very few farmers were found to grow food crops solely for sale.

Table 4. 8: Proportion of farmers growing selected crops for food and/or sale

District	N	Percent growing crop for food	Percent growing crop for sale	Percent growing crop for both food & sale
APAC DISTRICT				
Cassava	124	72	0	28
Millet	41	66	2	32
Beans	70	63	0	37
Maize	36	64	11	25
Simsim	23	52	4	44
SOROTI DISTRICT				
Sorghum	86	29	0	71
Maize	24	55	0	45
Beans	46	44	0	56
Simsim	22	64	0	36
Cassava	139	48	0	52
Millet	67	38	0	62
MBALE DISTRICT				
Millet	26	61	4	35
Beans	94	56	0	44
Bananas (matooke)	107	27	3	70
Maize	129	5	3	92

Source: *Primary Survey Data*

8 *Some farmers in Buyobo Sub-County argued that the practice of letting livestock off the tether after the* second rains but before the crops are harvested, are a discouragement because the crops are often *destroyed by the livestock.*

Farmers' storage practices have mainly involved sun drying food that is not consumed immediately after harvest and storing it for use in times of scarcity or off-season. Some crops are however, known to store better than others, e.g. millet stores better than either maize or sorghum. However, the study observed that many households no longer maintain granaries and where granaries were found, they were often empty. While it could be interpreted to imply less output, it is in part compounded by the fear of food theft and the high post-harvest losses. A concern for example is that some now widely grown crops, e.g. maize and sorghum do not store as long/well as especially millet, which they are replacing (Group discussions, 1998).

4.7 THE USE OF IMPROVED SEED

It has been argued that as commercialisation progresses, the incentive to increase yields is heightened and there is a shift towards using purchased inputs. Von Braun, Bouis & Kennedy (1994) it is recalled, posits that the proportion of purchased inputs to outputs can be a measure of the degree of commercialisation. Primary results however confirm various findings (Uganda-Household Agricultural Support Programme, 1997); the use of inorganic fertilisers is very low. Crop residues and animal manure are commonly disposed of in the gardens. The use of improved seed is highest in maize and beans, and specifically in Mbale District as seen in the following Table 4.9.

Table 4. 9: Farmers who use improved seed in selected food crops (percent)

CROP	APAC DISTRICT	SOROTI DISTRICT	MBALE DISTRICT
Beans	5	3	52
Maize	7	5	79
Millet	1	3	0
Ground nuts	1	2	0
Cassava	3	20	0

Source: *Primary Survey Data*

Although the use of improved cassava is low, most of the standing crop is resistant varieties that government and collaborating institutions have distributed. This was part of a concerted

effort to revive the crop following a destructive attack of the African Cassava Mosaic Virus disease. Otherwise, improved food seed is distributed by the private sector and farmers find the prices prohibitive. In contrast, for the traditional cash crops, certified seed is still provided through their respective support institutions, Cotton Development Organisation for cotton and Uganda Coffee Development Authority for coffee.

4.8 RESOURCE USE AND OWNERSHIP

As production systems gradually change, it is expected that changes would take place among the role players within the household according to different preferences by gender or age. These influence the decision making process, i.e. the allocation and utilisation of resources to meet the different individual needs and that of the household, affecting each household member differently (Von Braun et al., 1991).

With increased commercialisation of food crops, men have often become more involved in food production and marketing (ibid.). In the Gambia, a reduction in the women's share of cereal production with the commercialisation of rice which was traditionally a woman's crop, significantly reduced calorie consumption, holding income effects constant. Otherwise, income was positive to calorie consumption (Von Braun, Johm and Puetz, 1994). However, a further examination shows that calorie gains came from an incremental consumption of the women's crop previously used as a source of income rather than from the men's incremental income (Smith and Chavas, 1997).

4.8.1 Food control in the household

In the food crop sub-sector, production, processing, preparation, storage and marketing, ultimately ensuring household food security, have in many African countries been the domain of women (Von Braun, Johm and Puetz, 1994). This responsibility begins with control over food gardens. Men have nonetheless participated in the food sub-sector in various ways and sometimes had control over their own food gardens for various reasons. In Mbale District, some groups reported that the men controlled a garden of matooke for food security purposes, supplementing the household needs from his garden when the need arose. The survey

instrument included questions about the number of cultivated gardens, the crop in each garden and who was the owner of the different crops and/or gardens. The group discussions where the common practices were discussed complemented the questionnaire findings.

Table 4. 10: Control of different crop gardens by men and women

DISTRICT/CROP	N	Percent controlled by women	Percent controlled by men	Percent under shared control
APAC DISTRICT				
Cassava	124	47	28	25
Millet	41	60	18	22
Beans	70	43	27	30
Maize	36	27	49	24
Simsim	23	38	10	52
SOROTI DISTRICT				
Sorghum	86	24	47	29
Maize	24	38	38	24
Beans	46	35	35	30
Simsim	22	41	36	23
Cassava	139	36	45	19
Millet	67	38	31	31
MBALE DISTRICT				
Millet	26	8	19	73
Beans	94	24	33	43
Bananas (matooke)	107	13	17	70
Maize	129	21	54	25

Source: *Primary Survey Data*

Food is no longer the domain of women as seen in Table 4.10 above. Men are active participants in the food sub-sector and "own" food gardens, i.e. the output is theirs to do with as they please and this is often to generate cash income. The concern is that the shift in "power" relations over food may negatively affect food availability. In Apac District, cassava, millet and beans, which feature more prominently as mainly grown for food are predominantly female controlled crops showing 47%, 60% and 43% respectively. Maize is predominantly controlled by men, i.e. 49% of the maize gardens, were under their control. Although it features more prominently as grown for food purposes, observations are that maize is highly traded. Simsim is mainly a shared crop with 52% of the gardens shared.

In Soroti District, women controlled more millet and simsim gardens and simsim, as earlier seen, features mainly as being cultivated for food. The converse held for sorghum and cassava gardens, which feature more as male controlled crops and as dual-purpose crops. The showing of cassava as a dual crop is a largely a result of the destruction by the cassava mosaic disease and the subsequent shortages in affected areas pushing up demand. However, no crop has more than 50% of the gardens mainly controlled by either women or men.

In Mbale District, millet, beans and bananas stand out as shared crops, while men control more maize gardens, i.e. 54%. Women may inter-crop "their" crops amid the men's crops and they are often found to grow those crops that are relatively more for subsistence needs like sweet potatoes and yams. Mention is also made that control over a garden, especially by women, does not give her exclusive right to the food. Where they share crops, the implication is often that the man's portion will be used for cash needs. It was noted that in Mbale District, men were often not shy to say they controlled the food gardens, food in store and may even determine the quantity of food prepared for their meals. Given that food is an important source of cash income for women, they are at times forced to "steal" food to sell from their own household stores. In Muyembe Sub-county, relatively large quantities of maize and beans are produced. It was reportedly common for women to "siphon off" produce while it is being dried and before it is bagged, "stock taking", after which it would become more difficult.

In contrast, in Apac and Soroti districts, women remain the store-keepers and there is shared decision making regarding the quantities of food to sell and how to use the proceeds (Group discussions, 1998). In these two districts, it was reported that men have appeared before the relative authorities for climbing into the granary, or have been found stealing food to go and sell. "Gone are the days when it was a taboo for a man to be seen climbing into a granary" one respondent said.

It is noteworthy that the by-laws governing food reserves, introduced during the colonial period to ensure community and household food self-sufficiency, vested the control of some household food reserves outside the household. In so doing, to some extent imbalances in intra-household relations that might have compromised the household's food security were

addressed. The reserve granary for example had a seal that could only be broken following an assessment and the consent of the local chief (Cleave, 1973; Nyangabyaki, 1995).

4.8.2 Livestock ownership

Livestock have several socio-economic roles in many societies. They are a form in which savings are held, especially where formal financial services/institutions do not exist or the culture of formal savings is not strong, doubling as a measure of wealth. They are of cultural importance as bride-price/dowry or part of other ceremonial practices. If raised for consumption, they may contribute to improving the quality of the diet. Lastly, they are an integral part of agricultural activities; cattle are particularly important in production aided by animal traction.

Table 4. 11: Average livestock numbers, per household

Variable \ District	APAC	SOROTI	MBALE
Number of Goats	4 (3.3)	4 (3.8)	2 (2.5)
Head of Cattle	2 (5.9)	1.4 (2.8)	2.1 (2.7)
Households without Cattle	34%	69%	38%

***Source**: Primary Survey Data (standard deviation in parenthesis)*

Nowhere else in the country had ox-cultivation been adopted like in Soroti District, or the Teso agricultural zone as a whole. As noted in an earlier chapter, in the recent past, livestock in general and cattle in particular were one of the most important sectors in Soroti District. However, cattle rustling during the late 1980's wiped out the herd and various attempts are now being made to revive the industry. The destruction of the livestock sector has had adverse effects on production levels. In the period following insurgency, it is estimated that 50% of the arable land is under cultivation compared with more than 70% before the insurgency. This has had a direct bearing on the poverty dynamics in the district (Uganda-Soroti, 1997). From the primary survey, it was determined that about 70% of the surveyed households did not own any cattle in Soroti District, Table 4.11. Apac District was also affected but to a lesser extent and about 35% of the households did not own any cattle.

4.9 INFRASTRUCTURE DEVELOPMENT

As pointed out in Chapter one, repair and development of infrastructure to support the productive sectors, has been accorded high priority in Government's rehabilitation and development programme. The road network is the single most important infrastructure to economic development given that the rail network is largely non-functional. Resources have been invested in upgrading major trunk roads to all weather surfaces. However, most roads, especially feeder roads within the districts are seasonal dry weather roads. The rainy season therefore remains a major challenge for the transport sector, rendering seasonal roads impassable or more difficult to use. This was experienced during the study; many villages could be reached by vehicle during the dry season. The mountainous terrain in Mbale District, the swamp areas of Apac District and even major all weather murram roads became a challenge during the rains.

The road network in the districts is shown in Table 4.12. About 65% is considered all weather tarmac, murram, or gravel in each of the districts.

Table 4. 12: Road infrastructure in the sampled districts

District	Total road distance (Km)	Dry Weather (dirt road) (Km)	% of roads that is all weather (tarmac, murram, gravel)
APAC	862	308	64.3
SOROTI	1 083	373	65.6
MBALE	500	180	64.0

Source: Compiled from Uganda Bureau of Statistics, 1999.

Mbale as the administrative headquarters for the then eastern region, developed to become the third largest urban centre in the country, with a population of 54,000 (Uganda-Ministry of Finance & Economic Planning, 1992e). It is about 250 km from Kampala (the main city) and 70 km from the main border town of Busia. It is a major distributive centre from which commodities move to and from Kampala, Soroti, Gulu and West Nile, Kenya, etc. (Nobera, 1998). It partly shares a border with Kenya, Uganda's main trading partner in the region.

Soroti District with a municipality population of 40,970 (Uganda-Ministry of Finance & Economic Planning, 1992d) is 100 km farther east from Mbale. As of September 1998, about 500 km of feeder roads in the district had been rehabilitated/reopened and under regular maintenance (Uganda-ADB Soroti Field Office, 1998). Most of the district has, in so doing, been rendered usable by vehicles.

Apac is the youngest district of the trio with a town council population of 5,783 (Uganda-Ministry of Finance & Economic Planning, 1992a). The administrative centre is about 200 km from Soroti centre and 300 km from Kampala along the northern route. The swampy Lake Kyoga basin increases the challenges of road maintenance. Many roads are impassable during the rainy season and many that have been washed away or crossed by the swamps also remain closed to traffic.

At the micro-level, distances do not seem to deter trade as, on average, farmers travel 4 km in Apac, 6.6 km in Soroti and 3.1 km in Mbale to various markets. This is within the same range as much of the country where the average distance travelled is less than 5 km (Uganda-Household Agricultural Support Programme, 1997). However, transport to move produce to the market is a constraint as there is a limit that an individual on foot can physically carry and yet walking is the most common mode of movement, or even by bicycle the second most common mode.

4.10 ANTHROPOMETRIC INDICATORS

Stunting, a measure of height-for-age reflects long term effects of inadequate food. Wasting measures weight-for-height and is an indicator of short-term food inadequacies. Although stunting (low height-for-age) may indicate protein energy malnutrition in children, it may also indicate poor health. Pacey & Payne (1985) argue that childhood diseases are more fatal where children are malnourished. In Uganda, it was estimated that 56% of deaths in children less than 5 years old are a result of the effect of malnutrition on infectious disease (World Bank, 1996).

The in depth analysis of anthropometric data is beyond the scope of this analysis. It was nonetheless hoped that the necessary data would be available at the local health centres at the county level to allow for a location specific comparative analysis with the study findings. Unfortunately these records are not kept and one would have to gather the individual children's health progress cards for those attending clinics, to accumulate such data. Secondary data are here used to show the district differences. For lack of recent data on anthropometric measures, this data is drawn from surveys done in 1992/3. Table 4.13 shows the district estimates.

Table 4. 13: District specific stunting figures (based on the 1992/93 IHS)

	Boys Z – Scores		Girls Z – Scores	
DISTRICT	< -3	-2 to – 3	< -3	-2 to – 3
APAC	27.2%	15.5%	15.8%	24.5%
SOROTI	14.9%	26.9%	18.2%	17.2%
MBALE	21.6%	21.8%	24.0%	22.8%

Source: Extracted from World Bank, 1996

Stunting is said to occur when height-for-age is two or more standard deviations below the mean of the reference population (World Bank, 1993b). However, it is noted that cut off points at which abnormal growth is denoted remain subject to debate with a number of systems in use; percentiles, NCHS (US National Centre for Health and Statistics) standards, standard deviations, and normalised standard deviations or Z-Scores (Maxwell, 1991; Pacey & Payne, 1985).

Quantitatively, the EPAU study (Uganda-Ministry of Finance & Economic Planning, 1995a) using aggregated data, classified Soroti District as suffering transitory food insecurity. Both Apac and Mbale districts were classified as food surplus districts. However, by anthropometric data, Mbale District reflects more severe food insecurity. Apac District registered 42.7% stunting among the boys, Soroti 41.8% and Mbale 43.4%. Among the girls, Apac District registered 40.3% stunting, Soroti District 35.4% and Mbale District 46.8%. The district differences among the boys are narrower compared with those between the girls. Mbale District on average is faced with the worst case of stunting, i.e. about 45% while Soroti

District is the lowest of the three with 38.6% and Apac District shows 41% stunting. At the national level, 44% of children in the lowest expenditure quartile and 37% in the top expenditure quartiles were stunted (World Bank, 1996).

During the primary surveys, extension workers in Mbale District reported that there is a high death rate of young children during the lean months of May to July, which may partly be due to poor nutrition (Ayo, Wakwoma & Nambafu, Personal communication, 1998). Mbale district is plagued with high levels of malnutrition, especially protein deficiency (World Bank, 1993a; 1996). Integrated household surveys done shortly after civil strife which affected among others Apac and Soroti districts, showed the mortality rates of children up to 59 months old to be highest in Mbale District at 216 for every 1000 babies born. Apac and Soroti district are about equal at 191 and 192, respectively (World Bank, 1996). The most common causes in reported cases were malaria, diarrhoea and measles (ibid.).

4.11 CHAPTER SUMMARY

This chapter presented an overview of the study area by comparing and contrasting the average demographic characteristics of the household, agro-ecological and socio-economic factors in the district. The sample is drawn from the districts of Apac, Soroti and Mbale, each of which belongs to a different agro-ecological zone. A variety of food crops best adapted to the different conditions in the zones are cultivated. However, most food crops are grown to meet both food and cash needs. Besides crop cultivation, livestock (dairy or beef cattle, goats, pigs, sheep) and poultry are kept and mixed farming is the more common practice.

It is observed that on average, there is similarity in the demographic structure of households across the three districts. Due to a high population density, land is a constraint to production in Mbale District while a labour constraint is more pronounced in Apac and Soroti districts. Nonetheless, agriculture is the main source of a livelihood and this is underscored with farming being the dominant occupation of household heads. However, it is mainly reliant on the climate (rain-fed) and productive capacity of both land and labour as there is very little use of improved technology or production practices. Opportunities for income generation outside the agricultural sector are also limited. Wage labour is a common income generating

activity, but is subject to the seasonal nature of the agricultural sector. Other activities include fishing, trade, local artisans, brick making and transportation. Women are mainly engaged in the local beer industry or in selling cooked food/snacks along the roadsides or in the markets as a means of income generation. Cash income on the other hand is mainly spend on non-food goods and services but most of it goes to health care, education, alcohol and cigarettes.

On the basis of the district agro-ecological, socio-economic and demographic characteristics as well as agricultural practices, this chapter shows that there is no *a priori* reason for any one district to be more prone to food insecurity than others. However, a summary of anthropometric data shows that Mbale District is the most food insecure of the three with indications that it has the highest degree of stunting and infant mortality rates. An exploratory analysis of the sample data is therefore undertaken to explicate the less apparent factors that contribute towards food security/insecurity.

CHAPTER 5

CHARACTERISATION OF THE FOOD INSECURE

5.1 INTRODUCTION

It is recalled from the conceptual framework, that the effects of commercialisation on food security can be direct or indirect and negative or positive. Directly, food sales affect food availability by reducing the quantity of food available for consumption. Indirectly, food sales affect food availability through income effects, i.e. the size of the food budget and the nature of foods bought. To examine the hypothesis that food sales negatively affect household food security, the analysis begins with the application of cluster analysis, an exploratory analytical tool, to the primary data. The objective is to group the households and examine the relationship between production, commercialisation, income and expenditure levels on the one hand and food availability on the other.

Comparative analyses of the demographic and socio-economic characteristics of households are done to establish the functional characteristics that distinguish between the groups created from the cluster analysis. The analyses examine the data, evaluating if such differences predispose households to belonging to one group or other. A combination of logit analysis and descriptive statistics is applied. Later in the chapter, indirect effects of commercialisation on food availability are analysed by descriptive statistics. While the same analysis may be done based on household income levels, in doing so, an association between commercialisation and income levels would be presumed.

5.2 DISTRICT VARIATIONS IN FOOD AVAILABILITY DURING THE SURVEY YEAR

Food availability has been equated to food output and purchases, less quantity sold and incremental stocks.

Household food availability = output + purchases - (sales + increases in stocks)

By this definition, it is expected that;

i) Production enhancing factors positively contribute to food availability

ii) Sales negatively contribute to food availability

iii) Food purchases contribute positively to food availability.

The following section is a descriptive analysis of observations made regarding food production, sales and purchases.

5.2.1 Production related variation

Agricultural performance is highly correlated to climatic fluctuations given that it is predominantly rain-fed. A prolonged drought period covered most of the country from 1996 to the season beginning 1997. In some places like Mbale District, it extended into the second season (Uganda-Mbale Department of Agriculture, 1998). Later in the year, much of Uganda experienced unusual and exceptionally heavy rains starting in September, the latter half of the second season of 1997, through to March 1998. This was a manifestation of the *El Nino* weather phenomenon (Uganda-Ministry of Finance Planning and Economic Development, 1998; Uganda - Ministry of Finance, Planning & Economic Development, 1999; USAID-FEWS, 1997). The effects of this were inflationary food price fluctuations; 10.4% in June 1997, 6% in October 1997, a rise to an average 10% through to February 1998, 4.9% in March and –2.3% in May 1998 (Uganda-Ministry of Finance, Planning & Economic Development, 1998).

A positive outcome of the prolonged *El Nino* rains was the planting of more cassava and sweet potatoes that would otherwise not have been done then (Group discussions, 1998; FEWS-Uganda, 1998). Some second season annuals like sorghum, in Soroti District (Uganda-Soroti Dept. of Agriculture, 1998) and the banana crop that is predominant in Mbale District (Uganda-Mbale Department of Agriculture, 1998) also benefited from these rains. On the negative side, in some places landslides, hailstorms and too much rain at the wrong time, were more destructive than beneficial. In general, the *El nino* rains adversely affected annual crops (Uganda-Ministry of Finance, Planning & Economic Development, 1998; FEWS-Uganda, 1998).

The study therefore started with the negative effects of the heavy rains in the short term and that of the prolonged drought in the long term. The average daily calories available per adult equivalent reflect this in the different districts, Table 5.1.

Table 5. 1: District inter-survey variation in food security (average daily calories available per adult equivalent)

SURVEY	1st SURVEY		2nd SURVEY		3rd SURVEY		SURVEY MEAN	
DISTRICT	Average	Food insecure* (Percent)	Average	Food Insecure (percent)	Average	Food Insecure (percent)	Average	Food Insecure (percent)
APAC	2267 (672)	24	2458 (866)	25	2759 (1364)	25	2495 (727)	23
SOROTI	2189 (669)	28	2434 (823)	24	2589 (1160)	30	2404 (739)	25
MBALE	1698 (708)	75	1544 (888)	74	1905 (941)	59	1698 (798)	72

Source: Primary Survey Data (standard deviations in parenthesis).
**NB Food insecurity refers to those households consuming less than 80% of the minimum requirements by FAO standards*

The short-term analysis of the food security situation, observations at different points during the year, is not sufficient for a break down of the problem into transitory or chronic components. Nonetheless, descriptive statistics of the districts at the different surveys suggests how perennial the problem may be. Estimates of food consumed (food not accounted for by sales in the inter-survey months and what is in-store), to which is added food purchases estimated from a five-day recall period, are used to assess a household's food security status. The family size and structure are assumed to remain unchanged.

The slight improvement in the percentages of households having less than 80% of their minimum needs[9] at the second survey it is believed could be due to the *El Nino* rains. The food security situation at this time in the agricultural cycle, the lean period, would otherwise be worse than at the first survey on average. This improvement matched the improved average calories consumed in Soroti and Apac districts but not so in Mbale District where on average, consumption levels deteriorated. However, these gains,

9 *A commonly used cut-off point for establishing a situation of chronic food insecurity is if consumption is less than 80% of the calorie requirements (Von Braun et al.,1992; Maxwell, 1996; Pacey & Payne, 1985).*

mainly from the perennial food crops cassava and matooke, were in some areas fast lost later in the year. Due to what farmers referred to as "the Nile flowing backwards", gardens were submerged under water, destroying the standing crops. Somewhere along its course in Uganda, a large floating island had obstructed the River Nile's flow. This caused floods upstream and relatively lower volumes of water downstream as far as Egypt.

Several villages in Apac, Soroti districts and other districts along the shores of Lake Kyoga, which feeds the Nile, were adversely affected. Sampled villages in Nambieso Sub-county in Apac District and Ochero and Kateta sub-counties in Soroti District were among the affected. In aggregate, this led to lower than expected improvement in consumption levels, on average, from the second to third survey. In Apac District, an improvement from an average of about 2,458 to 2,759 calories per adult equivalent, per day is realised. In Soroti District, a smaller improvement from 2,434 to 2,589 calories per adult equivalent per day is noted. An increase from 24% to 30%, rather than the expected decrease in the size of households consuming less than 80% of the minimum requirements in Soroti District, was realised. No change is noted for Apac District. In Mbale District in contrast, average consumption improved by about 450 calories per adult equivalent per day, i.e. from 1,544 calories to 1,905 calories. The percentages of households consuming less than 80% of their requirements also decreased from 74% to 59%, as reflected in Table 5.1.

It is estimated that on average 23% of households in Apac District consume less than 80% of their minimum food requirements throughout the year. In Soroti District the estimate is 25% and in Mbale District it is 72%. However, based on production-related factors, Bahiigwa (1999), estimated that 28.6% and 53.6% food insecure in Apac in the period July to December 1997 and January to June 1998, respectively. In Soroti District, he estimates that 34% and 50% respectively were food insecure in the same periods. Comparing his findings with the above discussion suggests that despite being faced with food shortfalls, many households in the two districts can meet their minimum food needs. Mbale District was not among his sampled districts.

5.2.2 Food purchases

While farm output is the more important source of food to the farming population, food is also acquired from the market to meet shortfalls or to diversify consumption. Bahiigwa (1999) found that food purchases are a common means by which production shortfalls are met. From the conceptual framework, of interest to this study are the size of the food budget and the nature of the food bought.

There is a relatively more marked difference between the size of the food budget at the third survey compared to the first or second. There is a drop of about 1,000 shs per week, in food expenditure in each district, at the third survey as reflected in Table 5.2.

Table 5. 2: Average weekly food expenditure (shillings) by district

District	Survey 1	Survey 2	Survey 3
APAC	2 689 (1 898)	2 184 (1 547)	1 241 (967)
SOROTI	3 187 (2 244)	2 703 (2 235)	1 029 (888)
MBALE	2 975 (2 242)	3 343 (2 344)	2 295 (1 797)

***Source**: Primary Survey Data (standard deviation in parenthesis)*

This is also reflected in the nature of food bought, i.e. there is little difference in calories bought per 100 shs spent at the first and second survey but a drop at the third survey, (Table 5.3). It therefore suggests a variation in food purchases to meet the existing needs shortfalls at the first and second survey and diversity at the third survey. Calorie purchases per 100 shs spent on food, is for example lowest at the third survey in all three districts, i.e. the period between the first season and second season harvests. This is the period when on average households are most food secure.

Table 5. 3: Food calories bought per 100 shilling spent

District	Survey 1	Survey 2	Survey 3
APAC	431 (372)	476 (653)	362 (422)
SOROTI	555 (388)	595 (861)	439 (648)
MBALE	485 (468)	424 (387)	397 (410)

Source: *Primary Survey Data*

Because food purchases make a small proportion of food consumed, making inferences about the degree to which it bridges household food shortfalls is difficult. In Mbale District for example, although more money is spent on food, there is a drop in calorie purchases per shilling spent. This would normally be taken for a substitution to the more expensive calories. The study responses however show that vegetables, which make low calorie contributions to a diet, are the common foods bought.

5.2.3 Food sales

On average, households in Soroti District are the more subsistence oriented, making the least food sales relative to food output. Mbale District, having the highest proportion of food sales to food output as evident in Table 5.4, is the more commercially oriented. From the conceptual framework and main hypothesis, the relatively high proportions of food sales should render more households in Mbale food insecure compared with households in Apac or Soroti districts.

Table 5. 4: Variations in district average commercialisation index (HCI) values surveys 1 and 3

DISTRICT	SURVEY 1	SURVEY 3*
APAC	17 (18.2)	11 (9.6)
SOROTI	9 (13.6	8 (9.3)
MBALE	44 (17.8)	38 (15.3)

Source: *Primary Survey Data (standard deviation in parenthesis)*
** The HCI values at the third survey reflect the proportion of the first season's harvest that had already been sold by then.*

Food sales reflect the transition that is gradually taking place in the rural communities from a predominantly non-monetary exchange economy to monetary exchange. A wide range of economic activities take place on market days with a variety of consumer goods and services exchanged on a monetary basis, indications of a growing cash economy. The demands the expanding cash economy places on households have contributed to the gradual decline of non-monetary exchanges that were the common mode of especially inter-household exchanges (Group discussions, 1998).

Cash payments are now a preferred mode of payment. Labour exchange between households coming together into groups used to be done on a rotational basis. Besides the shared labour, the recipient home offered the working group food and beer after the completion of a task. Cash payments are preferred because it allows individuals to satisfy their preferences that may include goods and services offered by the market whereas non-monetary rewards would limit them to short term consumption (Group Discussions, 1998).

This is also reflected in inter-household food exchanges. Many men thought that their wives were too generous with food, giving it away to relatives or neighbours. One elderly woman asked, "who can give away even the smallest bunch of matooke when they know it is money they are giving away". Cash income as the opportunity cost of non-monetary transactions involving food, may be causing the latter to shrink. However, segments of the community that have relied on the support often rendered in the non-monetary exchanges, e.g. the aged, may be increasingly marginalised. Table 5.5 shows the interaction between production, sales and purchases of food and food insecurity in the three districts (at the first survey).

Table 5. 5: Sample means for household food production, sales and purchases at the first survey

DISTRICT	Average calories in 000's (standard deviation in parenthesis)			% of Households Food Insecure* (first Survey)
	Produced	Sold	Bought	
APAC	6 670 (3 306)	1 335 (1 778)	396 (465)	24
SOROTI	6 925 (4 195)	510 (810)	411 (270)	28
MBALE	4 771 (6 038)	2 129 (2 190)	563 (421)	75

* *On average daily food available per adult equivalent is less than 80% of minimum calorie requirements per adult equivalent by FAO standards.*

The difference in output arises mainly from that due to the dominant crops cultivated.

- The average yields are higher for cassava than bananas, i.e. about 3 tons per acre compared with 2 tons respectively. The cereal grains do not differ much, 0.5 tons per acre for millet or sorghum compared with 0.6 tons per acre for maize (Uganda-Mbale Department of Agriculture, 1998; Uganda Bureau of Statistics, 1999).
- The cumulative effects of relatively better use of the second rains in Apac and Soroti districts contribute to high annual productivity.
- The dominance of the cassava crop in Apac and Soroti districts compared with Mbale District where little is cultivated partly because of the mosaic disease. Cassava gardens act as a standing food reserve.

Mbale District where more food is sold both in absolute terms and relative to output has the highest proportion of food insecure households. Before the statistical examination of the relationship between food security and commercialisation, this observation supports the main hypothesis. A negative relationship between food security and commercialisation of the food sub-sector is apparent.

5.3 EXPLORATORY GROUPING AND ANALYSIS

5.3.1 Cluster analysis defined

A cluster analysis is applied in an exploratory manner to examine the nature of the conflict between the sale of food and household food availability. This grouping of households, while not testing any hypothesis, will principally allow for the analysis of how consumption patterns (largely descriptive) relate with commercialisation.

Cluster analysis is an exploratory analytical tool (cannot make statistical inferences) which aggregate's individuals/objects into groups defined by the within group homogeneity and between group heterogeneity. It is a data reduction technique that enables a more easily discernible description. Secondly, it may be used to explore hypotheses that may apply to a data set. Clustering or grouping differs from classification methods like discriminant analysis in making no assumptions about the number of groups or group structure. Discriminant analysis pertains to a known number of groups. Cluster analysis is largely arbitrary; the investigator has to pass judgement on the best grouping according to their knowledge of the subject and expectations based on literature on the subject (Johnson and Wichern, 1998).

Clustering methods include the hierarchical and non-hierarchical. The former combine (agglomerative) or divide (divisive) the cases starting/ending with individual cases respectively. Each case is assigned to a cluster created in the process. Non-hierarchical methods, in contrast, assign objects based on a specified number of clusters and cluster seeds to generate the best cluster solution (Hair, Anderson, Tatham and Black, 1998; Johnson & Wichern, 1998). Its efficiency relative to the hierarchical methods derives from the fact that it does not compute the distances between all pairs of cases. By the nature of the investigation, the non-hierarchical method is considered the more appropriate and the "Quick Cluster" method of Statistical Program for Social Scientists (SPSS) is used. Similarly, Makhura, Coetzee and Goode (1998) grouped commercialising farmers using a non-hierarchical method, the Ward's minimum variance. Rauniyar (1990), too used non-hierarchical methods to group farmers according to the technological practices in use.

Though exploratory, two critical concerns in cluster analysis are multi-collinearity and how representative the sample is (Hair et al., 1998). The choice of variables included in the analysis has been guided to control for multi-collinearity, i.e. highly correlated variables are not used in the actual clustering. Validation of the results is done by comparison with variables that have not been used in the clustering process.

5.3.2 Cluster analysis applied

The cluster analysis is applied to data generated from the first survey and with a total of 443 households, it yielded 15 clusters. Because of the sensitivity of cluster analysis to outliers (Hair et al., 1998), they are omitted from the final analysis. Six variables were used to generate the clusters. The three that reflect household productive capacity include; total calories produced and adjusted for calories sold, income generated from livestock and poultry sales and non-farm income (wage labour, beer sales, shop, stall or "hotel" trade, fish trade, handicrafts, salaries/wages, rent oxen etc.). Reflecting the commercialisation tendency are; food sales, food purchases and non-food expenditure (the sum of non-farm expenses on education, health, clothing, fuel, transport, cigarettes and beer etc.).

The generated clusters are rearranged and grouped into two broad categories, the potentially food secure and food insecure. With a sample average family size of 5 adult equivalents, the average minimum calorie requirements would be about 4,400,000 (about 1,300 kg of maize meal) per household per year and about 3,700,000 calories for 10 months (the recall period for the first survey). This estimate is a guide to the cut-off point between the food secure and food insecure households. The clusters were rearranged and ranked by the variable CALAV_HH (calories residual to sales). Total food purchases (CALBUY_1) and residual calories per household, gives an estimate of how much has been consumed. This is then compared against the 3,700,000 estimated requirements for an average household. The level of production is relative to the sample and is deduced from the sum of residual calories available for consumption and that sold. It is verified by the actual average output.

Table 5. 6: Cluster results by food security status and degree of commercialisation (calories and shillings in '000' s)

GROUPINGS	FOOD SECURE GROUP						FOOD INSECURE GROUP								
VARIABLES	High Producers/ Low Sales (9%)		Average Producers/ Low Sales (67%)				High Producers/ High Sales (3%)			Average Producers/ High Sales (5%)			Low Producers / Low Sales(17%)		
Cluster No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N	4	35	85	15	185	10	4	6	4	5	10	5	24	4	47
CALAV_HH	7782	4002	3856	3525	3309	3243	3242	3098	2865	2731	2251	2245	2237	2153	2151
CALBUY_1	378	362	506	573	422	494	221	623	842	662	584	584	482	220	435
CALSLD_1	1400	1781	1037	552	895	1615	3604	4698	5188	2558	2589	2594	1794	961	1529
CCRP_INC	41	8	7	5	3	3	168	62	472	410	307	272	210	82	92
AVLSINC	258	70	14	17	9	157	13	20	5	37	17	78	13	140	12
AVNFINC	53	32	36	117	16	32	95	70	28	34	18	18	15	31	19
AVNFEXP	114	38	23	47	10	67	43	46	12	25	14	34	12	61	13
CALPROD1	12726	7492	6759	5467	5821	6341	7517	8899	8667	5893	5270	5136	4447	3985	4276
HCI_1 (%)	9	25	18	13	16	26	49	43	48	42	47	46	41	26	35
CALORIAE	2141	2098	2097	2108	2128	2102	2059	2110	1958	1999	2049	2037	2072	2090	2080
%LESS80	0	6%	13%	0	6%	20%	0	17%	25%	40%	0	0	8%	25%	13%

***Source**: Primary Survey Data* *NB. n = 443 owing to exclusion of outliers*

CALAV_HH = residual calories after sales and losses
CALBUY_1 = quantity of food (calories) bought at first survey
CALSLD_1 = quantity of food (calories) sold at first survey
CCRP_INC = income from the traditional cash crops
AVLSINC = average livestock income
AVNFINC = average non-farm income
AVNFEXP = average non-food expenditure
CALPROD1 = quantity of food (calories) produced in recall period
HCI_1 = commercialisation index at first survey
CALORIAE = daily calories available per adult equivalent

Of the 15 clusters, 6 with a total of 335 households (75 %) are potentially food secure and 9 with a total of 108 households (25%) are food insecure at the first survey. Within the broad grouping (food secure and food insecure), further categorisation is by the level of production[10] as estimated by residual calories (CALAV_HH) and secondly, by the absolute value of calories sold. The 15 clusters are therefore reduced to five groups; High Production-Low Sales (HPLS), Average Production-Low Sales (APLS), High Production-High sales (HPHS), Average Production-High Sales (APHS) and Low Production-Low Sales (LPLS).

Five clusters fall under the broad category of high production and are 11% (53 households) of the sample. Two clusters grouped as high production-low sales (HPLS) are food secure; they make relatively low food sales, while three clusters making high sales are food insecure and are grouped as high production-high sales (HPHS). Six clusters making 71% of the sample, i.e. the majority with 315 households, are in the groups considered to have average production levels of which four clusters grouped as average production-low sales (APLS) make relatively low food sales and are potentially food secure. Three clusters grouped as average production-high sales (APHS) make relatively high food sales and are food insecure. Three clusters fall under the low production category with relatively low food sales, LPLS. They make up 17% of the sample (75 households) and are all food insecure.

5.3.3 Group descriptions:

5.3.3.1 High Production - Low Sales (HPLS)

With 9% of the sample (39 households), this group is considered a high production group as reflected by the high residual calories, 7,782,000 and 4,002,000 calories in the two clusters respectively, confirmed by their output (CALPROD1). Relative to what they produce, they make low sales; cluster No. 1 has the lowest commercialisation ratio of the sample, namely 9%, and cluster No. 2 has a ratio of 25%. In absolute terms, 1,400,000 and 1,781,000 respectively, they are however not the lowest of the sample. Food purchases are among the

[10] *Production refers to caloric output and not farm output in its widely used sense, i.e. weight of commodity produced.*

lowest in the sample, 378,000 and 362,000 calories respectively and the foods bought are likely to be for dietary diversification rather than meeting their basic food needs.

Besides food sales, they derive income from non-farm activities, cash crop and livestock sales. Income from the sales of livestock is 258,000 and 70,000 shs respectively for the two clusters, 1 and 2. The relatively high income (258,000 shs) from the livestock sub-sector in cluster no.1 is matched by the highest non-food expenditure (114,000 shs). This particular cluster no.1 with 4 households is considered a wealthy cluster. Its daily calorie availability per adult equivalent, 2,141,000 shows it as the most food secure cluster, with no household having less than 80% of its minimum requirements. Cluster no. 2, the larger of the two, with a daily calorie per adult equivalent of 2,098,000 is less food secure than lower production clusters and about 6% of its households consume less than 80% of their food needs. It may have fitted into the APLS group but for the difference in output.

5.3.3.2 Average production -low sales (APLS)

This is the largest group, 67% of the sample (295 households), reflecting the average situation observed during the survey. Though considered food secure, residual calories after sales and losses (CALAV_HH) is less than 3,700,000 calories. Food purchases are an important factor in bridging their food gap, ranging from about 50% to 100% of what is sold. In both absolute terms and relative to production, the group makes the lowest calorie sales of the sample, ranging from 552,000 to 1,615,000 calories and 13% to 26% respectively, i.e. a reflection of a strong subsistence orientation. Within the group, cluster, no. 6 making the higher sales of 1,615,000 calories, is rendered less food secure with on average 2,102,000 calories per adult equivalent and 20% of its households having less than 80% of their minimum requirements. This is despite that it is a higher producer than clusters no.4 and no. 5 with sales of 552,000 and 895,000 calories respectively. There are no households having less than 80% of the minimum requirements in cluster no. 4 but 6% in cluster no. 5 consume less than 80% of the minimum requirements.

Non-farm income followed by that from the sales of livestock and poultry, are the more important sources of non-food income for this average production-low sales (APLS) group. Both, however, vary considerably across the group. Cash crop income is lowest and more

uniform across the group. Non-food expenses also vary considerably across this group, ranging from 10 shs in cluster no. 5, the lowest of the sample, to 67,000 shs in cluster no. 6, which has the highest non-farm income and shows the highest non-food expenditures of the group.

The largest cluster, no. 5, suggests that most households face constraints in meeting their needs. This cluster on average derives the lowest non-food income, 28,000 shs, this is matched by it's having on average, the lowest non-food expenses for the sample, i.e. 10,000 shs. It is considered to consist of the poor whose livelihoods revolve around meeting their food needs and therefore "food first" is a guiding principle. In spite of all the constraints, this is the second most food secure cluster of the sample according to the average daily calories per adult equivalent, 2,128,000. In cluster no. 5, 6% of the households have less than 80% of the minimum requirements, while 13% in cluster no.3 have less than 80% of the minimum requirements.

5.3.3.3 High Production - High Sales (HPHS)

This group, 3% of the sample (14 households), would according to output levels, be placed with the first group of high producers that are food secure. It stands out for making the highest calorie sales in absolute terms, higher than what is left for consumption and is food insecure as a result. They have to buy back food, the highest of the sample, i.e. 623,000 and 842,000 calories in clusters no. 8 and no.9 respectively, except cluster no.7 buying 221,000 calories, the lowest of the sample. However, calorie purchases are still not enough to bridge the food gap created by food sales. Daily calorie consumption per adult equivalent ranges from 1,958,000 in cluster no.9 to 2,110,000 in cluster no. 8. Those consuming less than 80% of their minimum food requirements are 17% in cluster no. 8 and 25% of the households in cluster no.9.

Not only do households in this group derive income from food sales, but from cash crops and livestock sales and non-farm activities as well. However, income from livestock sales are comparatively low. Despite the high aggregate income, non-food expenses are not any higher than the average range for clusters no. 7 and no.8, but very low at 12 shs in cluster no.9.

5.3.3.4: Average production - high sales (APHS)

With 5% of the sample (20 households), this group is different from the high production-high sales (HPHS) group in caloric output levels but similar to it in that sales match or exceed that left for consumption. Food sales are about 2,558,000; 2,589,000 and 2,594,000 calories against 2,731,000; 2,251,000 and 2,245,000 calories left for consumption in clusters 10, 11 and 12 respectively. Households in this group are thus rendered more food insecure than the average production-low sales (APLS) group to which they compare in production, consuming about 2,000,000 to 2,050,000 calories per adult equivalent per day, on average. Calorie purchases made, though relatively high, are not enough to make up for the shortages created by the sale of food. However, it is only in cluster no. 10 that 40% of the households have less than 80% of their minimum requirements.

Cash crop income is on average highest in this group and is well complemented by livestock and non-farm income. However, like the previous group, non-food expenses are not any higher than the average range, in the order of 25,000, 14,000 and 34,000 shs for clusters 10, 11 and 12, respectively.

5.3.3.5 Low production - low sales (LPLS)

This group is the second largest (17% - 75 households) of the sample. Its production levels are the lowest of the sample. Despite this, the group makes relatively high food sales, higher than the sales made by the high production-low sales (HPLS) group in absolute terms. Relative to what they produce, sales are still higher than the more productive average production-low sales (APLS) group. Despite their needing more food to bridge their production shortfalls, food purchases are within the same range as the more productive groups.

Unlike the high production-high sales (HPHS) and average production-high sales (APHS) groups where high sales rather than low productivity renders them food insecure, both low productivity and food sales constrain this group's food security. In relative terms, the daily calorie available per adult equivalent is, however, better than the earlier HPHS and APHS, ranging from about 2,070,000 to 2,090,000 calories. Those having less than 80% of the

minimum requirements are about 8% in cluster no.13, about 25% in cluster no.14 and 13% of the households in cluster no.15.

Income from cash crops and livestock sales vary considerably within the group but that from non-farm activities is more uniform. Non-food expenses are at the lower end except cluster no. 14,000 at 61,000 shs. Based on these findings, it can be argued that this group is a relatively poor group, the poorest of the sample.

5.3.4 Discussion

Overall, all the groups are on average consuming less than their minimum daily calorie requirements. This could be because of the prolonged drought followed by the heavy rains discussed earlier. However, on average, the relatively low percentages in many groups suggest that most of the households nonetheless meet at least 80% of their minimum requirements.

A high correlation between production levels and food availability is evident. The high producers are relatively more food secure than the relatively lower producer clusters. Assuming a condition of purely subsistence production, the production variable suggests that most households, except those in the low production-low sales (LPLS) group, produce enough to meet the food needs of 5 adult equivalents per household, on average. However, a correlation is also apparent between food sales and food insecurity. By production levels, groups similarly ranked differ significantly depending on how much food is sold. Those groups where a relatively high proportion of food is sold are seen to be the more food insecure.

Food purchases should reflect the shortages created by either low production or food sales. The variation however, does not necessarily reflect the shortages realised by a group or cluster. It is recalled that the income effects on food availability depend on the proportion of expenses that go into meeting the costs of buying food versus non-food expenses and the nature of foods that are bought. Food purchases in households with on average sufficient food may therefore be one of diversifying their diets, but one of meeting shortages in the other clusters. The nature of purchased food would therefore be of interest. It is not necessarily a

case of lack of money to buy food because besides food sales, there is a general diversification in sources of income across all groups and there is no marked correlation between these incomes and levels of food purchased or non-food expenses either.

The high variability in livestock income could suggest different coping strategies not just to food shortages but to household needs in general, e.g. health, education, marriages etc. that would require the sale of livestock. A cluster average would be sensitive to the sale of 1 cow at about 150,000 to 250,000 shs. The wide variation in cash crop income is indicative of the variation in recovery of the different crops as discussed in a previous chapter. Coffee is the best performing traditional cash crop to date. However, even in a district like Mbale that is one of the leading coffee producing districts in the country, some areas grow almost no coffee.

5.4 GROUP COMPARISONS

A pair wise comparison of three selected groups from the cluster analysis of the previous section is done to establish those variables that are significantly different between them. The larger groups, more representative of the majority of the sample, are chosen for the analysis. The group size relative to the number of explanatory variables also limited the groups chosen for the analyses. A comparative analysis is done between:

i) The high production-low sales and average production-low sales groups (HPLS and APLS)

ii) The average production-low sales and the average production-high sales groups (APLS and APHS)

iii) The average production-low sales and low production-low sales groups (APLS and LPLS).

5.4.1 Socio-economic characteristics of selected groups

Table 5. 7: Socio-economic and demographic variables of selected groups (means and proportions)

Variable	HPLS n = 39	APLS N = 295	APHS N = 20	LPLS n = 75
Age of the household head	47.2 (12.3)	42.5 (14.2)	55.1 (12.0)	47.4 (14.0)
Education of household head (post-primary =1)	36%	26%	25%	21%
Gender of household head (male =1)	87%	88%	95%	92%
Occupation of household head (Farming = 1)	82%	84%	85%	93%
Number of children six years old or less	1.7 (1.4)	1.7 (1.6)	2.2 (2.0)	1.6 (1.2)
Number of children in primary school	2.6 (1.9)	2 (1.7)	3.1 (1.6)	2 (1.8)
At least one child in post primary school	23%	16%	30%	25%
Monthly non-food expenses ('000)	45.8 (25.6)	17.3 (15.2)	21.6 (13.9)	14.8 (14.3)
Percent of average non-food expenditure spent on education	26.5 (32.3)	14.8 (25.3)	30.3 (29.3)	19.1 (28.3)
Percent of average non-food expenditure spent on health care	14.6 (15.5)	20.9 (18.2)	12.3 (14.2)	16.0 (14.8)
Percent of average non-food expenditure spent on alcohol/cigarettes	31.0 (26.5)	30.5 (28.2)	33.3 (29.1)	37.0 (31.5)
Monthly non-farm income ('000)	33.4 (18.6)	27.3 (17.3)	21.6 (17.9)	18.0 (12.6)
Household with cattle	77%	53%	90%	71%
Number of goats	5.1 (4.4)	3.0 (2.7)	2.6 (3.2)	2.4 (3.0)
Cultivated area (acres)	4.8 (2.9)	3.0 (2.0)	4.5 (2.2)	3.7 (2.2)
Pre-dominant crops grown				
Cassava & cereals	80%	83%	5%	24%
Banana & maize	3%	7%	95%	61%
Maize & beans	17%	10%	0%	15%

***Source**: Primary Survey Data (standard deviations in parenthesis)* NB. Appendix 6 shows the variables by cluster.

The cultivated farmland area is an important factor in determining production levels. On average it is highest in the high production-low sales group with 4.8 acres and lowest in the average production-low sales group with 3.0 acres.

The high production-low sales (HPLS) group on average has the highest non-food expenditure, about 46,000 shs per month (it is recalled this group is considered a relatively wealthy group). It is followed by the average production-high sales (APHS) group with an average non-food expenditure of about 22,000 shs per month. The low production-low sales (LPLS) group, considered relatively poor, has the lowest monthly non-food expenditure, about 15,000 shs.

A similar trend is observed with the average monthly non-farm income except that the average production-low sales (APLS) group generates the second highest income from

non-farm activities. The high production-low sales (HPLS) group generates the highest non-farm income. The more food secure groups therefore generate more income from non-farm related activities, suggesting that it is more diversified.

Between health and education, on average, most of the non-food expenditure is spent on education. Only in the average production-low sales (APLS) group are costs on health care, about 21% of non-food expenditure, higher. On average, the proportion of non-food expenditure on education ranges from about 15% to 30% while that on health ranges from about 12% to 21%. However, the proportion of non-food expenditure spent on alcohol and cigarette consumption warrants much concern. Participants in the group discussions shared this concern, as did the local leadership. Non-food expenditure on alcohol and/or cigarettes ranges from about 31% in the average production-low sales (APLS), to 37% in the low production-low sales (LPLS) group.

The seeming indifference in the number of school children would imply a heavier burden on the poorer households to meet similar costs of education. On average, the lowest number of children in primary school across the groups ranges from 2 in the low production-low sales group to 3.1 in the average production-high sales group. The average number of children attending post-primary education is generally lower than that in primary school. The variable is thus recorded as a dummy variable.

Households in the groups where food sales are high (HPHS and APHS) are predominantly drawn from Mbale District. The average production-low sales (APLS) group draws from all the three districts. The low production-low sales group (LPLS) mainly has households from Apac and Mbale districts.

5.4.2 Logit analyses

Logistic regression (logit analysis) is an analytical technique that is pertinent when the dependent variable is a categorical variable. The cases can therefore be sub-divided into two groups. Described in greater detail by Gujarati (1995), Hair et al.(1998), Mukherjee, White and Wuyts (1998), it is similar to ordinary least squares regression (OLS) except that it predicts the probability of an event occurring (the dependent variable) given explanatory variables. While it applies the maximum likelihood method to estimate the

model, OLS analysis as the name suggests, estimates the value of the dependent variable by means of the least squares method. Like OLS, its appeal lies in the simplicity of interpretation of the results. It is robust even with the violation of the classical condition of homoscedasticity that renders OLS results biased. Like OLS, logistic analysis handles both continuous and categorical variables. The implicit log transformation of the variables also reduces the effects of correlations.

The model is generally expressed as:

$$\text{Log}\left(\frac{P(y=1)}{1-P(y=1)}\right) = \beta_0 + \sum_{i=1}^{n} \beta_i x_1 \text{ or as } \frac{P(y=1)}{1-P(y=1)} = e^{(\beta_0 + \sum_{i=1}^{n} \beta_i x_i)}$$

Following (Hair et al., 1998), to evaluate overall model fit as the coefficient of determination does in OLS, an R^2_{logit} can be calculated as:

$$R^2_{\text{log it}} = \frac{-2LL_{null} - (-2LL_{model})}{-2LL_{null}}$$

The logit analysis is appropriate to examine the membership of the different groups and determine the functional characteristics that may be used to identify vulnerable segments of the population. By recoding, a categorical dependent variable is generated with one group taking on the value 1 and the other the value 0. The socio-economic variables compared are: land as a basic factor of production, cropping patterns, household characteristics, wealth (reflected by ownership of livestock and expenditure on non-food goods and services), and diversification of income (reflected by non-farm income).

5.4.2.1 HPLS and APLS Compared

The high production-low sales (HPLS) group was recoded to take the value 1 and the average production-low sales (APLS) the value 0, in the analysis. It is recalled that clusters in both these groups are considered the most food secure of the sample.

Table 5. 8: Socio-economic differences between HPLS & APLS - logit results

Variable	Definition	B	Wald	Exp (B)
AGE_HHH	age head of household head	0.0092	0.2651	1.0092
EDPP_HHD (1)	attained post primary education	-0.0971	0.0320	0.9075
GEN_HHH (1)	gender of household head - male	-0.6796	1.0506	0.5068
OCC_FARM (1)	main occupation is farming	0.5429	0.5394	1.7209
CHI_SIX	number of children six or less	-0.2232	1.5434	0.8000
CHI_PS	number of children in primary school	0.0176	0.0171	1.0178
CHISES_D (1)	has children in post primary school	-1.0009	1.6017	0.3675
AV_NFEXP	average non-food expenditure	0.0082	33.6509*	1.0001
AVTO_INC	average non-farm income	-0.0003	6.2743*	1.0000
AVCATT_D (1)	household has cattle	1.0305	3.8540*	2.8025
AVGOATS	average number of goats	0.2232	6.8312*	1.2501
LND_USED	area of land cultivated	-0.0061	0.0033	0.9939
CAS_CERD (1)	cassava/cereal cropping pattern	-1.5767	4.9849*	0.2067
BAN_MZD (1)	banana/maize cropping pattern	-1.4399	1.2960	0.2370
CONSTANT		-3.1918	4.7796*	

χ^2 14 df 90.43
R^2_{logit} 0.38
N 334
*Note: * = significant at 5% level, Values in Parenthesis indicate variable is categorical.*

The model makes an overall average correct prediction of the group membership of 89%. Between the two groups it makes a relatively poor prediction, 33%, of the membership of the high production-low sales (HPLS) group, but 97% of the membership of the average production-low sales (APLS) group. The variables that are significantly different between the two groups are; average monthly non-food expenditure (AV_NFEXP), average monthly non-farm income (AVTO_INC), ownership of cattle (AVCATT_D), number of goats owned (AVGOATS), and cassava/cereals (CAS_CERD) as the dominant crops cultivated. The characteristics that define the household head, i.e. age, gender, education level and their main occupation, are insignificant in determining group membership. The cultivated area as a factor of production is also insignificant.

It is recalled that the high production-low sales group is considered a relatively wealthy group. Wealth as reflected by ownership of cattle and the average number of goats, increases the odds that a household belongs to this group. The odds ratio for number of goats owned is 1.25 while that for ownership of at least a head of cattle is 2.80. Non-food expenditure also an indicator of wealth is significant and increases the odds ratio, 1.00, of a household belonging to the high production-low sales group. Non-farm income however, reduces the odds of a household belonging to this group. The implication is that

the high production-low sales group generates less income from non-farm activities, on average.

The difference in output between the two groups is not from a difference in area of land under cultivation as this variable is insignificant. The choice of crops cultivated better explains the difference. The odds, 0.21, of a household belonging to the high production-low sales group are reduced by the variable indicative of the predominance cassava/cereal cultivation. This implies that most households in this group cultivate crops other than cassava and cereals, compared with the average production-low sales group.

The variables indicative of the pressures that come to bear due to costs of social services, pre-school and school going children are insignificant. This is interpreted as an indication that the cost implications may affect some segments of the population more than others.

5.4.2.2 APLS and APHS compared

Table 5. 9: Socio-economic differences between APLS & APHS - logit results

Variable	Definition	B	Wald	Exp (B)
AGE_HHH	age of household head	-0.0166	0.1045	0.9835
EDPP_HHD (1)	attained post primary education	5.1604	1.4143	174.2345
GEN_HHH (1)	gender of household head – male	-5.6983	1.1294	0.0034
OCC_FARM (1)	occupation mainly farming	21.1967	0.2081	1.61E+09
CHI_SIX	number of children six years or less	-1.3865	1.2467	0.2500
CHI_PS	number of children in primary school	-1.0329	2.7860*	0.3560
CHISES_D (1)	children attending post primary school	2.7153	0.4635	15.1093
AV_NFEXP	average non-food expenditure	-0.0001	1.9357	0.9999
AVTO_INC	average non-farm income	0.0004	3.4830*	1.0004
AVCATT_D (1)	household owns cattle	-4.7979	1.5849	0.0082
AVGOATS	average number or goats	-0.1111	0.0259	0.8948
LND_USED	area of land cultivated	-2.1553	3.7767*	0.1159
CAS_CERD (1)	cassava/cereal cropping pattern	38.2122	0.1526	3.94E+16
BAN_MZD (1)	banana/maize cropping pattern	-22.7673	0.2376	0.0000
CONSTANT		17.2103	2.4604*	

χ^2 14 df 131.638
R^2_{logit} 0.88
N 315
Note: * *= significant at 5% level, Values in Parenthesis indicate variable is categorical*

The average production-low sales (APLS) group takes on the value 1 and the average production-high sales (APHS) group takes on the value 0. While the APLS group is considered food secure, the latter group is considered food insecure.

The model makes an overall average correct group prediction of 98.41%. Between the groups, it correctly predicts 85% of the membership of the average production-high sales (APHS) group and 99.32% of the average production-low sales (APLS) group. The characteristics that define the head of the household are insignificant. The significant variables are the number of children in primary school (CHI_PS), area under cultivation (LND_USED), and average total non-farm income (AVTO_INC). Average non-food expenditure (AV_NFEXP) is marginally insignificant. Cropping patterns are significant in comparing these two groups.

The number of children in primary school reduces the odds, 0.36, of a household belonging to the average production-low sales group. On average, this group has two primary school going children per household while the average production-high sales group has three. The area of cultivated farmland increases the odds, 0.39 that a household is a member of the average production-high sales (APHS). On average, the cultivated area is 4.5 acres in this group and 3 acres in the average production-low sales group.

The livestock variables, indicative of wealth, are both insignificant. Non-food expenditure is marginally insignificant, and reduces the odds of a household belonging to the average production-low sales group. Non-farm income is significant, and increases the odds of a household belonging to the average production-low sales (APLS) group.

5.4.2.3 APLS and LPLS compared

The average production-low sales (APLS) group took on the value 1 and low production-low sales (LPLS) group the value 0 for this analysis. The latter is considered a food insecure group and relatively poor.

Table 5. 10: Socio-economic differences between APLS & LPLS - logit results

Variable	Definition	B	Wald	Exp (B)
AGE_HHH	age of household head	0.0111	0.5378	1.0112
EDPP_HHD (1)	attained post primary education	-0.0411	0.0088	0.9597
GEN_HHH (1)	gender of household head – male	0.0575	0.0085	1.0592
OCC_FARM (1)	occupation mainly farming	0.1847	0.0906	1.2029
CHI_SIX	number of children six years or less	0.1369	1.0190	1.1467
CHI_PS	number of children in primary school	-0.0926	0.6917	0.9115
CHISES_D (1)	has children attending post primary school	0.8210	2.5539*	2.2728
AV_NFEXP	average non-food expenditure	-0.0147	1.1196	1.0000
AVTO_INC	average non-farm income	0.0383	7.4683*	1.0000
AVCATT_D (1)	household owns cattle	-0.9241	5.4838*	0.3969
AVGOATS	average number of goats	-0.1510	3.6510*	0.8599
LND_USED	land area cultivated	-0.1459	2.4586*	0.8642
CAS_CERD (1)	cassava/cereal cropping pattern	2.1939	15.9557*	8.9700
BAN_MZD (1)	banana/maize cropping pattern	-1.8408	7.4683*	1.0000
CONSTANT	0.6561	0.3000		

χ^2 14df 143.775
R^2_{logit} 0.39
N 370

*Note, *= Significant at 5% level, Value in parenthesis indicates variable is categorical*

The model makes an average correct group membership prediction of 88%. It correctly predicts 93% of the average production-low sales group and 65% of the low production-low sales group. The significant variables are: post-primary school going members, (CHISES_D), earnings from non-farm activities, (AVTO_INC), ownership of cattle, (AVCATT_D), number of goats owned, (AVGOATS), area under cultivation, (LND_USED) and the dominant crops, (CAS_CERD and BAN_MZD). Like the previous analyses, the variables that define the household head namely age, gender, education level and main occupation are all insignificant.

The area of farmland under production is significant but contrary to expectations, it reduces the odds ratio, 0.86, of a household belonging to the average production-low sales (APLS) group. On average, the acreage in the average production-low sales group is 3 acres and that in the low production-low sales group (LPLS) is 3.7 acres. The odds ratio of a household belonging to the average production-low sales group (APLS) is increased by the variable indicative of the dominance of cassava and cereals. The odds of membership of the average production-low sales group (APLS) are however reduced, if bananas and maize are the dominant crops.

The odds ratio, 2.27, of a household belonging to the average production-low sales group is reduced by the variable, children attending post-primary school. Given that the low

production-low sales group is considered a relatively poor group, this finding is indicative of the high regard with which investing in education is held. However, contrary to this finding, a related variable, the average non-food expenditure, is insignificant. The wealth related variables are supportive of the earlier finding that average production-low sales (APLS) are less likely to own cattle or many goats, i.e. ownership of cattle and the number of goats both reduce the odds that a household belongs to the average production-low sales group. Non-farm income increases the odds of a household belonging to the average production-low sales group.

5.4.3 Discussion of the group differences

Land as a basic factor of production is important in determining production levels. The finding that the low production-low sales group on average has more land under production than the average production-low sales group may seem contrary to expectations. However, coupled with it is the finding that the low production-low sales group is more likely to be cultivating bananas and maize. The average production-low sales group is more likely to be cultivating cassava and cereals. This is partly explained by the differences in yields which is relatively higher for cassava (3 tons per acre) compared with bananas (2 tons per acre). Between the high production-low sales group and average production-low sales group, the latter group is still more likely to be cultivating cassava and cereals. It is therefore surmised that the cropping patterns coupled with cultivated acreage determine production levels. Indications also are that the more commercial households have more farmland under cultivation. The more commercial average production-high sales (APHS) group has more land under production, than the less commercial average production-low sales (APLS) group.

Wealth indicators, the livestock variables and average non-food expenditure, suggest several relationships. From the analysis of the high production-low sales (HPLS) and average production-low sales (APLS) groups, and the latter (APLS) with the low production-low sales (LPLS) group, it is surmised that ownership of livestock may cushion the household from the negative effects of high non-food expenditure. This then reduces the pressure to sell food. The high production-low sales (HPLS) and low production-low sales (LPLS) groups are both considered as low commercial groups. From the principal hypothesis of the thesis, high non-food expenditure, or school going

children (an indicator of the cost implications of education), would otherwise have rendered them high commercial groups. The hypothesis is borne out in the finding that the average production-high sales group (APHS) is more likely to have more children attending primary school than the average production-low sales (APLS) group.

Non-farm income as an indicator of income diversification is supportive of the above argument. The average production-low sales group where the livestock variables are not in favour seems to meet its income needs from off-farm activities, so too reducing the pressure to sell food. In comparison, the average production-high sales (APHS) group to which the wealth indicators and non-farm incomes are not in favour, rely more on food sales and is considered a high commercial group. In summary, the demand for cash income is variously met across the groups. If met from activities other than food sales, the pressure to sell food may be reduced.

5.5. DIETARY HABITS IN UGANDA

In the development paradigm proposed by Timmer (1997), commercialisation entail's specialisation in production of fewer crops, and an increased diversity in the foods consumed. However, it was argued that consumption habits are influenced by other factors besides income, notably the dietary culture. Within the context of this argument, this section starts by reviewing the general dietary habits in the country and the study area in particular. By means of descriptive statistics, the effects of commercialisation on the nature of foods eaten and purchased are then examined.

Dietary habits vary by agro-ecological, ethnic and socio-economic dispositions in the country. Nonetheless, a meal generally consists of a starchy staple (e.g. matooke, millet, cassava, osho, sorghum, potatoes), that forms the bulk and is the main source of energy. These are complemented by a "sauce", which mainly provides the proteins and minerals (Uganda-Ministry of Agriculture & Forestry, 1984b; Goode, 1989). The sauce may be a legume (e.g. beans, peas, groundnuts), a vegetable (e.g. cabbage, various greens, tomatoes), or animal protein (e.g. fish, poultry, beef, goats and pork). The average food basket is protein deficient, reflected in shortages realised in beans, milk and beef, but surpluses for most crops, as evident in Table 5.11. Income elasticity's of staple foods in Uganda, as seen in the same Table 5.11, is less than 0 except for animal protein where

the income elasticity is greater than 1 (Uganda-Ministry of Finance & Economic Planning, 1995c). The implication is that consumption is still predominantly to meet basic needs.

Table 5. 11: National per capita food availability and consumption for selected commodities

Commodity	Per capita availability (kg/yr) (a)	Per capita consumption (kg/yr) (b)	(b) as % of (a)	Income elasticities
Beans	19	20	105	0.18
Maize	45	23	51	0.20
Finger Millet	39	15	38	0.10
Cassava	218	131	60	0.13
S. Potatoes	128	81	63	0.20
G. Nuts	10	5	50	0.18
Banana	286	217	76	0.165
Milk (lts)	20	25	125	0.58
Beef	5	6	120	1.01

Source: *Adapted from Uganda–Ministry of Finance & Economic Planning, 1995b*

No single food can be called a national staple. As earlier noted, consumption habits have a strong ethnographic bias. Matooke, for example, was predominantly eaten in the central, south and montane regions where rainfall is relatively well distributed throughout the year. Millet, sorghum and cassava were predominantly eaten in the relatively more arid east, north and parts of the south of the country. The situation is however gradually changing and ethnographic dietary boundaries are breaking down.

Notable is posho (maize meal) which was not a staple food in Uganda; maize was mainly grown to be eaten green on the cob (Uganda-Department of Lands & Surveys, 1966; Goode, 1989). Where consumed, posho was considered food for the poor. It has since become a widely eaten food, especially in urban areas (Bibagamba, 1996; Goode, 1989) and is the main food in institutions like schools and prisons. Millet was the preferred grain in the millet/sorghum eating areas in the eastern region while sorghum was reserved for the lean season (Group discussions, 1998). Sorghum is now more commonly eaten while millet is reserved for sale as grain or brewed beer.

With rising incomes, the share of food expenses in the household budget should decrease and the nature of foods consumed shifts towards the more expensive foods and to ensuring a wide variety (Timmer, 1997). Whether an increase or improvement in nutrition accompanies such shifts is not clear. In a study in Rwanda, the composition of the food basket changed considerably from the poorer to the better off segments of the community (Von Braun et al., 1991). However, despite the changes in consumption, the overall level of the food budget share remained stable across income levels. They attributed this to the wide variance in income elasticities, e.g. 4.73 for sorghum, 2.96 for new cereals like wheat and rice, 4.29 for animal products and 0.48 for maize.

Von Braun (1994), discussing findings from studies done in several countries, suggests that given the level of elasticities of nutritional improvement (ranging from 1 to 4.9% for a 10% increase in income), major increases in income levels would be necessary for a major nutritional improvement effect. Schiff and Valdes (1990), citing Behrman & Deolalikar (1988), suggest that as income increases, more of the expenditure on food is spent on non-nutrient attributes such as diversity, freshness, taste and convenience. These attributes however, may not improve nutrition.

From the income elasticities shown in the previous table, dietary variation across income groups in Uganda should come from the consumption of animal protein. Cognisance is taken of areas where they are widely consumed, e.g. fish in villages where fishing is an important economic activity. To examine how commercialisation translates into the nature of foods bought and consumed, and the size of the food budget, this section uses the cluster groupings rather than income levels for analysis.

5.5.1 Dietary habits in the study area

Indirectly, the income effects of commercialisation depend on the proportion of income spent on food compared with that on non-food goods and services, i.e. the size of the food budget. Within the food budget, they depend on the nature of foods purchased (Von Braun, Bouis & Kennedy, 1994), which in turn partly depends on the dietary habits within a cultural setting. To explicate the effects of commercialisation on dietary culture, the group discussions (complemented by consumption data from the surveys) were used to evaluate the changes in eating habits over time. The group respondents ranked the

crops grown in relation to how they featured in their diet during Amin's regime, Obote's regime and to date. These regimes were used to represent the progression from high subsistence to commercialisation. While all the group discussions cannot be presented, the general trend by district is presented in the next section (minor differences exist across micro-ecological dispositions).

In Apac District, the diet has changed from a finger millet/cassava mix complemented by pigeon peas, simsim, vegetables, groundnuts, and sweet potatoes to one mainly made of cassava and beans, simsim and vegetables. They now eat sweet potatoes, millet, groundnuts and pigeon peas to lesser extents while posho often features in the diets of many. In fishing villages close to the shores of Lake Kyoga, fish frequently replaces beans.

In Soroti District, the diet used to be a finger millet/cassava mix, complemented by cow peas, pigeon peas and groundnuts. They mainly ate sweet potatoes and sorghum in the lean season. The diet is now mainly a sorghum/cassava or sorghum/sweet potato mix complemented by beans, vegetables and cowpeas to a lesser extent. Millet, sweet potatoes, simsim and groundnuts now rank lower. Like Apac, fish replaces beans in villages along the lakeshores. Millet though still widely grown, has become an important source of cash through direct sales or is used in making local alcohol for sale. Groundnuts, has been replaced by simsim in some places but both are now highly traded.

Mbale District in general shows the least dietary diversity, i.e. matooke, posho, beans, sweet potatoes and vegetables. Millet and cassava (partly because of the cassava mosaic disease) are no longer as common across the district. Where millet is grown, it is more important for the making of locally brewed beers. Sweet potatoes are no longer as prominent as they used to be (Group discussions 1998). Farmers' note that the loss in production diversity, discussed earlier, also contributes to a loss in dietary variety.

It is also noteworthy that:

i) The nature of the staple food, e.g. matooke compared with millet and sorghum predisposes the consumers to low protein diets and high possibilities of malnutrition (World Bank 1993a). Matooke for example has less than 1.5 gm of

protein per 100 gm compared with either millet or sorghum, each of which has about 8-9 gm of protein per 100gm (Goode, 1989).

ii) Important in Apac and Soroti districts is the role of simsim and groundnuts in the diet. It is a common practice for them to be introduced as a paste into cooked vegetables thus adding qualitative value to the meal (Goode, 1989; Group discussions 1998). On the contrary, many households in Mbale commonly eat plain vegetables that make comparatively negligible calorie contributions, (FAO/US Department of Health, Education and Welfare, 1968; Goode, 1989), aggravating the dietary protein deficiency.

iii) For Apac and Soroti districts, because of the proximity of Lake Kyoga basin, fish a relatively cheap source of animal protein, is widely consumed. Mbale District is not as endowed with fishery resources.

iv) Matooke and posho are generally more highly priced sources of energy than cassava, millet, sorghum, or sweet potatoes, per unit weight.

5.5.2 Dietary differences between the clusters

The application of strategies for dealing with various insufficiencies at the household level can be used as indicators of their food security status (Maxwell, 1996; Teklu et al., 1991; Von Braun et al., 1991). Some of these strategies are; short-term dietary changes, reduced or rationed consumption, altering household consumption or intra-household distribution of food, depletion of stores, use of credit for consumption, increased reliance on wild food, etc.

Maxwell (1996) used short-term food sufficiency indicators as part of a study to quantify the determinants of a long-term adaptive strategy, semi-subsistence farming in a major urban centre, Kampala. The respondents identified the different coping strategies and focus group discussions were then used to rank them in order of application and depending on the severity of food shortages. The least severe coping strategy was reportedly eating foods that are less preferred followed by limiting the portion size. Skipping meals or not eating at all on anyone day are strategies indicating severity of food shortages.

Similarly, a study done in Malawi found that most households produced enough food for 5 to 8 months after which they applied various coping strategies. These included eating less preferred food (mgaiwa) and inferior foods (madeya, pumpkins, green maize, roast cassava etc.) and/or reducing the frequency of meals (Kandoole and Msukwa, 1992). As households run out of maize stocks, the proportion of "nsima" mostly made from maize flour, declined from 72% in June, to 62.4% in December and 47.1% in March. Concurrently, the proportion of meals prepared from "mgaiwa" flour (less preferred in comparison to "nsima") increased from 9% in June to 27.4% in March. The hunger months are January to March. Vegetables, beans and pulses as a complement to the main food accounted for 82% in May, 71.3% in January and 78% in March. Animal proteins were taken with 16.4% of the meals in May and 25.4% of the meals in November.

From the first section of this chapter, the grouping by cluster analysis suggested that purchased food might contribute to bridging household food deficits. This observation is further analysed by examining variations in the size of the average weekly food budget and the nature of foods that are bought. Implicitly, the effects of commercialisation on consumption habits are examined. It is expected that the more commercial or relatively better off households would show a tendency to consume more expensive calories.

Without getting into the details of individual consumption and intra-household food distributions, the nature and the quantities of food consumed was collected for a 5-day recall period. Findings are that most households have a minimum of two meals a day. Where they skipped meals, it was either due to lack of food or lack of time (they left for their gardens early in the morning and returned late in the day). The use of this as a variable indicating food stress is rendered impotent.

The nature of foods consumed however varied across the clusters and the frequency in the recall period of five days is compared. Supported by the literature, (Uganda-Ministry of Finance & Economic Planning. 1995a; Goode, 1989; Maxwell, 1996), group discussions and respondent responses, it is assumed plain vegetables, as the complement to the carbohydrate base of a meal, is an indication of some food constraint. It is a strategy that tides households through the lean season when they have run out of beans, peas, etc. Reference was often made to meat or fish as "good" or "tasty" food while vegetables were a reflection of poverty (Group discussions, 1998). Basic food

Table 5. 12: Dietary habits across the different clusters and groups (5-day recall period)

Cluster Grouping	HPLS		APLS				HPHS			APHS			LPLS		
Variables\ Cluster number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
No. meals at 2nd Survey	10	10	9.6	10	9.7	9.9	9.3	9.8	9.7	10	10	10	9.8	10	9.6
No. meals at 3rd Survey	10	10	9.7	10	9.7	9.6	9.7	9	10	10	9.9	10	9.9	10	9.7
Vegetable 2 (no. of meals)	1	3	3	4	3	4	6	4	4	3	5	4	4	3	4
Vegetable 3 (no. of meals)	2	2	2	3	3	3	4	4	6	4	5	5	4	5	4
Ave. expenditure/week- shs	2942	2272	2567	3375	2079	2666	3238	3517	3017	4117	2917	2900	2582	2225	2298
Calories per 100 shs spent	368	427	534	451	568	486	137	431	435	427	507	457	435	226	451
% calories protein nature 1	81	66	67	68	68	60	61	40	10	48	26	41	31	68	41
% calories protein nature 2	55	74	77	64	74	73	50	19	21	67	45	44	62	83	53
% calories protein nature 3	75	47	61	63	65	48	33	69	25	59	47	34	51	55	47
AVERAGE	**70**	**62**	**68**	**65**	**69**	**60**	**65**	**43**	**19**	**58**	**39**	**40**	**48**	**69**	**47**
%calories animal nature 1	47	37	38	40	36	33	53	36	10	26	18	4	24	63	32
% calories animal nature 2	54	64	44	44	40	43	80	19	4	65	18	38	48	68	44
% calories animal nature 3	75	31	42	44	41	32	33	43	25	10	29	3	34	50	28
AVERAGE	**59**	**44**	**41**	**43**	**39**	**36**	**55**	**33**	**13**	**33**	**22**	**15**	**35**	**60**	**35**

NB. Numbers 1,2 or 3 after variable indicate data are of survey 1, 2 or 3 respectively

Vegetable 2 (3), (no.of meals) = The number of meals at which plain vegetables were the main complement at the second (third) survey.

% calories protein (animal) nature = proportion of food purchases that are of a protein (animal protein) nature at the first (second or third) survey

availability is the focus of this analysis. Therefore, although such meals are inadequate in that they provide minimal body building foods, they meet the basic need of food, i.e. to keep away hunger (Goode, 1989). Relatively low levels of income justify the assumption that, respondents are more concerned about having sufficient food as a basic need, than whether they are meeting all their dietary needs. Cognisance is however taken of the fact that food groups have different attributes that contribute to ensuring a healthy and active life. Micro-nutrients are a necessary component of all diets and vegetables are an important source. Vitamin "A" deficiency, anaemia and iodine deficiency disorders are examples of micro-nutrient related disorders affecting particularly children and women in Uganda (Uganda-National Food & Nutrition Council, 1996a).

The low sales clusters, no.1 to no.6, consume vegetables as the complement to the main staple on average 3 to 4 times at the second survey and the frequency drops to 2 to 3 times out of the 10 meals in the recall period, at the third survey. The high sales clusters no. 7 to no. 12 eat plain vegetables in 3 to 6 meals out of 10 at the second survey and 4 to 6 times, an increment, at the third survey. In the low production-low sales group (LPLS) 3 to 4 out of 10 meals, were complemented by vegetables at the second survey. This remains unchanged at the third survey except in cluster no.14. As a coping strategy commonly applied during the lean season, the average number of meals where vegetables are the main complement should drop at the third survey, as seen in clusters no.1 to no. 6. The incremental consumption of vegetables or no change as shown in the low production-low sales (LPLS) and high sales clusters suggest that food may be inaccessible despite being available. During the surveys, it was observed that some households had beans, simsim or groundnuts (all relatively high value crops) in-store, consuming only small amounts because it was to be sold later.

Of the food bought, the high producer-low sales (HPLS) and average producer-low sales (APLS) groups evidently buy more proteins, at least 60% of calories bought. Animal proteins are between 36% and 44%, except cluster no.1, where they are 59% of calories bought. Dietary diversification therefore seems to be the reason for food purchases. In contrast, the high sales groups spend proportionally less on either protein or animal protein. By implication, these groups buy more basic foods, i.e. the proportion of proteins bought range from 19% in cluster no. 9 to 58% in cluster no. 10. Cluster no. 7 stands out with a high proportion, 65% of calories bought, are of a protein nature. Animal proteins

are an even smaller proportion of calories bought. They range from 13% to 33%, again cluster no. 7 stands out with a high proportion 55%of calories bought.

The low producer group on average spends about 50% on protein. Animal proteins in particular make about 35% of the food bought. Food purchases therefore are not just to diversify the diet but to meet food shortfalls too. Cluster no. 14, with 4 households in this group has the lowest calories bought per 100 shs spent on food, i.e. 226 and about 60% of calories bought are animal proteins.

Inter-survey analysis shows an unexpected increase in the proportion of proteins purchased in the second survey period. The increase seems to come mainly from an increase in the proportion of animal proteins purchased. This could be due to the shortages of the commonly eaten beans and peas, at this time of the year. At this time of the year when the demand for food and labour are both high, it is also a common practice for livestock to be slaughtered to pay for wage labour (one day's wage earnings are converted into the meat equivalent). The observed demand for animal protein is consistent across the sample even among the relatively poorer low production-low sales (LPLS) group. This reflects the desire for dietary variety expressed during some group discussions. Women for example sometimes sold their food crops to buy meat or fish to "balance their diet".

Similar findings were made in a study done in three districts in Mozambique. Food purchases made up nearly 50% of all cash purchases despite the low proportion of net staple food buyers. For 51% of the households, the typical hungry season meal was not sufficient to maintain the health of the family. Of these 51%, the reason given by 46% was lack of variation in the diet rather than insufficient quantities of food. It was found that fish expenditures accounted for 48% to 74% of the food purchases. Fish complemented the bland staples while consumption of staples remained mainly from own production (Tshirley & Weber, 1994).

Despite the need for dietary variety, the quantities bought are small, frequently a kilogram of meat or less. This begs the question of how they share it within the household. A kilogram of meat, depending on whether it is pork, goat meat or beef, ranges between 1,500 and 2,200 shs. Fish ranges from 200 shs to 1,200 shs (for a kg or

less) depending on the season, species and whether it is fresh or smoked. In contrast, a cabbage head costs about 300 to 500 shs off-season and 100 to 200 shs while in season. A bundle of kales/spinach ranges from 100 to 200 shs while in season and 300 to 700 shs off-season. In season, tomatoes will range from 50 to 200 shs and off-season 300 to 400 shs a heap (less than a kilogram).

Whether increased cash income, assumed by the increased commercialisation, translates into higher expenditure on food is uncertain. Weekly expenditures on food in the high producer-low sales and average producer-low sales groups' are lower than those made by the high sales groups but higher than the poorer low producer-low sales group. However, per 100 shs spent on food, there is little difference in calories bought. The difference in expenditure as made by the more commercial high sales groups does not necessarily translate into more expensive calorie consumption. A fair amount of the expenditure is on various vegetables that are cheaper yet make minimal caloric contributions to the diet.

5.6 CHAPTER SUMMARY

The exploratory cluster analysis reaffirms own production as an important factor in ensuring food availability and therefore food security. Households were categorised into the food secure and the food insecure based on production and sales levels. The higher producers are the relatively more food secure across the sample, i.e. within both the food secure and food insecure groups.

The analysis shows that limited sales have a limited negative impact on food availability if cushioned by relatively high production. Food sales of considerable amounts however, render groups more food insecure than those making lower food sales. Such households then seem to rely on the market to try to bridge the food gap so created. This pattern is observed both on an inter-group and intra-group analysis.

Logistic analyses, a pair-wise comparison among three of the groups, find that group membership cannot be predicted from the characteristics of the head of the household; age, gender, education level and main occupation. However, area under cultivation and the dominant cultivated crops, indicate that the more commercial households on average

have more land under production. On the other hand, more land is also under cultivation where bananas and maize rather than cassava and cereals, are the dominant crops. Output from cassava is relatively higher than that from bananas, per unit acreage.

Alternative sources of income, as presented by the ownership of goats and cattle, or non-farm activities, seem to reduce the pressure to sell food. The groups with relatively high non-food expenditure are the more likely to have more goats or own cattle. The group less likely to own cattle or with fewer goats is more likely to generate more income from non-farm activities. This is also indicative of the need for cash income.

Consumption habits suggest a tendency for the more highly commercial households to consume vegetables more frequently in their meals. The higher expenditure on food does not therefore translate into higher calorie purchases per 100 shs spent. Varying amounts of protein foods, particularly animal proteins are bought by all the groups. There is thus an apparent desire to diversify consumption, but does not necessarily match the sale of food.

CHAPTER 6

THE RELATIONSHIP BETWEEN COMMERCIALISATION AND HOUSEHOLD FOOD SECURITY

6.1 INTRODUCTION

The cluster analysis of the previous chapter yielded groups of households classified by food production, sales, purchases and ultimately, food availability levels. A comparative analysis of three of the groups shows the difficulty of identifying group membership by variations in socio-economic, demographic or production related variables. For example, land as an important factor of production is inconclusive as a variable distinguishing group membership.

The objectives of this chapter are twofold. It will statistically examine how food sales and other socio-economic variables affect household food availability and compare the degree of food insecurity in the three districts. To do this, logistic analysis is applied in the first section of the chapter to establish the variables that determine whether a household is food secure or food insecure and therefore household food availability. The latter section in the chapter compares the food insecure households (the degree of food insecurity) across the three districts by means of a food insecurity index.

6.2 FACTORS THAT DISTINGUISH BETWEEN FOOD SECURE AND FOOD INSECURE HOUSEHOLDS

It was earlier postulated that:

Average daily calorie per adult equivalent = f(household characteristics, production, commercialisation, non-food expenditure, wealth).

A number of variables were also earlier identified as indicators of these different factors. They include the age, gender, main occupation and education level of the head of the household, the demographic structure of the household in terms of size and dependency

ratio, the resources available for production (farm-land), income and wealth (livestock owned), and degree of commercialisation.

Logistic analysis is applied to test the main hypothesis that food availability is negatively affected by commercialisation of the food sub-sector. The dependent variable average daily calories available per adult equivalent (AVCALAE) is metric and therefore OLS would have been an appropriate tool for the analysis (Gujarati, 1995; Koutsoyiannis, 1977; Hair et al., 1998; Mukherjee, White and Wuyts, 1998). However, drawing from the objective of the study, to determine whether food sales do contribute to food insecurity, the analysis seeks to identify the factors that distinguish between households categorised as food secure and those that are food insecure. This allows for the use of the logistic analysis, which is applicable where the dependent variable is dichotomous. The sample is categorised into two groups, food secure and food insecure groups on the basis of the dependent variable, i.e., AVCALAE, which is collapsed into a categorical variable. The food secure households are those where average daily calories available, meets their minimum requirement, they take on the value 1. The food insecure households are those who on average, are not meeting the daily minimum calorie requirements. They take on the value 0.

Between OLS analysis and Logistic analysis, the log transformation in the latter reduces the problem of multi-collinearity. Although multi-collinearity is really a question of degree, the abrogation of the assumption that the independent variables are not linearly correlated, creates large variances in the estimated parameters and in so doing reduces the efficiency of the estimators, rendering their interpretation uncertain (Gujarati, 1995). Some of the explanatory variables such as children up to six years old (CHI_SIX) and the dependency ratio (DEP_RATI) and the sum of non-food income (SUMINCOM) with non-food expenditure show varying degrees of collinearity. The correlations between the variables are shown in Appendix 6.

Like OLS analysis, the explanatory variables may also be non-metric (ordinal or nominal). However, it is necessary that they be transformed by means of dummy variable coding (Gujarati, 1995; Hair et al., 1998). It is also noteworthy that Kirsten, Townsend & Gibson (1998), suggest that a low explanatory power in an OLS analysis including a relatively high number dichotomous explanatory variables could be due to a bias arising

from many dichotomous variables explaining the variation in a continuous variable. To try to avoid such a bias, Kirsten et al. (1998) applied a logit model to the same data and and found that some variables that were insignificant with an OLS analysis were significant with the Logit analysis.

OLS analysis predicts the average value of the dependent variable Y, given the explanatory variables, X's. In contrast, the logit analysis employs maximum likelihood estimates to determine the probability that an event occurs or exists given the independent variables. Its advantages were noted in the previous chapter. The Logit transformation allows for the detection of patterns where the variable of interest is rare or highly prevalent (Mukherjee et al., 1998). This further motivates the use of the logit model.

The Odds (O), is the ratio of the number of observations with the dependent characteristic to the number without,

$$O = \frac{n}{n-N} = \frac{p}{(1-p)}$$

A logit transformation:

$$\log O = \log\left(\frac{p}{(1-p)}\right) = \log p - \log(1-p)$$

However, given the limits set by the probability 0 and 1,

$$\log 1 = -\infty$$
$$\log 0 = +\infty$$

Then:

$$-\infty \leq L \leq +\infty$$

Stretching the tails of the distribution thus allows the inclusion of otherwise obscure patterns in the categorical variables.

Categorical variables in this analysis were with regard to gender, occupation, and education level of the head of the household. The use of dummies in two variables, the number of cattle and the number of children attending secondary school, otherwise continuous variables, was because of many 0 values in the data set. The positively skewed distribution due to the 0 values would have the potential of generating biased tests of significance (Mukherjee et al., 1998). The use of the dummy variable in the children who are six years old or less (CHISIX_D) is to enable a "with and without" comparative analysis.

From the focus group discussions in particular, school going children is expected to be highly positively correlated with non-food expenditure (higher with children attending post-primary school than with children attending primary school). However, because payments that are relatively substantial are often made in small instalments, getting a net reflection of the effects of costs of social services was difficult. In the absence of record keeping, the accuracy of data gathered on these items is questionable. Latt & Nieuwoudt (1988) in a study of the effects of plot size on commercialisation were faced with similar circumstances; the crop maturation period of sugar-cane exceeded the study period. For analytical purposes, they replaced the crop income variable with a dummy variable to distinguish between producers and non-producers of sugar-cane.

An additional appeal of Logisitic analysis is its simplicity and ease of interpretation.

Table 6.1 shows the averages and standard deviations or proportion in percentages of the different variables included in the model estimation. The sample size of households included in the analysis is 453.

Table 6. 1: Sample means/proportions of variables to be estimated

Variable	Definition	Variable Mean or Percentage	Standard Deviation
AVCALAE	Calories available per adult equivalent per day	2199.5	806.4
AGE_HHH	Age of the household head	45	14.3
EDU_NONE	Household head attended formal education	88%	
GEN_HHH	Gender of the household head (male)	89%	
OCC_FARM	Main occupation of household head (farming)	84%	
CHI_PS	Number of children attending primary school	2.2	1.8
CHISIX_D	Households with children six years old or less	73%	
CHISES_D	Households with children in post primary school	20%	
AVHCI	Average commercialisation ratio	23.11	22.30
SUMINCOM	Sum of non-food & cash crop income ('000 shs)	393	362
MKT_DIST	Distance to the markets commonly used (km)	4.6	4.0
LND_USED	Area of cultivated land (acres)	3.8	2.37
AVGOATS	Number of Goats	3.2	3.4
CATTNO_D	Households owning cattle	49%	

Source: Primary Survey Data

Table 6. 2: Factors distinguishing between the food secure and food insecure groups

Variable	Definition	B	Wald	Exp (B)
AGE_HHH	age of household head	-0.0140	1.6852	0.9861
EDU_NONE (1)	household head educated or not	0.2888	0.5062	1.3348
GEN_HHH (1)	gender of household head – male	-0.4475	1.1808	0.6392
OCC_FARM (1)	main occupation of head is farming	-0.4684	1.2349	0.6260
CHI_PS	number of primary going children	-0.5868	45.3439*	0.5561
CHISIX_D (1)	household has children six years or less	-0.7971	5.6917*	0.4506
CHISES_D (1)	household has post primary children	-0.8426	5.7721*	0.4306
AVHCI	average commercialisation ratio	-0.0322	11.153*	0.9683
SUMINCOM	sum of income from non-food	-0.0002	0.1235	0.9998
MKT_DIST	average distance to markets used	0.0032	0.0076	1.0033
LND_USED	cultivated land area	0.2604	13.6194*	1.2974
AVCATT_D (1)	household owns cattle	-0.0566	0.0389	0.9450
AVGOATS	average number of goats	0.0659	1.7791	1.0681
APAC_DD (1)	district is Apac	0.2254	0.4631	1.2529
MBALE_DD (1)	district is Mbale	-1.0818	5.4024*	0.3390
CONSTANT		3.7172	16.9902*	

χ^2 15 df 201.588
N 453

*Significant at 5%. Exp β is the odds of the event occurring rather than not occurring, with a unit change in the dependent variable, B.

Table 6. 3: Classification matrix of logit analysis

ACTUAL GROUP	PREDICTED		
	Group 0	Group 1	Total
Group 0 Food Insecure	**131 (72.38%)**	50	181
Group 1 Food Secure	32	**240 (88.24%)**	272
Total	163	290	**453 (81.90%)**

Values in parenthesis are percent correctly classified

The model by logit analysis makes an overall average correct prediction of about 82%. It makes a correct prediction of about 72% for the food insecure group and about 88% for the food secure group.

$$\text{The estimated } R^2_{\text{logit}} \text{ for the sample} = \frac{609.586 - 407.998}{609.586} = 0.33$$

Table 6.2 shows the factors that distinguish between the food secure and food insecure groups. The model has an estimated R^2_{logit} of 0.33. Area of land under cultivation; proportion of food sold out of that produced; number of primary school going children; whether a household has children six years old or less; and whether a household has children attending post-primary school; are the significant variables distinguishing between the food secure and food insecure households. The district variables show no significant difference between Apac and Soroti districts but Mbale District is significantly different from Soroti District.

The variable estimates defining the head of the household are all insignificant. Similarly, the proxies to wealth, i.e. cattle ownership and the number of goats owned and non-food income that in addition to wealth indicates income diversification, are insignificant to daily calories available per adult equivalent.

6.2.1 Demographic characteristics

The age of the household head, though insignificant, has a negative sign. Based on the group discussions, it was hypothesised that the younger households would be relatively more food insecure and therefore that the variable would be positive and significant. One argument made by different groups of farmers was that the younger households (both husbands and wives) are more attracted to consumer goods and therefore sell a higher proportion of food to meet these demands. However, the more common argument that the costs of education and health drive the sales of food, implies that the older households who are likely to have more children of school going age, would have to sell more food to meet the costs of social services.

The gender variable is insignificant although the sign indicates that male-headed households have less food available than female headed households. Female-headed households may have been expected to be the more food insecure given the general argument that they are relatively resource poor households. However, it was observed that rather than rely totally on the sale of food to meet their cash needs, female headed households rely predominantly on beer brewing and sales.

The education variable though insignificant, makes a positive contribution to food availability, as was hypothesised. Education reflects a gain in human capital and among others should impart the ability to better manage resources.

Farming as the main occupation of the household head and the predominant economic activity of most households, is insignificant but negative to food availability. Based on observations during the survey and on the literature, no *a prior* hypothesis was made in respect of this variable. Nonetheless, by implication of the sign of the coefficient, off-farm activities like tailoring, trade, or public service, make a positive contribution to food availability. Drawing from this, the diversification of income could positively contribute to food availability by reducing the pressure to sell food as a means of generating cash income as reflected in the conceptual framework.

6.2.2 Production

As was hypothesised, the area of farmland under cultivation contributes positively to food availability, rendering a household more food secure. With an odds ratio of 1.30, the likelihood of a household meeting its minimum requirements improves with every additional acre brought under production. As noted and in an earlier chapter, expansion in agricultural production in Uganda is mainly horizontal (acreage) rather than vertical (yields) and that in all the three districts, land is a limitation to production. As discussed in chapter four, Mbale is one of the most densely populated districts in the country and households are varyingly faced with land constraints. In Apac and Soroti districts, land is indirectly limiting because of the labour constraint. Thus, the area of land under production becomes a major determinant of production levels, and the gravity of land as a constraint to increased productivity is increased.

It is also recalled from an earlier discussion that most of the cropped land is under food crops. Where non-food cash crops are grown, they are often inter-cropped with food crops. Agriculture is characterised by low input use and is predominantly rain-fed, implying a high correlation between land and labour use and output. That land positively contributes to food availability typifies production in general, that is, strategies to improve productivity should improve food availability.

6.2.3 Commercialisation and transaction costs

The commercialisation variable, AVHCI, is statistically significant with a negative sign, as hypothesised. The food insecure households can also be distinguished from the food secure group by the proportion of food sold. A percentage increase in the proportion of food sold out of produced output, reduces the likelihood of a household being food secure and the odds ratio is 0.97. Households where food sales relative to production are high are more food insecure. Households with a relatively low aggregate output would by implication of the ratio, be more negatively affected by high food sales than households with high aggregate output.

This finding emphasises the subsistence level of production at the farm level and the relatively low levels of production. Most of the farmers produce limited surpluses

beyond their subsistence needs, which given the vagaries of nature may be better held as insurance stocks. Withdrawing these surpluses from the household to the market may, therefore, subject them to the risk of food shortages in the short term. The conceptual framework reflected this in that the more food is deducted for sale implicitly reduces that available for subsistence needs. While it could be argued that if the food system is functioning, households could purchase back food from the markets when in need, opportunities for reliable income generation remain limited. A household is more likely to be in need of food at a time when such opportunities are even more limited, i.e. before seasonal harvests.

The unavailability of food (physical and because of price) at the local markets is a problem that relying on income as a means to meeting food needs also poses. In Bumbo Sub-county, farmers told of the experiences of households who, one season, put most of their cultivated land to growing onions with the intention that part of the money generated would be used to buy maize. This was in reaction to very favourable market conditions for onions. However, when the time came, maize was not available locally, rendering them vulnerable to food shortages. It is recalled from the earlier graphical illustration of price differences between rural and urban markets that at some points during the year, (pre-harvest), prices in the rural markets may be comparative to those obtaining in urban markets, an indication of shortages in the rural areas. The predominance of subsistence production, poor storage facilities and information, and the fact that small traders can ill- afford to lock up their limited savings in holding stocks subject to many risks (market, post harvest loss and theft), are likely reasons for local unavailability. In general therefore, cash income is not a guarantee to having food when it is needed.

Between the districts, a household in Mbale District is less likely to belong to the group able to meet its minimum requirements compared with a household in Soroti District. The odds ratio is 0.34. No significant difference is found between Apac and Soroti districts.

A high correlation is found between the district and commercialisation variable. Mbale District is the most commercial of the three districts. It had an average HCI value of 44% at survey 1 and 38 at survey 3. Apac District had an average HCI of 17% and 11% at

surveys 1 and 3 respectively and Soroti District HCI values were 9% and 8% at surveys 1 and 3 respectively. It is therefore expected that because of the negative effects of commercialisation, Mbale District will have a more pronounced food insecurity problem than either Apac or Soroti districts.

Mbale District, by the size of its urban population and by virtue of its relative proximity to the large urban centres (Jinja and Kampala), has easier access to a potentially wider domestic market. In addition, it borders Kenya, Uganda's largest trading partner in the region and an important food market. Apac District borders Lira District, which is an important food market in its own right. But Lira Town is also a regional trading centre servicing the more northern districts whose production has suffered because of insecurity. Food is generally moved from Apac to Lira District. During the study, farmers in Chegere and Inomo sub-counties in Apac District (these sub-counties border Lira District) reported that traders from Lira District often bought their cassava gardens (i.e. the entire standing cassava crop). While they saved the farmer the costs of harvesting, processing and transport to the market, that traders are prepared to pay for a standing crop on the basis of an estimated output, also reflects the demand for food.

Besides the impact of commercialisation in Mbale District, the district variation is a proxy for the difference in the dominant crops cultivated in the different districts. Apac and Soroti districts, predominantly grow cassava, finger millet, sorghum, maize and sweet potatoes and a variety of pulses. In Mbale District, matooke and maize are the more widely cultivated staple foods. Cassava has a yield advantage over matooke (discussed in more detail in section 6.3) while the yields of maize, finger millet and sorghum are comparable.

As indicated in an earlier chapter, maize and beans are widely consumed domestically and in the neighbouring countries and are thus highly traded food crops. It is estimated that between 4 to 7% of maize and beans produced have been purchased by World Food Programme on an annual basis, and that 35 to 40% of maize and 25 to 30% of beans are sold on the domestic market (Uganda-Ministry of Agriculture Animal Industries & Fisheries, 1997). This excludes informal cross-border trade.

During the study, it was observed that maize and beans are fast selling crops, sold soon after harvest. Where they are the more dominant crops, there is a pronounced tendency for households to sell large amounts of food. However, the lack of storage facilities is also an important factor in the household decision making process. Post harvest losses are higher for maize and beans estimated at between 25% to 30% than they are for millet and sorghum estimated at 7% to 12%, (Uganda-Ministry of Agriculture Animal Industries & Fisheries, 1997; Uganda-Ministry of Finance and Economic Planning, 1995b). Households would be more predisposed to sell maize and beans to minimise such losses.

Matooke, a highly perishable crop, is widely consumed in urban centres and therefore highly traded. Cassava on the other hand is mainly considered a food security crop given its ability to remain in the garden with limited spoilage for a relatively long period of time where it presents no storage problem (Uganda-Ministry Agriculture Animal Industries & Fisheries, 1997). The most common response from respondents who considered themselves food secure was that they had cassava in the garden. Its food security properties therefore contribute to insuring households in Soroti and Apac districts against production and inter-seasonal fluctuations. However, after harvesting it is highly perishable and its losses are as high as 25% and this coupled with its very bulky nature renders it less traded while fresh. More of it is traded following a drying process and because of the deficits created by the cassava mosaic disease, the demand is high.

Sweet potatoes also have an important food security role. In Bumbo Sub-county, respondents reported that following pronounced food shortfalls in 1994, there was an apparent increase in the acreage of sweet potatoes cultivated. It is predominantly grown for subsistence purposes and is considered a woman's responsibility. In Soroti and Apac District, it is harvested, sliced, dried and stored to reduce spoilage in the garden. In the dried form, it is a food reserve but may be traded in limited quantities.

The average distance travelled to the markets, represented by MKT_DIST, conveys an important message despite being statistically insignificant. It is positively associated with food available per adult equivalent as was hypothesised based on the theory of transaction costs and its negative impact on commercialisation. The insignificance of the variable however, could be explained by the observation that marketing opportunities

exist right from the farm gate where traders or their agents roam the villages in search of food to buy and the existence of collection points within the villages. It was observed that many traders have collection points in the areas where a crop is concentrated. Village weekly markets and roadside sales, are the other collection points. Although farmers reported that prices offered at the farm gate are often lower than those offered in the market, the trade-off is that, they would have to pay several market dues to use the market to sell their food, i.e. their transaction costs are higher. They are also relieved of the burden of having to carry the produce to the market. See Appendix 5 for marketing channels.

The various opportunities reduce transaction costs. The market activity however tapers off after most of the immediate post harvest sales have been done and most of the transactions then take place at the market. For the majority, the most common mode of transport is walking, while the most common vehicle is the bicycle. A limit on how much can be sold at one time is set by how much an individual can carry. Boda boda (bicycle or motorcycles used on hire basis) may be hired to carry the produce to the market, at an average of 1000 shs per bag (100kgs) of produce within an average radius of less than 10 km. However, farmers complained about market dues and so it can be argued that the additional costs of transport would further reduce their profit margins.

Although not factored into this analysis, insecurity is a problem frequently mentioned by farmers as driving food sales. Indicative of its effects, in Bumbo Sub-county, some farmers argued that it is at times better to sell the food even if at relatively low prices rather than wait to lose it to food thieves. In Muyembe Sub-county, one becomes a likely target for food thieves, particularly during the scarce periods when prices are relatively better for the producer. To reduce this risk, some households will sell food despite their household needs. It was also observed that in several homesteads with traditional granaries, more often, the granaries had no food in them and a common reason was fear of theft. Farmers suggested that the readily available market and a need for money rather than a need for food, are the reasons for food thefts.

6.2.4 Income and non-food expenditure

Income effects are insignificant to food availability as shown by the variable defined as the sum of non-food income (SUMINCOM), which is negatively correlated with food availability. This may seem contradictory to the earlier argument that off-farm income generating activities could have a positive contribution to food availability. However, this is in consideration of the observation that food purchases, through which income effects would be transmitted, make a small proportion of food available for consumption. On average, they contribute about 13% in Apac District, 15% in Soroti District and 27% in Mbale District. The relatively low percentages reaffirm the importance of own production to food security.

That the variable is negatively associated with food availability could arise from two factors. Income from the traditional cash crops contributes to the variable, SUMINCOM. The cash crop mainly grown was coffee in Mbale District where it is inter-cropped with bananas. However, because it is also a common practice to inter-crop beans in the bananas and therefore coffee would compete for especially land, in Mbale District. Very few farmers grew tobacco and cotton in Apac and likewise, very few were found to be growing cotton in Soroti District.

Second, a relatively high positive correlation exists between SUMINCOM and AVNFEXP. This partly explains why income is negatively related to food availability, i.e. high expenditure matches high income. In general, the group discussions ranked education, health care, drinking alcohol, buying basic consumer goods like fuel (mainly paraffin for lighting), clothing, soap, and the need to diversify the diet, as motivating food sales. They chronicled the most cash-demanding period as starting with the festive Christmas season. The new-year then sets in with demands to meet school needs and pay taxes. The cost implications regarding wage labour and/or seed follow with the beginning of the planting season (March-April). It leads into the lean season when the demand for food is highest and most stores have been emptied. From the conceptual framework, the proportion of the food budget of the household budget, is one of the determinants of whether commercialisation would render households more or less food secure. By implication of the above discussion, more cash income is spent on non-food than on food expenditure.

From the previous chapter, it is also recalled that a comparative analysis of the different foods bought at different times of the year indicate that on average, expenditure on food shows a slight increase during the lean season (before the first season harvest as recorded during the first and second household surveys). However, the nature of foods bought, especially in Mbale district which had a relatively higher proportion of households in the least secure food clusters, make little calorific contribution to the diet (mainly green vegetables). Price data, illustrating price movements during the year and therefore interseasonal variation, (Figures 3.1a and 3.1b) are also indicative of producers facing higher prices later in the season. This should further constrain them from making purchases to bridge the shortages faced during periods of relative scarcity.

Together with this finding that non-food income is not significant to food availability, the heavy reliance on own production to meet subsistence food needs is again emphasised. A more comprehensive analysis of the seasonal variation in food availability and food purchases is therefore called for.

6.2.5 Education and health-care

As hypothesised, the number of children attending primary schools, households with children attending post-primary school or households with children who are six years old or less, negatively affect food availability. Having children who are six years old or less (the odds ratio is 0.67), having primary school going children (the odds ratio is 0.56) and having children attending post-primary education (the odds ratio is 0.66), all increase the likelihood of a household being in the food insecure group.

The effects of primary school going children could be interpreted in two ways. First, the high correlation with the number of adult equivalents (correlation coefficient is 0.78) implies that the larger the household size, the more constrained households are in meeting their minimum food needs and this negative association is expected. Second, every primary school going child could reduce food availability indirectly if food sales are undertaken to meet the costs of maintaining them in school. The latter explanation is supported by the farmer group discussions, the costs of education consistently ranked high as one of the reasons encouraging food sales in the three districts.

Even with the Universal Primary Education programme parents are still obliged to meet the costs of maintaining their children in primary school. These include providing books, school uniforms and paying non-tuition fees as stipulated by the schools and the tuition fees for those children additional to the four whose tuition fees are met by the state. Despite Government's contributions, parents still argue that the total non-tuition bill is high. This argument is supported by a poverty study in which it is reported that the costs of basic scholastic materials remain a burden on many poor families (Uganda-Ministry of Finance, Planning & Economic Development 1999). Put in perspective, the costs of an exercise book and a pencil, the most basic scholastic requirements, are less than 500 shs.

However, the higher correlation between non-food expenditure and the number of post-primary school going (0.44 compared to 0.26 between primary children and non-food expenditure) makes the variable CHISES_D, which is significant and negatively associated with food availability, a better proxy to non-food expenditure, particularly education related costs. The high positive correlation between adult equivalents per household and the number of primary going children implies household size is controlled for by the variable CHI_PS.

The costs of post-primary education are on average higher than primary education and therefore fewer parents can afford to educate their children through post primary education. This is evident in this study; on average every household has 2 primary school going children but more households do not have children attending post-primary education. If incomes from food sales contribute to meeting some of these costs, it is expected that the food availability implications of educating one primary school child are less than that for a post-primary school child. Livestock were also reportedly sold to pay school fees. Some children attending post-primary education, pay their own fees through income generating activities like brick making, petty trade, beer brewing etc.

Pre-school children aged 6 years or less (CHISIX_D) is statistically significant with a negative sign. It is also a proxy for the dependence ratio (correlation coefficient is 0.54) and health care. From earlier discussions, it is assumed that health care needs would be more pronounced among this age group. As a proxy for the dependency ratio, households with fewer "workers" relative to dependants are less food secure, as expected. By

implication, younger households, expected to have more dependants than workers compared with households in the later stages of the life cycle, would therefore be more food insecure. The group discussions suggested this, although they based their argument on higher food sales to meet demand for consumer goods.

Based on the theoretical relationship between food availability, nutrition and health, that the young children are more adversely affected, and on the argument that food was sold to meet among others health care needs, this variable estimate suggests that health care negatively impacts on food availability. A relatively low correlation is found between non-food expenditure and this variable. However, because of the observation that many bills are paid for on an instalment basis, the correlation coefficient should be higher. The finding that an additional primary school going child reduces food availability by less than a pre-school child does, favours the argument that this variable reflects additional effects beyond food needs.

Given the HIV/AIDS pandemic, it is expected that the demand for health care contribute to its costs and following the same argument, to food insecurity. On the other hand, because the most economically active age bracket is relatively more affected by the pandemic, negative externalities may arise from the effects on the labour force. However, although undoubtedly an important factor worth further research, was beyond the scope of this study.

The pressure that comes to bear on households is illustrated by the following examples. To pay off a medical bill of say 2,500 shs would require about 25 kgs of maize at an average price of 100 shs per kg, or about 10 kgs of beans at an average price of 250 shs per kg. School requirements of 10,000 shs will on average be a bag (100 kgs) of maize. One farmer in Muyembe Sub-county pointed out that the 30 bags of maize he had in store could not pay the fees of his three children in secondary school. That households with children in these defined brackets reduce daily calorie availability per adult equivalent supports the finding that food sales negate food availability in that implicitly food sales are made to meet these needs.

However, while the costs of accessing social services may bear heavily on the rural population, health costs on average make up 19% of non-food expenditure in Apac

District, 21% in Soroti District and 16% in Mbale District. Education costs make up 20% of non-food expenditure in Apac District, 15% in Soroti District and 22% in Mbale District. Of concern is the finding that alcohol and cigarette consumption combined, on average make up 30% in Apac and Mbale districts and 34% in Soroti of non-food expenditure. In Bugobero sub-county, a group of women lamented that their husbands sell all the matooke and spent most of the money on drinking with their friends. The women were particularly pained that even paying for the children's school needs, it is up to they the women to "look around".

Despite the use of these variables as indicators of the likelihood of a household being faced with relatively higher costs of accessing social services, given more reliable data on expenditure, the relationship between actual expenditure and food availability should be examined. The implications of these findings are that, food sales are in part driven by the need to meet the costs of accessing non-food goods and services.

6.2.6 Wealth

Although wealth should ease consumption smoothing, i.e. it enables a household meet its food needs both in good and bad times, there was no *a priori* hypothesis. One reason being the fact that livestock have social value in addition to the economic value and may not therefore be converted into cash income. However, the wealth proxies, i.e. the livestock owned (number of goats and whether a household owns cattle), are both insignificant. Goats make a positive contribution but cattle a negative one to food availability. Livestock could contribute to food availability indirectly through income effects if sold and directly, cattle may be used for animal traction. As for directly contributing to production, alternatives exist; it was observed that with or without oxen, reciprocal or hired labour and shared or hired oxen, are common practice. In Muyembe sub-county where maize and beans are grown on a relatively large scale, tractors were used to a small extent. Indirectly, because of the importance attached to cattle, it is not expected that the need for food would result in their sale. Other coping strategies would be adopted and if need be poultry or the smaller stock (goats or pigs), would be sold first in times of need. Hence the positive association between food availability and number of goats owned. Otherwise as wealth, therefore, livestock rarely enter the food security equation.

It is noteworthy to say that owning cattle is negative to food availability could also be due to restocking efforts particularly in areas of Soroti and Apac districts that are recovering from the effects of cattle rustling. The most common source of income is food sales and households were observed to be prioritising restocking for various socio-economic reasons.

Summarily, the scale of production is still predominantly subsistence and therefore deductions from output reduce the food available to meet subsistence needs. In addition to that, it was earlier discussed that whereas food sales do not necessarily negate food security, food purchases make a small proportion of total food that is consumed, implying own production is still the most important means to ensuring food availability.

6.3 THE DEGREE OF FOOD INSECURITY IN THE THREE DISTRICTS COMPARED

One of the objectives of the study was to compare the status of food security in the three districts. The findings so far indicate that Mbale District is the most food insecure of the three districts. Between Apac and Soroti, it is difficult to distinguish which is the more food secure or insecure. For a concise comparison of the three districts, this section generates an aggregate food insecurity index. It combines two variables, the proportion of food insecure households in a given population and the degree of food insecurity as evaluated by the "food gap". This stems from Sen's ordinal poverty index, a measure of poverty that combines the head count and the poverty gap (the income gap below a poverty line) both of which are commonly used measures of poverty (Sen, 1976).

Sen argued that the "head-count ratio" (H) the number of people with income below the poverty line to the total population, is insensitive to the degree of poverty. The head count may remain the same despite changes in the degree of poverty among the poor. The poverty gap (g) is the aggregate gap below the poverty line and it, on the other hand, is insensitive to the numbers of the poor sharing the gap.

His arguments centred around two axioms:

i) Monotonicity axiom - a reduction in income of a person living below the poverty

line increases the degree of poverty.

ii) Transfer axiom - a transfer of income from someone below the poverty line to someone better off increases the degree of poverty.

Ceteris paribus, the head-count ratio violates both axioms while the aggregate poverty gap (shortfall below the poverty line, of all the income of the poor) satisfies the monotonicity axiom but violates the transfer axiom.

He proposed a set of axioms, two of which made reference to the welfare rankings of individuals', i.e. relative equity and ordinal rank weights. First, that within an income configuration, the lower ranked are assumed to be the worse off. Second, their income gap therefore draws heavier weighting. He argued that while it is questionable that a rich but crippled person is better off than a poorer and fully able person, the third axiom, i.e. monotonic welfare, is based on the relatively crude assumption that a richer person is necessarily better off. It therefore does not take into account the totality of welfare because of the multitude of factors that would then need to be taken into consideration.

While both the head count and poverty gap should contribute to defining a poverty index, together, they still do not provide enough information on poverty. This is because neither gives adequate information on the income distribution among the poor. Assuming a special case where all the poor have the same income, then the two measures provide adequate information, i.e. the number of people affected and how poor they are, from which the last axiom (normalised poverty value) is thus drawn.

The poverty index that satisfies these axioms is defined as:

$$P = H[I + (1 - I)G]$$

Which (Sen, 1976) went on to prove, and where:

G is the Gini coefficient of the income distribution amongst the poor and is defined as:

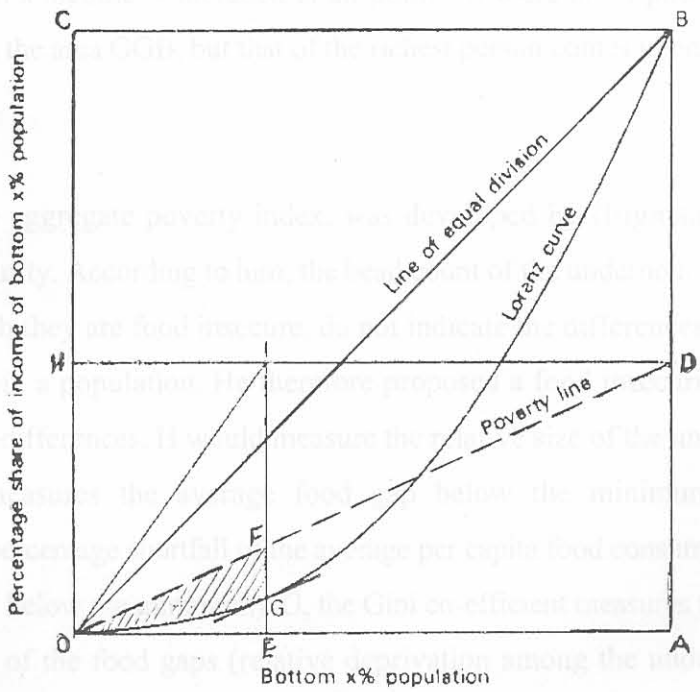
$$G = \frac{1}{2} q^2 m \sum_{i=1}^{q} \sum_{j=1}^{q} \left| y_i - y_j \right|$$

"I" is an individualised income-gap-ratio defined as;

$$= 1 + \frac{1}{q} - \frac{2}{q^2 m} \sum_{i=1}^{q} y_i (q + 1 - i)$$

$$I_{i \in S_{(x)}} = \sum \frac{g_i}{qz}$$

It is the normalisation of the aggregate poverty gap into a per-person percentage gap, the percentage of the shortfall below the poverty line of an individual's income. "I" is augmented by G, the distribution of income among the poor weighted by (1-I), the ratio of the mean income of the poor to the income level defining the poverty line, i.e. I ignores the distribution and G provides information on the distribution. Unequal distribution of income among the poor is the gini coefficient of this distribution multiplied by the mean income ratio. Thus [I + (1 - I) G] is the income gap normalised per poor person, but it does not take cognisance of the number of the poor, H.



Source: Adapted from Sen, 1976

Figure 6. 1: The relationship between P and G illustrated

OB is the line of equal division

OGB is the Lorenz curve,

The gini coefficient, G, is the area OGB/OAB,

The slope of the line OD = poverty line,

OE is the number of the poor.

The poverty measure P corresponds to the area OGF/OEI. It depends on the difference between the slope of OB (normalised mean income) and the slope of OD, (poverty line), and on the number of the poor as opposed to the whole population, OA.

From the formula above,

$$P = H[I + (1 - I)G]$$

1-G is equivalent to the area under the Lorenz curve, OGB.

The poorest person's income is included at all points. If there are n poor people, it is included n times in the area OGB, but that of the richest person comes in only once when point A is reached.

An analogy to the aggregate poverty index, was developed by (Bigman, 1993) with respect to food security. According to him, the head count of the undernourished, and the margins with which they are food insecure, do not indicate the differences between the food insecure within a population. He therefore proposed a food insecurity index that takes care of these differences. H would measure the relative size of the undernourished population. "I" measures the average food gap below the minimum nutritional requirements (the percentage shortfall of the average per capita food consumption of only the undernourished below the minimum). G, the Gini co-efficient measures the inequality in the distribution of the food gaps (relative deprivation among the undernourished). Bigman's concern over the aggregate food insecurity measure remained that it does not take into account individual differences and needs or intra-household factors that negate the attainment of individual food needs.

The analyses so far done are based on the average situation of both food secure and food insecure households. They cannot be conclusively used to compare the degree of food insecurity in the districts. An attempt is here made to apply this index to do so and determine the degree of household food insecurity. It is recalled that the daily average calories available per adult equivalent, addresses the gender and age differences within the household. This food insecurity index collapses two variables, the average daily calorie shortfalls below the minimum requirements and the proportion of households that are food insecure, into an index for the comparison of food insecurity across the three districts. An application of the aggregate measure of food insecurity across the three districts on the basis of average daily calories available per adult equivalent is here specified as:

$$FI = H_n [F_s + (1 - F_s).G]$$

$$G = 1 + (1/q) - 2 /(q^2 K_h) \sum F_i (q + 1 - i)$$

Where:

FI = District Food Insecurity Index

H_n = Proportion of households in the district that are food insecure

F_s = Average district Household food shortfall (calories) from minimum household requirements

K_h = Average daily food (Calories) available per adult equivalent amongst the food insecure households

F_I = Household food shortfall (calories) from minimum household requirements

G = The gini-coefficient of the food insecure only

Q = Total number of food insecure households in the district

I = Individual households that are food insecure

The application of the aggregate food insecurity index establishes the relative deprivation across different agro-ecological and socio-economic settings.

On average the food insecure have available to them about: 1,751 calories per adult equivalent per day in Apac District, in Soroti District they have about 1,468 and in Mbale District they have about 1,358 Calories. It is recalled that on average about 35% households have less than 80% of their minimum needs (1,935 calories) in Apac District, in Soroti District it is about 37% of the respondents and in Mbale District about 72%.

The results are as follows:

Apac District	FI = 19
Soroti District	FI = 107
Mbale District	FI = 429

By the food insecurity index, the degree of food insecurity is greatest in Mbale District, followed by Soroti District and lastly Apac District. There is a wide margin between Mbale and the other two districts. Commercialisation, as discussed earlier, is a factor that contributes to this wide variation. Other possible reasons are now discussed.

Variations in the yields of the dominant food crops cultivated and by implication consumed. The yield estimates of selected crops (tons per acre) are; cassava - 3 tons, sweet potatoes - 1.5 tons, maize - 0.6 tons, millet - 0.6 tons, sorghum - 0.6 tons, beans - 0.3 tons, and bananas - 2 tons (Uganda-Mbale Department. of Agriculture, 1998; Uganda Bureau of Statistics, 1999). Cassava has a yield advantage over bananas, sweet potatoes or the cereals. It is a dominant crop in Apac and Soroti districts while matooke is mainly cultivated in Mbale District. The grain crops maize, finger millet and sorghum do not impart any yield advantage on those cultivating either of them.

Because of the importance of own production in meeting food needs, the yield advantage of cassava in particular should impart a higher degree of food availability to those cultivating it. Although the yield of bananas is relatively high, substantial quantities are sold, and therefore less of the estimated output is available for consumption. In addition to the yield differences between the dominant food crops being cultivated, it is recalled that Mbale District is faced with a land constraint. About 21% of the sampled households cultivate less than 2 acres. In contrast, those cultivating less than 2 acres in Apac and

Soroti districts are less than 10% of the sampled households. This has a bearing on output that is mainly a function of area under cultivation.

The relatively low use of the second rains in Mbale District also contributes to the aggregate variation in food availability. In effect many households have one harvest of the main annual crop. In contrast, in Apac and Soroti districts, crop rotation patterns ensures that two harvests of the main annual crops are made. Besides the yield advantage of cultivating cassava, a second season crop of either sorghum or sweet potatoes as is practised in some of the villages in Soroti District, increases this advantage.

The influence of dietary eating habits, which are strongly ethnographic, cannot be ignored. Discussed in the previous chapter, the nature of the foods that make up an average diet in Soroti and Apac districts inherently provide more calories than the foods commonly eaten in Mbale District. Therefore knowingly or unknowingly, the choice of foods grown and consumed also influence calorie availability.

The lack of awareness was manifest in the responses of a study respondent, a licensed teacher and office bearer on the area's Local Council I executive committee. She could not relate the apparent malnutrition in her children and the diet she was feeding them. Their diet was predominantly matooke from the garden, fried cabbage/spinach and less frequently included potatoes and beans. Although they were also cultivating maize and beans, these were mainly for sale to enable them complete building their permanent house. The previous season they had sold the maize harvest to buy iron sheets. Cumulatively, the diet limits caloric consumption. In contrast, a group of women in Soroti District said they included some simsim in their vegetables, which would otherwise be bland. Simsim imparts upon the meals a higher caloric content and has a high protein content (21%).

6.7 CHAPTER SUMMARY

The chapter estimates the relationship between food availability and commercialisation and other socio-economic variables. Logistic analysis is applied to test the hypothesis that commercialisation negatively affects food availability. Secondly, a food insecurity index to compare the degree of food insecurity across the three districts is generated.

The findings of the analyses reaffirm that increased productivity, reflected by land brought under production, increases food availability. Commercialisation however, negatively affects food availability. Other variables also found to negatively affect food availability imply a constraint on household resources to meet its demands and a competition of needs. Mbale District on average is significantly more food insecure than either Apac or Soroti District. Human capital reflected by variables regarding the age, gender, formal education, or occupation of the household head, are all insignificant to food availability.

The aggregate food insecurity index focuses on inequality among the food insecure and the numbers of food insecure households and thus the degree of food insecurity. It shows that the degree of food insecurity in Mbale District is far worse than either Soroti or Apac districts. This is in support of the main hypothesis given the overall observation that Mbale district is the more commercially oriented of the three. However, the cropping patterns and land availability contribute to determining the degree of food insecurity too as some crops, i.e cassava and sweet potatoes impart a higher degree of food security by their very nature and by the fact that they are very bulky. This finding also underscores the observation that the apparent abundance of food, as seen in Mbale district in particular and Uganda in general, masks the food insecurity problems faced by many and due to a compounded relationship of a number of factors.

CHAPTER 7

CONCLUSIONS AND POLICY RECOMMENDATIONS

7.1 INTRODUCTION

This study seeks to contribute to the on-going debate on food security/insecurity commercialisation, an important developmental issue. It was motivated by concerns over the growing food insecurity problem in Uganda, a country that is predominantly rural and agrarian and has long been associated with aggregate food self-sufficiency. Historically, incidences of food insecurity have been associated with production shortfalls caused by adverse climatic conditions and insecurity/civil strife. The concerns however, are that besides production shortfalls, food insecurity increasingly is a result of the economic reform programme implemented since 1987. Rather than try to evaluate the food security situation within the broad context of the Economic Recovery Programme (ERP), the study is limited to the sale of food and its effects on food availability. Commercialisation of agriculture is a sector specific objective but has also been spurred on by policy changes that are part of the ERP.

Based on the premise that the ERP would benefit those involved in the cash rather than the subsistence and largely non-cash economy, the rehabilitation of the traditional cash crop economy was accorded high priority. However, their earnings, dominated by coffee the country's main export, are subject to fluctuations in international markets. To reduce instability induced in the economy because of these fluctuations, efforts to diversify the revenue base were put in place. In the agricultural sector, it included the promotion of non-traditional exports, many of which are food crops. The sale of food has also been spurred by growth in domestic and regional demand. The study finds that food crops are more widely cultivated than the traditional cash crops and to varying degrees, many are cultivated to meet both food and cash needs.

Besides the diversification of the revenue base, the sale of food is also important for overall economic growth, a national policy goal. In contributing to cash earnings, food sales enable the producers to consume goods and services provided by the market. This

should have positive spillover effects for domestic production and ultimately economic expansion. In this respect therefore, commercialisation of food should contribute to higher utility levels and export earnings. Income generated from food sales also contributes to the general welfare and development of the nation through expenditure on health care and education.

However, the main hypothesis of this thesis is also borne out by the findings of the study. On average, an increase in the proportion of food sold to that produced reduces daily food availability per adult equivalent. Similarly, households with children in different age brackets, inferring certain non-food cost implications, also reduce food availability. The area under cultivation is found to increase food availability. From these findings, this chapter draws the study's conclusions and makes policy recommendations.

7.2 STUDY CONCLUSIONS

7.2.1 Productivity

Land and labour availability are the most important factors of production. This is pronounced given the dominance of basic agricultural practices, more often unaided by either input use or more productive agronomic practice. A starting point for food security analysis under these circumstances is the production level. This mainly depends on the area of land under cultivation hence the allocation of resources to food production *viz a viz* other activities (livestock and non-food crop production or non-farm work) as presented in the conceptual framework. Ultimately, land and labour availability determine the area under cultivation, which the study finds to positively affect daily food availability. However, land use (cropping choices) also has a bearing on food availability given that yields and caloric variations differ by the nature of foods cultivated and by implication consumed. Given the vulnerability to food shortages, certain crops particularly cassava and sweet potatoes are important in that by their nature and because they are relatively less traded, impart a higher degree of food security.

The pressure on land is bound to increase with population growth. The study also shows a tendency for the more commercial households, on average, as having more land under production. Therefore if production remains mainly a function of cultivated area and

commercialisation progresses as envisioned by sectoral objectives, the demand for land is expected to increase. This in turn could increase inequitable land access, rendering some segments of the population more vulnerable to food insecurity.

Although not included in the conceptual framework, the climatic factor was discussed as an important factor to food security albeit beyond the control of the producer. Climatic fluctuations are a dominant factor in determining levels of production in any particular season, given that agriculture is predominantly rain fed. During the study, adverse natural phenomena, beyond farmers' control, were followed by food shortages in the short term. This shows that the country's early warning period for food shortages is short. It is also strongly indicative of weak insurance measures, more particularly household storage. The reasons for poor storage vary from insecurity of self and property, to high post-harvest losses because of poor handling and poor storage infrastructure. Besides, some foods are subject to high pest infliction.

As hypothesised, production levels are important in determining food availability. Because it is mainly a function of cultivated area, variations in land availability and productivity have a direct bearing on food security. Factors that affect either of the two variables will indirectly affect food security. Commercialisation is seen to encourage the allocation of resources, i.e. land, towards certain crops and given the negative relationship found between commercialisation and food availability, it further subjects the households to higher risk of food shortages.

7.2.2 Household characteristics

The defining characteristics of the household head have been shown to affect decision making and resource allocation within the households. However, the study finds that gains in human capital as reflected in the age and whether the household head has attained some formal schooling, are insignificant to food availability. The gender variable is also insignificant although it indicates that households that are female-headed are more food secure than male-headed households. Various group discussions revealed the general argument that men sell food but often at the expense of the welfare of their families. Female-headed households on the other hand tend to generate their income from other activities than food sales and in so doing, reduce the pressure to sell food.

Two aspects of the structure of the household, i.e. family size and dependence ratio however, negatively affect daily calorie availability as hypothesised by their proxy variables, primary school going children and those six years old or younger. On average, relatively large households are more constrained to meet their food needs. This is more so given the limits set on production levels by the available factors of production particularly land, as discussed above. Likewise, where fewer members of a household are productive, implying more mouths to feed per productive person, *ceteris paribus*, such households are rendered less food secure.

7.2.3 Commercialisation effects

From the conceptual framework, the effects of commercialisation on food availability can be direct or indirect and it was hypothesised that it is negative. The study finds that subsistence food needs are predominantly met from own farm production as food purchases, on average, make a small proportion of what is consumed. Therefore, by deducting from farm output, food sales directly reduce the food available for subsistence needs. The analyses did reaffirm this. However, the negative effects of commercialisation are cushioned by high food output. Households with relatively low food output and selling a large proportion of it are therefore more vulnerable to facing food shortages. This it is recalled, was illustrated by the conceptual framework, i.e. food available for consumption was dependent on how much of it was sold and implicitly on the output.

The indirect (income) effects of commercialisation on food security may be through the size of the food budget relative to other expenses as illustrated through the conceptual framework and/or the nature of foods purchased within the food budget. The study finds that higher food expenditure does not translate into either more calorie availability or the purchasing of the more expensive animal proteins. However, it is observed that during the year, calorie purchases per 100 shs spent on food reflects food scarcity on average. It is lowest later in the year after the harvest. Higher income levels therefore do not necessarily translate into better nutrition. Nonetheless, variations in the size of the food budget and choice of foods bought reflect food scarcity during the year.

The negative effects of commercialisation on food availability underscore the subsistence level of production. Food purchases make a small contribution to aggregate household food availability.

7.2.4 Effects of income and non-food expenditure

Despite the difficulty of collecting accurate data on income and expenditure in the absence of record keeping, there is an apparent need to diversify rural household income. This is reflected in different members of the household engaging in different income generating activities. Opportunities to generate income are however, limited and those that exist are closely related to activities in the agricultural sector and are therefore subject to its seasonal nature. The inter-group analyses, show that diversification of income (livestock income and non-farm activities) reduces the pressure to sell food to meet cash needs. Again it is recalled from the conceptual framework that cash could either be used to purchase food or on non-food expenditure or held as savings. Implicitly, a diversification of income contributes to non-food expenditure that would otherwise have been met through selling of food.

This is reaffirmed by the finding that pre-school and post-primary school children, proxy variables for the costs of health care and education respectively, reduce daily food available per adult equivalent. The implications are that accessing social services, i.e. health and/or education, increases the pressure to sell food. On average, the highest non-food expenditure centres are health care, education and spending on alcohol and cigarettes. As part of improved national budgetary management under the Economic Recovery Programme (ERP), a cost-sharing policy was adopted for the delivery of social services. It is only lately that Universal Primary Education has been introduced. The relief this direct subsidy imparts is evident in the observation that more households have children attending primary school than those with children attending post-primary school. From the above discussion, an indirect positive effect of the subsidy on food availability is inferred.

However, of concern is that on average, at least 30% of non-food expenditure are spent on alcohol and/or cigarettes. The implication of this finding is that there is a disproportionate distribution of income effects within the household, a large share of

income going to meet the needs of one or two adults. This concern was widely shared by the respondents during the group discussions. It was generally expressed that the sum implications of expenditure on especially drinking, often meant that other needs in the household have to be foregone and these include food.

While increased taxation may seem an attractive way of mitigating against the negative effects of expenditure spent on alcohol and cigarettes, because beer selling and drinking largely operates in the informal sector, the challenges of enforcement would be immense.

Therefore, alternative means of income generation would positively contribute to food security by reducing the pressure to sell food to meet cash needs. Although food is a primary need, household priorities may demand that non-food needs be met at the risk of subjecting the household to food shortages. Food needs cannot therefore be looked at in isolation from such secondary needs. Poverty alleviation strategies that directly or indirectly relieve the household from these secondary pressures should positively bear on food availability.

7.2.5 Geographic differences

Variations in a number of factors create productivity differences. The agro-ecological setting for example influences the cropping patterns across different zones. Areas where certain crops are dominant are more vulnerable to food insecurity either because of crop specific characteristics or their tradability. The availability of basic factors of production discussed earlier, also vary by geographic location and have a direct bearing on production levels. Although there is similarity in the socio-economic factors that increase the pressure to sell food, the effects on food availability are cushioned by productivity levels, which are in turn influenced by other factors. The study finds that Mbale District, where many of the cultivated crops are highly traded, is the most food insecure. Cassava and sweet potatoes bear positively on food availability in Soroti and Apac District. Area specific differences therefore depend on how these different factors interact.

7.2.6 Food security/insecurity

The study's main hypothesis, that commercialisation of the food sub-sector is contributing to food insecurity as manifest in food shortages and/or inadequate food intake is borne out by the analyses that have been done. However, commercialisation itself, may not necessarily be motivated by profit making but rather by the need to meet other obligations within the household. Given that on the one hand opportunities to generate income off-farm are limited, and on the other, there is a readily available market for food, food is an important source of cash income. Food security/insecurity therefore brings into play other sectors and their respective policies, which need to be embraced in addition to the focus on the agricultural sector and production levels. It can therefore insecurity is often a compound problem and other factors too have been found to have a direct or indirect bearing on food availability.

7.3 POLICY RECOMMENDATIONS

It is noteworthy that the re-enactment of the by-laws governing food reserves has frequently been called for by different stakeholders including respondents during this study, i.e. it should be mandatory that every household maintains a food reserve of stipulated quantities. However, promoting free market conditions on the one hand and legislating/instituting controls on some aspects or actors in the market on the other, are contradictory.

The policy recommendations here made emphasise the need to enable the population make informed decisions and choices in the manner in which they use their resources, food being a resource that is important for their well-being. Emphasis is also made of the need to mitigate against the factors that the study has found to put pressure on households to sell food. The decentralisation process is supportive of the overall recommendation that remedial measures/strategies be area (district) specific and based on the underlying factors in the area.

- The agricultural sector's development thrust over the years has focused on increased production that has mainly been from horizontal expansion. The role of production

in ensuring food availability has been underscored by this study. In general, increasing productivity presents the largest potential to ensuring food security. Directing strategies by production zone as proposed by sectoral programmes, should allow a focus on area specific constraints to increased productivity. Generally however, land pressure or the ability to bring more area under production, will increasingly put limits on horizontal expansion. More specifically, to increase productivity in Mbale District where land availability already is a constraint to varying degrees, strategies should be towards vertical rather than horizontal expansion. This calls for collaborative efforts between agricultural research institutions, the extension service, and farmers to come up with yield enhancing technology. Similarly, the labour constraint in Apac and Soroti districts could benefit from technology that encourages both horizontal and vertical expansions. The promotion of animal draught technology should therefore have a positive bearing on food availability. A collaborative effort between research, extension, and farmers would also be necessary.

- Food security considerations must include not just agricultural policy and performance, but those of other sectors that directly affect the welfare of the population, e.g. the social sector. Government's plan to invest further in social services through increased investment in both primary and post-primary education should have a direct bearing on food availability. However, strategies should directly target the poor and more vulnerable segments of the population. It is acknowledged that most of the poor are in rural areas and rely on farming for a livelihood, justifying this recommendation. The current policy of cost-sharing for health-care services could for example, be relaxed in vulnerable societies or waived for particular target groups like children. In reducing the cost implications of such services, the pressure to sell food should ease.

- Family planning services' and education as part of health care should be extended to rural areas through collaboration between the public sector and civil society. This recommendation is made considering the finding that family size and dependence ratio both negatively affect food availability. Assuming families are then planned within the context of available resources should bear positively on the ability of the

household to meet the food needs of its members.

- Government should encourage private sector investments in the rural areas or up-country urban centres as a means to creating jobs and diversifying the household income base. This should reduce the pressure to sell food as a means of generating cash income and would also be a long-term strategy to reducing poverty, which has a bearing on food security.

- To ensure that food consumed meets adequate nutrition requirements, the population needs to be empowered to make informed choices. This mainly calls for nutrition education. The economic standing of households, culture and cropping patterns all influence consumption patterns. This is therefore bound to be a gradual and long-term process. The introduction of Universal Primary Education presents an opportunity to ensure nutrition education with long-term benefits across the population. Nutrition education could be included as part of the primary school curriculum. In the short-term, the agricultural and primary health care extension services could collaborate in educating the population about the relationship between the foods they regularly consume and health. This should influence both what they consume and what they sell.

- Some crops, like cassava and sweet potatoes render households more food secure. Their production as food security crops should be maintained and encouraged where they are not being cultivated. More broadly, farmers need to be encouraged to plan the use of their farm so that it caters for both food and cash needs. The choice of crops that they cultivate would then be with the objective of meeting projected needs and should enable better post-harvest management. This would mainly be achieved through the agricultural extension service.

- A national food reserve to guard against production shortfalls has been considered unnecessary in Uganda. This is partly because of the challenges of managing national reserves and also because for most of the years, the country in aggregate, produces sufficient food. Nonetheless, an efficient and reliable early warning system to monitor production related variables and food movements given the increasing

integration of domestic and regional markets, is recommended. At the national level, this calls for the strengthening of the existing early warning system to service remedial institutions like the Ministry of Disaster Preparedness, among others. At the household level, efforts by the National Agricultural Research Organisation to encourage household storage, e.g. better storing seed and improved granaries, need to be furthered.

- A partnership between the public and the private sector in providing storage infrastructure closer to the producer such that they can sell their produce when they need to but that food is equally available when needed, needs to be explored. This may necessitate putting in place some investment incentives that are attractive enough for the private sector. Improved market information to both traders and producers is also expected to contribute positively towards households making decisions with a better understanding of how the market works and the likely effects on their own livelihoods.

7.4 CONCLUDING REMARKS

Food sales have been found to negate food availability. However, the commercialisation process cannot be looked at in isolation of the levels of production which are predominantly subsistence oriented, the demand for cash to pay for social services, goods on offer in the market, alcohol and cigarettes among others. Neither can it be looked at in isolation of the limited job opportunities off the farm and therefore few options the producer has of generating the much needed cash income from elsewhere other than food sales given the readily available market.

Although by-laws have in the past been applied to ensure self-sufficiency, regulating against commercialisation would be contrary to the free and open market policies that have been embraced under the economic recovery programme. Education is therefore necessary not as a remedy to food shortages, which are induced by the sale of food, but to ensure that the producers are empowered to make correct decisions with regard to the use of their resources, in this case food. However, it is also necessary for a re-evaluation of some of the social policies that have likewise been embraced under the ERP with a

view to reducing the costs of accessing these services by the vulnerable groups. Government has already moved to re-dress the policy of cost-sharing in the provision of social services as part of its long term programme geared to addressing poverty. However, more specifically it is recommended that this be done to address the negative effects that arise due to the social imbalances in society.

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Aornga Parish, Nambieso	March 1998
Acaba Parish, Nambieso	March 1998
Buweri Village	March, 1998
Bunabeya Village	March, 1998
Sonoli Trading Centre Buyobo	4/4/98
Butsema village LCI Bugobero	5/5/98
Bukabole Village Bugobero	5/5/98
Bugobero Butsema village	5/6/98
Bumbo Trading Centre	3/06/98
Ibuje - Aketo village	October 1998
Congolobo Womens Group	October 1998
Inomo	October 1998
Ochero	October 1998
Lole Women's group	29/11/98
Aoya B LCI	30/11/98
Bumbo Buteteya	18/11/98
Buyobo	3/11/98
Bumuyonga village Bubutu	18/11/98
Chegere sub-county	12/11/98
Amochar Farmers Group	12/11/98
Mr. Etin and group Amok Village, Nambieso	13/11/98
Muyembe	1/12/98

Muyembe	5/12/1998
Agurur and Ocupe villages Kateta	December 1998
Kamusala	December 1998
Muyembe Trading centre	December 1998
Kateta	19/1/1999
Agule – Olupe village	19/1/1999
Akuorot – Omagara Village	21/1/1999
Amugoi – Orokojal village	23/1/1999
Apuuton Agola village	24/1/1999
Omakal – Orupe village	27/1/1999
Plaa Amuli Orupe village	27/1/1999

APPENDICES

APPENDIX 1: LIST OF VILLAGES INCLUDED IN THE STUDY

APAC DISTRICT

County Kwania

Sub-County Inomo		Sub-County Nambieso
Villages	Bar-Itek	Acokoaloa
	Alik-Engel	Egwor
	Acegi	Bar-Mogo
	Alai	Agwei

County Maruzi

Sub-County	Ibuje	Sub-County Chegere
Villages	Langodyang	Apoki
	Aketo	Arwotoleko
	Aberidwogo	Abwal "B"
	Congolobo	Aminkec "A"

SOROTI DISTRICT

County Serere

Sub-County	Kateta	Sub-County Olio
Villages	Okulukulun	Okulonyo
	Agurur	Igola 1
	Orupe	Obulai
	Oburiekori	Akoboi

County Kaberamaido

Sub-County Alwa		Sub-County Ochero
Villages	Aoya "B"	Apai
	Atingi	Awiimon
	Ojony	Agule
	Palatau	Awelu

MBALE DISTRICT

County Bubulo

Sub-County Bumbo	Sub-County Bugobero
Villages Bunanyama	Butsema
Bunamonyonyi	Bufumbula
Buwantsala	Buwasyeba
Bukimuna	Bugobero

County Budadiri

Sub-County Buyobo

Villages Bunabeha
Buweri
Bumusi
Bunabahala

County Bulambuli

Sub-County Muyembe

Villages Buluguya
Bunamuje
Butta
Bumuyoga

Appendix 2: The Agro-ecological zones & Their Characteristic Economic Activities

Farming System	Districts	Major crops	Major live-stock, fish & others	Rainfall (mm pa.)	Soil Type
Teso	Soroti, Kumi	Millet, sorghum, gnuts, simsim, s.potato, cassava, cotton,	Beef cattle, goats, fish farming, apiary, poultry,	1065 to 1774	Moderate
Banana /coffee	Bundibugyo, parts of Hoima & Luwero Kabarole, Mubende, Mukono, Masaka, Jinja, Mpigi, Iganga, Kampala	R.Coffee, banana, maize, beans, s.potato, gnuts, cassava, tea, horticultural Crops,	Dairy cattle, pigs, apiary, poultry,	940 to 1438	Good to moderate
Banana/ f.millet/ Cotton	Pallisa, Tororo, Kamuli, parts of Masindi & Luwero	Cotton, R.coffee, beans, maize, f.millet	Dairy & beef cattle, poultry, goats, pigs apiary, floriculture	1056 to 1595	Moderate
Northern	Gulu, Lira, Apac, Kitgum	Cotton, tobacco, simsim, gnuts, f.millet, cassava, sorghum	Dairy & beef cattle, pigs, apiary, goats, fish farming, sericulture	1204 to 1822	Moderate to poor
West Nile	Moyo, Arua, Nebbi	Tobacco, cotton, A.Coffee, gnuts, simsim, cassava, fmillet, sorghum	Dairy & beef cattle, goats, piggery, apiary, fish farming, cashew nuts	1246 to 1670	Good to Poor
Montane	Kabale, Kisoro, Rukungiri, Kasese, parts of Mbarara, Mbale, Kapchorwa	A.Coffee, maize, banana, cotton, S & I. Potatoes, rice, beans,	Dairy cattle, goats, poultry, fish farming, Horti/ flori/ seri-culture	809 to 1427	Good to Moderate
Pastoral	Rakai, Kotido, Moroto, parts of Mbarara & Masaka, Luwero, Mpigi, Kiboga, Masindi, Bundibugyo	f.millet, cassava, sorghum, beans, maize	Dairy & beef cattle, goats, poultry, apairy, fish farming & cashew nuts	768 to 1115	Moderate to poor

Source: *Uganda – Ministry of Finance & Economic Planning, 1996*

Appendix 3: Variable Dictionary

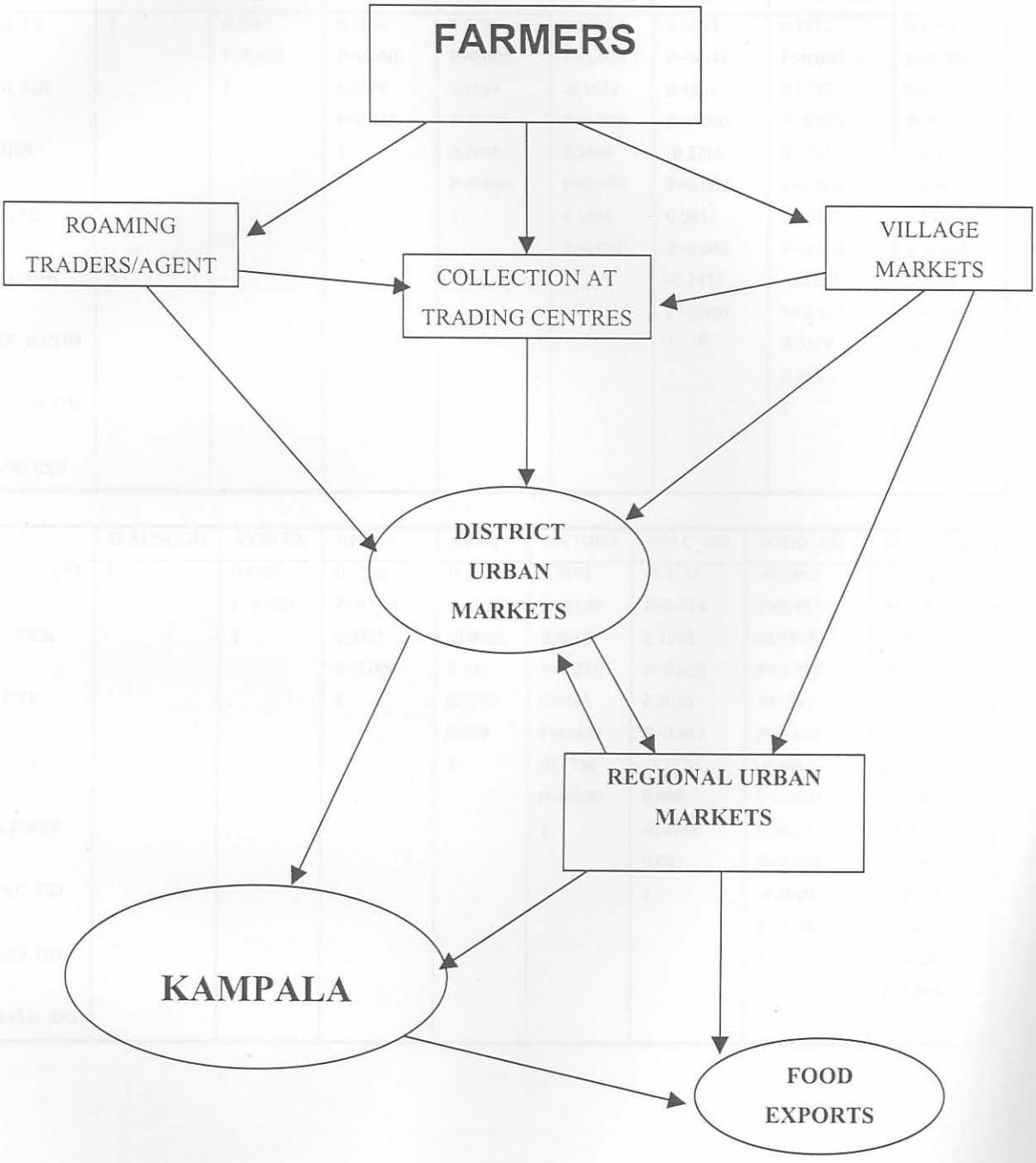
Variables[11]	Definition	Unit
AGEFE_Q2	Dummy for age of the female 1= 26-35 yrs, 0 = others	Years
AGEFE_Q3	Dummy for age of the female 1= 36-45 yrs, 0 = others	
AGEFE_Q4	Dummy for age of the female 1 ≥46 yrs, 0 = others	
AGE_HHH	Age of the head of the household	Years
AFETO_IN	Ratio of average monthly female controlled income to total household income	
AVCALAE	Average daily calories available per adult equivalent	Calories
AVCATT_D	Dummy variable for owing cattle = 1, otherwise = 0	
AVGOATS	Average number of goats owned by the household	Number
AVHCI	Average quantity of food sold to that produced	
AVLSINC	Average income generated from livestock sales	Shillings
AV_NFEXP	Average monthly non-food expenditure	Shillings
AVNFINC	Average monthly income from non-farm activities	Shillings
BAN_MZD	Dummy variable for crop combination, Bananas & maize = 1, otherwise = 0	
CALAV_HH	Calories available for consumption after sales and losses	Calories
CALBUY_1	Sum of calories bought for consumption	Calories
CALORIAE	Daily calories available per adult equivalent	Calories
CALPROD1	Sum of calories produced	Calories
CALSLD_1	Sum of calories sold	Calories
CALSTO	Calories available as household stocks	Calories
CAS_CERD	Dummy variable for crop combination: Cassava & cereals = 1, otherwise = 0	
CCRP_INC	Sum of income generated from non-food cash crops	Shillings
CCRP_IND	Dummy variable for household generating income from non-food cash crops = 1, otherwise =0	
CHI_SIX	Children six years old or less	Number
CHISIX_D	Dummy variable for households with preschoolers = 1, others =0	
	Children attending primary school	
CHI_PS	Children attending post primary school	Number
CHI_SS	Dummy variable for households with children attending post	Number
CHISES_D	primary education = 1, otherwise = 0	

[11] *A variable that has the number 1,2 or 3 as part of the variable name indicates whether it is with respect to the first, second or third surveys, respectively.*

Appendix 3 cont.

Variables	Definition	Unit
EDPP_HHD	Dummy variable for level of education attained by the head of The household: post-primary = 1, otherwise = 0	
EDPR_HHD	Dummy variable for level of education attained by the head of the household: primary = 1, otherwise = 0	
FEDU_PPR	Dummy variable for level of female education: 1 = post primary Education, 0 = others	
FEDU_PR	Dummy variable for level of female education: 1 = primary education, 0 = others	
FSSTAT1	Measure of food available to household	Calories
GEN_HHH	Gender of the head of the household, male = 1, female = 0	
HCI_1	Ratio of food sales to sum of food produced	
LND_USED	Area of farm land under production	Acres
MKT_DIST	Average distance to markets which household frequents	Km
OCC_FARM	Main occupation of the head of the household, farmer = 1, otherwise = 0	
SUMINCOM	Sum of traditional cash crop and non-farm income	Shillings

APPENDIX 4: FOOD TRADE PATHWAYS



Appendix 5: Bivariate correlations:

	CHIPS	CHI_SIX	CHI_SS	TOTALAE	AGEHHH	DEP_RATI	SUMINCOM	ANFEXP
CHI_PS	1	0.2641	0.1886	0.7593	0.1766	0.0680	0.1773	0.2169
		P=0.000	P=0.000	P=0.000	P=0.000	P=0.148	P=0.000	P=0.000
CHI_SIX		1	0.0578	0.3869	-0.1934	0.4864	0.1377	0.0711
			P=0.219	P=0.000	P=0.000	P=0.000	P=0.003	P=0.131
CHISS			1	0.3895	0.2604	-0.2216	0.3732	0.4762
				P=0.000	P=0.000	P=0.000	P=0.000	0.000
TOTAE				1	0.1466	0.0811	0.2814	0.2741
					P=0.002	P=0.085	P=0.000	P=0.000
AGEHHH					1	-0.2477	-0.0163	0.0509
						P=0.000	P=0.729	P=0.280
DEP_RATIO						1	0.0319	-0.0657
							0.498	P=0.163
SUMINCOM							1	0.5457
								P=0.000
AVNFEXP								1

	SUMINCOM	AVNFEX	NFEX3	AVHCI	MKTDIST	APAC_DD	SORO_DD	MBALE_DD
SUMINCOM	1	0.5457	0.3236	0.1027	0.0191	-0.1151	-0.0368	0.1521
		P=0.000	P=0.000	P=0.029	P=0.685	P=0.014	P=0.435	P=0.001
AVNFEX		1	0.3951	-0.0003	0.0582	0.1018	-0.0313	-0.0710
			P=0.000	0.995	P=0.216	P=0.030	P=0.507	P=0.131
NFEX3			1	0.1252	0.0365	0.0034	-0.1241	0.1202
				0.008	P=0.439	P=0.942	P=0.008	P=0.010
AVHCI				1	-0.1736	-0.2679	-0.4640	0.7313
					P=0.000	0.000	P=0.000	P=0.000
MKTDIST					1	-0.0959	0.3620	-0.2645
						0.041	P=0.000	P=0.000
APAC_DD						1	-0.5000	-0.5050
							P=0.000	0.000
SORO_DD							1	-0.4950
								P=0.000
MBALE_DD								1

Appendix 6: Socio-economic and demographic characteristics of the cluster groupings

CLUSTER GROUPS	High Production/ Low Sales		Average Production / Low Sales				High Production / High Sales			Average Production / High Sales			Low Production / Low Sales		
Cluster Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
N	4	35	85	15	185	10	4	6	4	5	10	5	24	4	47
AGEHHH (years)	50	47	41	41	43	41	49	37	59	54	58	51	52	46	45
CHI_SIX (no)	2.3	1.6	2.0	1.7	1.6	2.2	1.7	3.2	1.3	3	2.1	1.6	1.2	1.5	1.7
CHI_PS (no)	2.8	2.6	2.4	2.6	1.8	2.5	2.6	3.5	4.2	3.4	2.5	3.8	2.6	2.3	1.9
CHI_SS (no)	1.8	0.4	0.3	0.3	0.2	0.3	0.3	0.5	1.8	1.2	0.9	0	0.3	0.5	0.4
LND_USED (acres)	7.8	4.5	4.2	4.3	3.1	4.6	5.4	4.3	5.1	5.1	4.7	3.5	4.2	2.6	3.6
GOAT_NO (no)	8.3	5.1	4.1	2.7	2.7	2.9	2.5	5.2	1.8	3.6	3.0	1.6	2.8	3.3	2.0
CATT_NO (no)	17.3	2.5	1.2	1.7	0.7	1.5	6.8	3.8	2	3.2	2.6	4.0	3.1	2.6	1.6
AVNFEXP ('000 shs)	114	38	23	47	10	67	43	46	12	25	14	34	12	61	12
% Spent on health	6	16	17	15	23	15	8	5	8	19	12	7	18	13	16
% spent on education	64	22	18	22	12	30	39	27	29	29	39	15	23	39	15
% spent on leisure	19	32	31	25	31	27	33	37	30	23	25	60	33	33	40
APAC	3	13	32	4	75	3	0	3	0	0	0	0	1	2	13
SOROTI	1	14	41	7	80	4	0	0	0	0	0	0	0	0	1
MBALE	0	8	12	4	30	3	4	3	4	5	10	5	23	2	33

AGEHHH = age of the head of the household
CHI_SIX = number of children six years old or less
CHI_PS = number of children in primary school
CHI_SS = number of children in post-primary education
LND_USED = cultivated area
GOAT_NO = no. of goats
CATT_NO = no. of cattle
AVNFEXP = non-food expense