FSS Discussion Paper No. 4

SMALL-SCALE IRRIGATION AND HOUSEHOLD FOOD SECURITY:

A Case Study from Central Ethiopia

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The opinions expressed in this paper are those of the author and do not necessarily reflect the views of FSS or its Board of Advisors.

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LIST OF ACRONYMS

ETB	:	Ethiopian Birr
FFD	:	Free Food Distribution
FFW	:	Food for Work
HH	:	Household
HFS	:	Household Food Security
MoA	:	Ethiopian Ministry of Agriculture
NGO	:	Non Government Organizations
PA	:	Peasant Association
PRA	:	Participatory Rural Appraisal
SHEWA	:	Shoa Health, Extension, Water and Agriculture project
USAID	:	United States Agency for International Development
TLU	:	Tropical Livestock Unit
ZDoEDP	:	Zonal Department of Economic Development and Planning

ABSTRACT

This study examines the use of peasant based small-scale irrigation for cash crop production and its impact on agricultural productivity. Its main objective being the study of impact of cash cropping on household food security, the research focuses on how irrigated vegetable farming is used to increase household income and how that income is utilized within the household. The study also looks at complementarities between cash crops and food crops and how that contributes to crop and livestock integration.

Household survey and PRA tools were used to collect data at the community, household and individual levels. Annual household income and expenditure data were collected using structured questionnaire and with the help of locally recruited and trained enumerators. Agricultural production, market survey and weather data were accessed from development institutions operating in the area.

The findings of this study highlights the positive effect that irrigated vegetable farming as cash crop production brings to agricultural production in the area. Cash cropping has enabled many households to diversify their source of income and generate more income. It enabled the target households not only to feed themselves throughout the year but also to invest on agricultural production in order to make efficient use of their land and livestock resources.

The result of this study showed that households with access to irrigation have been able to double their annual income through cash crop production thereby improving the household access to food. With increased flow of money in the market as a result of cash cropping, women have been able to run more income generating activities to meet their need for independent income and to improve the distribution and utilization of food within the household.

CHAPTER ONE

INTRODUCTION

Statement of the Problem

Low productivity of the arable land and irregularity of rain combined with shrinking of individual land-holdings have forced the farmers of Doni Kombe Peasant Association to expand cash crop production through irrigation which they believe brings a better return compared to food crop production. However, some people believe that the expansion of cash crops is a threat to household food security in the area based on the following argument.

"Cash crops are expanding at the expense of food crops. This resulted in decrease in local production of food crops, which is believed to be a major strategy to achieve household food security in the area."

"Livestock production, which is an important component of the economy, is entirely dependent on by-products of food crops for its feed resource. Any reduction in production of food crops is a threat to livestock production and hence, to household food security."

"Women, who play an important role in the distribution and utilisation of food within a household would not have enough access to the cash income from cash crops as compared to the income in kind from food crops. Income from cash crops can be used by men for other purposes. Therefore, more income does not necessarily mean improved household food security."

The above statements are some of the opinions of people concerned with the expansion of cash crops in the area and its implication on the economy. However, a formal research has not been carried out to investigate the facts surrounding this issue.

Objective of the study

The main objective of the study is to reveal the recent trends of cash crop production and to identify its impact on the rural economy in gen-

eral and on food security in particular. Specific objectives of the research have been aimed at addressing the following issues:

Do cash crops give higher income than food crops?

Is there a pure trade-off between cash crops and food crops due to competition for resources or do they complement each other?

Is income distributed differently when it is in cash from sale of cash crops than when it is in kind as produce from food crops?

Answers to these questions are important to development thinkers concerned with long term objectives of enhancing food security in the area. With out clear information on the contribution of cash cropping to income and household food security, it would be too difficult to reach a conclusion on whether to encourage or discourage the production of cash crops.

Background

The people in the study area live a difficult life. It has become too difficult to generate enough income from subsistence agriculture which majority of the people depend on as their major source of income. Many households are not able to feed themselves through out the year. According to the socio-economic study conducted by CARE Ethiopia in Boset in 1993, over 40% of the households studied reported that food from own production falls short of consumption even during normal years. Many households reported that the food they produce is usually enough for seven to nine months. During years of insufficient rain, the situation gets even worse. Several factors contribute to this problem of food insecurity; some of the major ones being low productivity of the land and moisture stress according to the local people.

One of the mechanisms used to cope up with this food shortages is to sell out productive assets so as to procure food for the family during seasons of food shortages. However, subsistence crop production brings little or no surplus production to replace assets or to invest in assets on a regular basis. Existing assets, on the other hand, are eroded with each recurrent shock resulting in a serious lack of primary productive assets such as oxen used for traction. Credit or social systems

that provide safety nets for households under stress are limited opportunities in the area. The lack of productive assets and alternative income opportunities that would complement food production is compounded by the high rate of population growth which put more pressure on the productive land which is already being over exploited. The joint effect of all these problems creates pressure to divert resources to consumption and away from the investments needed for long-term growth.

The Concept of Food Security

Food security is defined in its most basic form as access by all people at all times to the food required for an active and healthy life. Availability of food and access to food are two essential determinants of food security. The first does not ensure the second; food may be available, but households may for various reasons not have access to it. However, adequate national or local food availability remains a necessary condition for household food security (Braun, 1992).

Food security at the household level can be defined as the ability of the household to secure enough food to ensure adequate dietary intake for all its members. Household food insecurity can exist even when there is national food security. Crises of national food security are usually started by widespread losses of household food security, for example, following crop failure. Logistical and distribution failures are at the centre of national food security crises, as causes of inability to relieve household food insecurity even when there is sufficient food available in the country to do so (Hubbard, 1995).

The problem of food insecurity is not just about food alone but also about the general problem of poverty and unequal distribution of purchasing power among and within regions and nations (United Nations' Economic Commission for Africa, as cited in Obasanjo, 1992).

In theory, two types of household food insecurity-chronic and transitory-can be distinguished but in reality they are intertwined. Chronic food insecurity is a persistently inadequate diet caused by the continual inability of households to acquire needed food, either through market purchases or through production. Chronic food insecurity is rooted in poverty. Transitory food insecurity, on the other hand, is a tempo-

rary decline in household's access to needed food, due to factors such as instability in food prices, production or incomes (World Bank, 1986 as cited in Braun, 1992).

In its worst form, transitory food insecurity can result in famine. It is typically the chronically food insecure who are hit hardest by transitory food insecurity problems. Famine represents the most severe form of temporary food insecurity manifesting itself in sudden collapse of food consumption and a dramatic increase in the incidence of disease and death (United Nations' Economic Commission for Africa as sited in Obasanjo, 1992).

With half of its population of over 60 million inhabitants living in abject poverty, Ethiopia is one of the poorest countries in the world characterized by both chronic and transitory food insecurity problems. Due to chronic poverty and subsistence nature of agricultural production, even a modest decrease in crop and livestock production results in famine of different magnitude oscillating between transitory and chronic food insecurity problems.

Prospects of Food Security in Ethiopia

At the time of writing this thesis (June 2000) one of the issues making headlines in the international media was the famine in Ethiopia, which yet again, brought the life of over eight million people in the southern and south-eastern parts of the country at risk. The famine is reported to have been triggered by poor rain received in 1999, which resulted in crop failure and high livestock losses compounded by below average harvest obtained in many parts of the country in the two years before. The failure of the rains may have triggered the crisis, however, it is believed that this is not the fundamental cause. The coping mechanisms of these vulnerable communities are so fragile that minor climatic variations can result in crisis conditions.

The current crisis is happening only six years after the famine in 1994 which claimed the life of over 100, 000 Ethiopians, and only three years after the government of Ethiopia reported that the country is close to food self-sufficiency following the record harvest obtained in 1997.

The chronic problem of food insecurity in the country is getting even more complicated as a result of the Ethio-Eritrean war which is about to enter its third year at the time of writing this paper. This war which is believed to be one of the most costly(in terms of human life as well as material resources) wars in Africa has disproportionately diverted resources of the country as well as attention of the government away from development initiatives. On the other hand it has resulted in displacement of people, which adds up on the already too much number of food insecure people in the country. The current crisis would have obviously been a different story if the country had not been engaged in this kind of war. The resource that went in to the war would have averted the situation and saved many lives.

In spite of massive relief and development assistance from the international community over the past two decades, famine has become a regular phenomenon in Ethiopia with the only difference being in the magnitude of its occurrence year after year. According to the 1998 annual report of USAID, which is one of the major donors of food aid to Ethiopia, over the past 10 years, Ethiopia's food production has not always met even the most basic food needs of its population. The food gap over this period has averaged one million metric tons per year. Even the most optimistic forecasts do not see food security in Ethiopia in a short period of time.

In an effort to alleviate the chronic problem of food insecurity in the country, the government of Ethiopia has set an agricultural development plan focused on providing small-holder farmers with technology packages to bring about rapid increase in food production. This approach, which has an agronomic extension package at its core, is designed to supply peasants with fertilizers, improved seeds, chemicals and the technology required to boost crop productivity. It is a nationwide extension program geared towards the government's ambitious goal of food self-sufficiency in a period of five to ten years.

It is, however, important to point out that food security is not narrowly defined as being simply synonymous with food self-sufficiency. Rather, it should be viewed not only as food availability through domestic production, storage, and trade, but also as accessibility to food

through home production, purchase in the market or food transfers (United Nations' Economic Commission for Africa, as cited in Obasanjo 1992).

In higher potential areas of the country, there are evidences of remarkable increases in cereal production due to government's success in introducing the agronomic extension packages and, in no small part, due to good rainfall; although there are questions about sustainability of the strategy, which is focused only on increasing cereal production. However, in the dry and arid areas of the country where moisture stress is prevalent due to a relatively lower rainfall, the extension package alone has not been big success mainly due to the lack of response to inputs such as fertilizer and improved seeds.

If the ill effects of increasing food insecurity in the country are to be alleviated, agricultural productivity in the low land areas of the country, which are more vulnerable to recurrent drought and famine, must be increased. It is believed that food production in these areas can considerably be increased if plant nutrient supply is combined with water availability through technologies such as the use of irrigation in the promotion of small-scale cash crop production integrated with food grain and livestock production.

The Role of Irrigation Development in Alleviating the Problem of Food Insecurity

In many of the drought prone countries, the concentration of the human population is relatively high and can't be adequately supported by rain-fed agriculture alone. Thus, where rainfall is insufficient and unreliable, and rain-fed agriculture can't fully support food production, investment on water management schemes will help stabilize agricultural production and promote food security (Dessalegn, 1999).

According to the Ethiopian classification, irrigation schemes have been classified in to three categories:

- Large-scale schemes: Schemes used to irrigate over 3000 hectares of land owned by state farms. These were constructed by different government water construction authorities through funding from UN agencies and other international donors.

- Medium : Include schemes used to irrigate 200-3000 hectares of land managed by state farms and para-statal enterprises.
- Small-scale : Include schemes used to irrigate up to 200 hectares of land owned mainly by peasants organized in to community groups or water users associations.

Large and medium scale schemes have often been used for large-scale commercial crop production run by government enterprises and, in general, have not been successful in alleviating the problem of food insecurity in many African countries including Ethiopia. Several studies have indicated that such schemes have had an adverse effect on food security and has demonstrated environmental damages including the displacement of people and livestock(Longhurst 1988, Braun and Kennedy 1992, Brown and Nooter 1992).

On the contrary the development of small-scale irrigation schemes provide farmers with a less drought-affected, additional income sources in the form of food and has obvious advantages for food security (Braun, Puetz and Webb 1989). Small–scale irrigation is the development of traditional irrigation systems, which are used as a complement to rain-fed crop production involving predominantly horticultural crops and fruit trees 1989).

Small-scale irrigation has the following advantages over the medium and large scale schemes (Dessalegn, 1999).

- They have much lower investment costs, and in majority of cases these costs are born by the community.
- They do not involve dams or storage reservoirs, hence no population displacement is involved.
- They are less demanding in terms of management, and operation and maintenance.
- They have no land tenure or resettlement implications.
- They have no serious adverse environmental impact.
- They allow a wider diffusion of irrigation benefits.
- They permit farmers to learn irrigation techniques at their own pace and in their own way.

The development of small-scale irrigation can help peasant agriculture in drought prone areas of Ethiopia detach from regular food aid and

get firmly on its feet. It can help vulnerable peasants in their quest for production increase and reduce dependency on food aid, which may result in disincentives for local food production if not properly targeted.

The Use of Small-Scale Irrigation in Ethiopia

In spite of the immense water resource of the country, Ethiopia is one of the least irrigation water using countries in the world. According to the Ethiopia's Office of the National Committee for Central Planning (as cited in Dessalegn, 1999), the total irrigation potential of the country in early 1990s was estimated to be 2.7 million hectares. However, according to the MoA report of 1993, the total coverage of irrigation in the country, then, was only 168,000 hectares which is less than six percent of the country's irrigation potential. These include 79,000 hectares of land irrigated by small-scale irrigation, which accounts for about 47% of the total irrigation coverage of the count

CHAPTER TWO

DESCRIPTION OF THE STUDY AREA

General Description of the Country

With land area of over one million square miles, Ethiopia is one of the largest countries in Africa. Based on the 1994 census, the total population of the country in year 2000 is estimated to be about 60 million. According to MoA, only 15% of the country's land is under cultivation although the land that is suitable for cultivation is estimated to be as high as 65% of the countries land. According to TGE, 1994 (as sited in Tibebe, 1996) arid and semi-arid zones occupy 39.2% of the country's land. Most of this land has not been used for agriculture due to low and erratic rainfall.

Socio-economic Environment

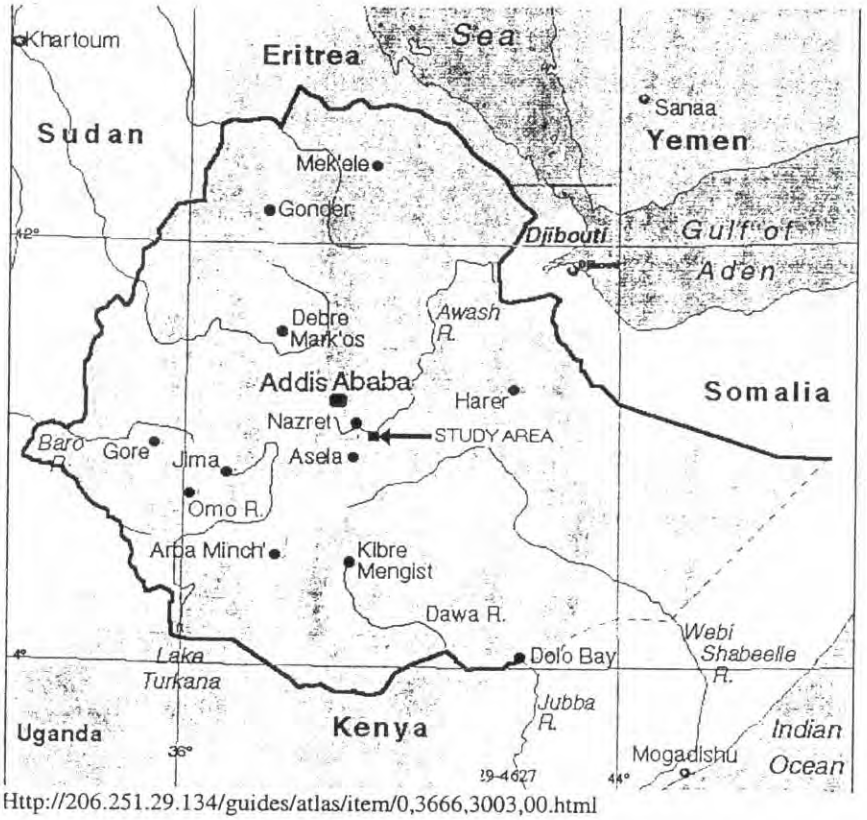
Agriculture remains to be the engine for economic development in Ethiopia.Its contribution to the GDP, and foreign exchange earning of the country are 50% and, 90% respectively. It also provides employment and livelihood to about 80% of the population. In spite of this fact, the sector has not received a concerted attention and is still dominated by small holder farmers or often called peasants whose farming practices remained unchanged for decades. Peasant farming in Ethiopia is characterised by insecure land tenure, small land holding often below one hectare, very low productivity due to poor farming practices, insignificant use of inputs and overexploitation of the land which is leading to land degradation.

In spite of their indispensable role in the economy of the country, smallholder farmers in Ethiopia find it too difficult to have their voices heard on public policy issues that directly affect agricultural production. This lack of participation often resulted in policies of top-down nature that eventually led to failure to produce food at the same rate as the population growth.

Location of the Study Area

Doni Kombe Peasant Association, which is the target area of this study is located in central Ethiopia as shown on the map below. It is one of the PAs in Boset district of Eastern Shoa Administrative zone in Oromiya region.

Figure 2.1 Location of the Study area.



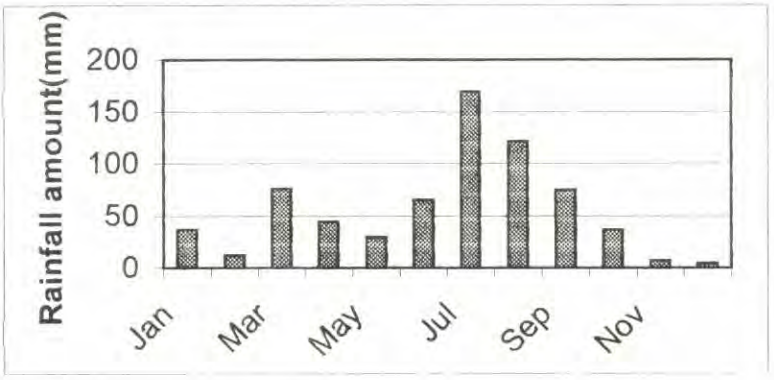
Http://206.251.29.134/guides/atlas/item/0,3666,3003,00.html

Climates and Rainfall Distribution

According to the Ethiopian classification of climatic zones, Doni Kombe falls in the Semi-arid zone of the Awash basin, which is characterized by hot dry climate with monthly mean temperature ranging from 19 c to 23 c and significantly variable annual precipitation. According to the rainfall data collected by CARE Ethiopia's Food Information System over the past six years, annual rainfall received in the area ranges between 500 to 900 mms while the potential evapotranspiration is estimated to be 1.65 meters per annum (CARE Ethiopia's Development Activity Proposal FY 97-2001).

As can be seen from table 2.1, the rainfall has a typical pattern of the dryland areas of Ethiopia. It has a bimodal nature with a short rainy season between March and May and a longer one from June to September. The short rainy season, which is locally known as *belg* has light rain, which often comes late. The amount also fluctuates a lot and farmers find it relatively unreliable for short season crop production. The long rainy s find it relatively unreliable for short season crop production. The long rainy season, locally known as *Meher* usually comes with a heavy rain and accounts for about 75% of the annual precipitation. Over the last 10 years the rainfall was not only inadequate but also unevenly distributed. This has been a contributing factor to the declining production, which affected most farmers in the area.

Figure 2.2 Monthly mean rainfall at Boffa rainfall station(Year 94-99)



Source: CARE Ethiopia's Food Information System

Soil and Topography

Doni Kombe is dominated by a level plain with altitude range between 1200 to 1400 meters above sea level. In some places it also extends to the hillside of the Awash watershed with altitude of up to 1900 meters above sea level. The Soil texture is dominated by Sandy loam and has good water drainage capacity. It is well suited for irrigation.

Farming System and Cropping Seasons

All communities in the study area, with the exception of the irrigation group, depend mainly on livestock and rain-fed crop production for their subsistence. The farming system is a mixed type, which is characterised by subsistence holding geared to meeting household needs, with a highly interdependent cropping and animal husbandry subsystems as will be discussed in section 5.7 in detail. Major food grains produced in the area include maize, *teff*, and legumes. Recent trends, however, indicate that *teff* production is expanding at a relatively higher rate than, for example, maize.

In normal years Doni Kombe has two cropping seasons known as *belg* and *meher* following the short and long rainy seasons, respectively. The *belg* plantation usually starts in March with short season crops including short maturing maize and legumes. There are also two season crops such as sorghum and long maturing maize, which are planted in April-May and harvested in November-December. *Meher* crops including *teff* and haricot bean are planted in July and harvested in November.

Marketing

Communities in the study area have their market-place at Doni and in three other places around the study area. The role of periodic markets in view of improving food security situation in the area has been important particularly in terms of diffusing the benefit from marketing agricultural products more widely. The markets represent subsistence-oriented exchange of commodities and traditional commercial values among rural households as well as between the rural and the urban communities. As will be seen in table 5.4 not only the cash crop com-

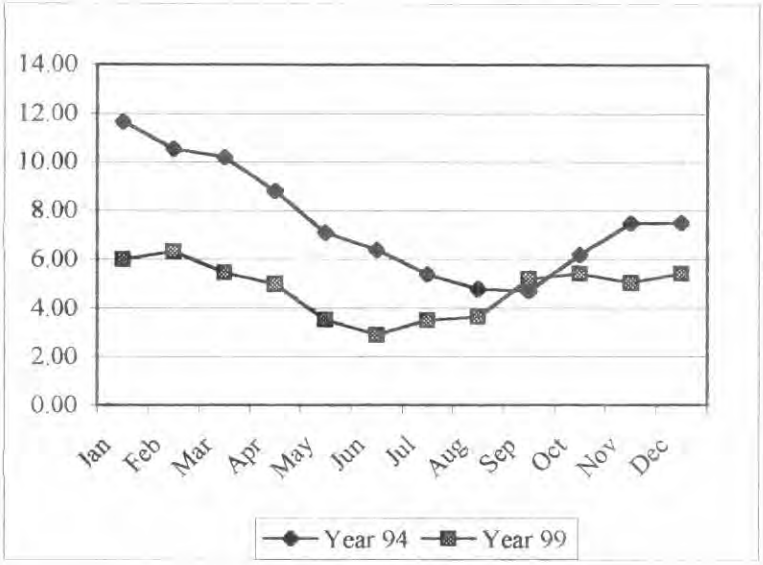
munity, but also the non-cash crop community, in the study area depend on the market for majority of their annual food consumption. Another study (Lemma, 1996) conducted in Ethiopia revealed that trade in periodic markets has increasingly become important strategy for; absorbing surplus labour, providing supplementary cash and diversifying the diets of the population.

However, in spite of the role of markets, which is becoming increasingly important in stimulating the economy in the rural area, the government has not paid much attention to the development of market infrastructure in the rural area. According to the Ethiopian Road Authority (as cited in USAID's annual report of 1997), Ethiopia has only 90 centimetres of road per capita versus, for example, 930 centimetres in Zimbabwe. The lack of transport and marketing infrastructure limits smooth flow of information especially to the producers in the rural area and leads to a situation where producers had to sell their products at a lower price in favour of the middle men involved in trading agricultural products from producers in the rural area to consumers in the urban area.

2.8 Terms of Trade

As elaborated in chapter five, most farmers in the study area have to sell livestock, livestock products and/or crops such as *teff* to purchase staple food so as to meet their household food consumption. To this effect, the terms of trade between ox and maize in 1994 is compared to that of 1999 as shown in the following graph in order to see how the purchasing power of the farmers has been affected through time.

Figure 2.3 Terms of trade between oxen and maize at Boffaa market



Source: CARE Ethiopia Food Information System

The terms of trade was significantly high in 94 than in 99. For example, in January 1994, income from the sales of one ox was enough to buy about 1200 kgs of maize however, in 1999 it came down only to 600 kgs of grain. This shows how the farmers' access to food deteriorated through time.

Storage of Cash Crop Products and its Effect on the Market

One of the major difficulties smallholder farmers face in dealing with vegetables as cash crops is the lack of proper storage and the effect it has on market prices. As will be explained in section 5.10.1 the price of vegetables in the local market fluctuates a lot. All farmers from the cash crop community follow the same production season. Due to lack of storage facilities, most of them bring their products to the market almost at the same time resulting in too much supply in the market. At one occasion in a market outside the study area, the Author had wit-

nessed a situation where farmers had to abandon their onion right in the market because there was no one to buy them or even to take them free. When the vegetable involved is tomato, the situation gets even worse. In dry areas of Ethiopia such as Doni Kombe, onion can be preserved in a locally made storage only for a month or so however, tomato can be stored only for a few days.

Constraints of Agricultural Production

The major constraint of agricultural production in semi-arid areas of Ethiopia such as Doni Kombe is the lack of nutrients and soil moisture. In the good old days, when the area was scarcely populated, shifting cultivation allowed farmers to have a fallow period that is long enough for regeneration of nutrients and maintenance of fertility of the soil. The land had enough vegetation cover to facilitate smooth percolation of surface water for maintenance of optimum water holding capacity and soil organic matter content. However, through time, the population increase forced the farmers to abandon such agricultural system with long bush fallows but, without a new sustainable alternative option in place.

Declining soil productivity as a result of decreasing fallow period forced farmers to encroach onto grazing, forest, bush and other marginal land eventually leading to impoverishment in plant nutrient, soil organic matter, and water retention capabilities of the soil. All these contributed to rapid deterioration of the land and its productivity. As a result, soils in the study area are now so overworked that they are so easily eroded. With rainfall of such a high intensity, as is in the tropics, the high rate of soil erosion adds up to the loss of nutrients from the soil and reduction of water holding capacity of the soil.

Description of the Doni Irrigation Project

CARE International in Ethiopia through funding from USAID has launched a five years(1996 - 2001) project to help alleviate the problem of food insecurity in the area. This project, which is known as Shoa Health, Extension, Water and Agriculture (SHEWA) project is a rural integrated development project and is implemented in Adama and Boset districts of Eastern Shoa Administrative zone. It has different components including the development of: small-scale gravity irri-

gation, agricultural extension and rural infrastructure. Irrigation being its main component, the project aims to improve household food security through improved agricultural production.

Awash river is one of the country's main arteries, second only to the Blue Nile. It rises about fifty miles west of Addis Ababa, flows northward in the Great Rift Valley, and in its descent of about six thousand feet through the eastern slope and canyons of the Ethiopian platue, picks up several tributaries. All these end in ultimate absorption in the below-sea-level Danakil depression (Prouty, 1994)

The irrigation component of the SHEWA project has two schemes known as Doni and Hasse Nura. The Doni scheme, which was implemented in two phases, was designed to divert a total of 750 litres of water per second from the Awash river. It has a diversion weir located at Doni Kombe Peasant Association, 33 kms down stream of Sodere on the left bank of the Awash river or 50 kms east of Nazareth town as shown on the map in figure 2.1. The first phase of the project, which was completed in 1997, is reported to have brought a total of 80 hectares of land in Doni Peasant Association under irrigation. In 1998 the scheme was extended to an adjacent PA known as Sefa Bate to bring another 110 hectares of land under irrigation during the second phase of the project. According to CARE Ethiopia's report, to date, a total of 190 hectares of land is being irrigated and a total of 161 households benefit directly from the Doni irrigation scheme in the two PAs. At the time of this study some structures in Sefa Bate PA have been under construction. When completed, this will also bring more land under irrigation.

The Hase Nura irrigation scheme, which is located 15 kms from Doni down the Awash basin, is still under construction. Headwork of the scheme including the diversion weir has been completed. Once the canal work is completed, the scheme is expected to bring another 80 hectares of land in Hase Nura PA under irrigation.

Water from the irrigation schemes is used to expand the production of cash crops in the area. The main objective of the project in this case is to help the target households increase their cash income so as to enable them procure food during seasons of transitory food shortages to complement food from own production. Cash crops produced through irri-

gation include onions and tomatoes. On a different component the project is involved in the construction of all-weather roads connecting irrigated lands to market centres so that farmers can access markets for food as well as for their cash crop products.

The Doni irrigation is not a newly established scheme. It is an improvement of a traditional irrigation system, which has been there since the late 1960s. Originally it was established by a landlord designated by the king during the period of monarchy in Ethiopia. This was intended to be part of the king's plan of commercialisation of the country's agriculture. Later during the socialist revolution in the country in 1974, the irrigable land was confiscated by the *Dergue* government and was given to the producers cooperative in the area where it had been used less efficiently. At the verge of fall down of the socialist government the irrigable land was distributed to individual farmers or members of the Doni Kombe Peasant Association.

Although the original plan was to expand the production of fruits for commercial and export purposes, the irrigable land has mainly been used for food crop production and occasionally for vegetables particularly since its confiscation in 1974. The major shift to the production of vegetables as cash crops was realized only after CARE's intervention in the area.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

The cash crop community referred to in this study is the group of households who are using the irrigation water for cash crop production or households who are considered to be the direct beneficiaries of the irrigation scheme. The non-cash crop community, on the other hand, is the group of households that do not have access to the irrigation water.

In order to compare the cash crop community with the non-cash crop communities three other villages were selected from communities outside the irrigation area but with in the same Peasant Association in such a way that the difference between the cash and non-cash crop communities is limited to access to irrigation water as much as possible.

Sampling

Once the target area was classified into two different clusters based on their access to irrigation 30 households were randomly selected from each cluster to make a total 60 households required for the questionnaires based survey. It is believed that 60 households from a total of 677 households living in the PA would allow a valid statistical inference to be drawn from the study.

Methods of Data Collection

Both primary and secondary data have been gathered for this study. The collection of primary data involved the use of PRA tools and a structured questionnaire for the household survey.

Participatory Rural Appraisal

A number of PRA techniques were used to facilitate the target households in order to generate information which might have not been captured by the household survey.

Focus group discussion and participatory diagramming were some of the tools used extensively in the course of the study. A number of discussion sessions were held with village representatives, elderly people, women group, Peasant Association officials as well as the extension staff of CARE and MoA in the area. Venn diagrams were used with women group to describe power relation and control of income within a household. It was also used to study household decision-making and how allocation of food and other household resources are executed.

Household Survey

The household survey involved the design and use of formal questionnaire to generate the required information at the household level. This was done with the help of two Enumerators selected from extension staff of CARE and MoA based in Doni Kombe Peasant Association. Following their recruitment the Enumerators were trained familiarised with the through several exposure sessions.

The survey was tailored to examine the complex production and consumption situation within the household. Once the questionnaire was finalized, considerable time was invested in collecting the data carefully. Following its completion, the questionnaire was carefully coded for direct entry in to the computer so as to simplify the analysis work.

Secondary Data Collection

A number of institutions involved in agricultural production and food security programs have been contacted to gather information related to recent trends of crop and livestock production in the study area. The main sources of data in this aspect were organisations like the Ministry of Agriculture, CARE International in Ethiopia, Zonal Department of Planning and Economic Development in Eastern Shoa, Institute of Agricultural Research at Melkasa and other NGOs operating in the area. The data gathered include crop production and land use reports, market survey, rainfall, temperature and other food security indicators monitored by these organizations on a regular basis.

Data Analysis

Both the qualitative and the quantitative data were analysed. The qualitative data was analysed in the course of data collection with the help of the target community members. The quantitative data was analysed on the computer using regression, co-relation and percentage values so as to establish statistical relationship between different variables used in the study. The qualitative data has also been used to explain relationships established between the variables.

Limitations of the study

Households in the study area do not keep record of their expenditure or income on a regular basis. As a result, most of the quantitative data used in this study was gathered based on memory of the respondents about their expenditure and income as far as one or two years ago. In some cases they had to make estimation of certain expenditures. This might have some degree of error.

This study was conducted at the time when the current food crisis in Ethiopia was about to burst. Some of the respondents particularly from the non-cash crop community might have under-reported their harvest assuming that this kind of response would help them get some kind of assistance from the government or CARE which is a relief organization in the area and host of this research. The survey team has always used every possible opportunity to explain to the respondents that the study has nothing to do with any kind of assistance from the government or other relief organizations in the area.

Even though a wide range of data has been gathered over a long period of time, these was limited only to few places in the study area. For example, there is only one rain gauge station in the study area and its surrounding. It was assumed that the data gathered at Boffaa which is the second closest center to the study area could be a representative to the study area. In some cases data from the market at Boffaa center has also been used.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

Demographic data

Population

According to the 1998 statistics of Ethiopian Ministry of Agriculture a total of 677 households live in Doni Kombe Peasant Association with 41 of them being female headed ones. The total population of the PA is 3217 with male and female proportions being; 1695(52.7%) and 1522(47.3%), respectively. Based on this statistics the average family size of the PA is 4.8 which is lower than that of the national averages which is 6.7 according to Central Statistics Authority of Ethiopia. As will be seen in the next session, the average family size of the sample households of this survey is found to be 6.8, which is slightly higher than the national average.

Comparison of Family Size

The average family size is significantly ($p<0.05$) higher in the Cash Crop Community than in the Non-Cash Crop community. The result of a T-test for equality of the means between the two groups is summarized in the table below.

Table 4.1 T-test result

Variable	Group	N	Mean	St.Dev	SE Mean	P-Value
Family Size	Cash Crop	30	7.77	4.01	0.73	0.026
Family Size	Non-cash Crop	30	5.83	2.28	0.42	

One of the explanations for the difference in family size between the two groups is that Six or 20% of the cash crop households are married to more than one wife where as only 2 or 6.7% of the Non-cash Crop households are so. On the other hand, twenty (40%) of the cash crop (and only 4 or 13.3% of the non-cash Crop) HHs have one or more individuals living as dependent or

employee of the family on permanent basis. These individuals make their living by assisting the family in looking after livestock and taking care of regular farm activities. These factors considerably increased the family size of cash crop households as compared to the non-cash crop ones.

According to some respondents, one of the reasons for having more than one wife is to increase the labor force in the family in order to cope up with the increased labor demand for cropping. Some HHs involved in petty trade activities also prefer to have additional wife in the market center of the area in order to facilitate their business. Muslim household heads are culturally bound to marry their widow sister-in-law in order to protect resource of the family and to take care of their nephews and nieces.

Land Distribution

The recent major redistribution of land in Ethiopia was carried out in 1975 following the fall down of the imperial government. This was done through a land reform legislation issued by the *Dergue* government, which succeeded the imperial regime. The legislation abolished all forms of private ownership of land and put land under state control. It gave Peasant Associations the authority to administer the land in their areas (Dessalegn, 1984: 37 – 39).

The redistribution, which entitled farmers only to use right, was carried out based on family size of individual households with maximum holding not to exceed 10 hectares. After 1975, the PAs around the study area carried out minor redistributions a couple of times to include new households. However, since the land holding of each Peasant Association was fixed to 20 *Gasha* or 800 hectares by the land reform legislation, new households had to share the existing cultivated land with their fellow Peasant Association members. Or, often expand to their parents' land or even clear forest or grazing lands for cultivation so as to have enough land to support their family. All these resulted in expansion of cultivated land beyond the 800 hectares limit and eventually led to a serious land fragmentation.

The current average land holding in many areas of the country is less than one hectare. In the highland areas it is about 0.5 hectares according to reports from the Ethiopian Ministry of Agriculture. However, as shown in the table below, the average land holding in the study area is 2.1 hectares. This figure is similar to the average land holding for semi-arid areas in many parts of the country and is consistent with the general truth that semi-arid areas in Ethiopia are less densely populated than the high or mid land areas.

Table 4.2 Average land holding by type

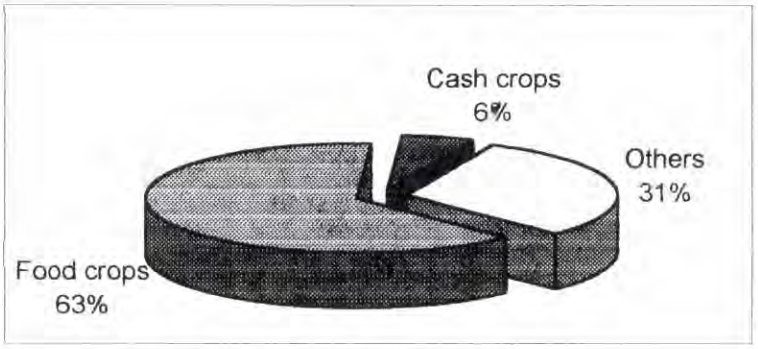
Community	Average land holding per HH	Average Non-irrigable land-holding per HH	Average Irrigable land Holding
Cash crops(30) Non cash(30) Both(60)	2.36 hectares 1.90 hectares 2.129 hectares	1.738 hectares 1.896 hectares	O.63 hectares

As shown above, the average land holding of the cash crop group is significantly higher than that of the non-cash crop group. However, excluding the irrigable land, there is no statistically ($P>0.05$) significant difference in land holding between the two groups as shown in the table above. This is due to the fact that the irrigable land was distributed recently in addition to what people already had as a result of earlier land redistributions as explained in section 2.11. The simultaneous use of both the irrigable and non-irrigable lands has been helpful for supporting small level of livestock production in line with crop production.

Land Use

According to the 1999 statistics of the district office of the Ministry of Agriculture in Boset, land use of the Doni Kombe PA can be summarized as shown in the chart below. Majority of the land is used for food grain production.

Figure 4.1 Land use of Doni Kombe Peasant Association in 1998



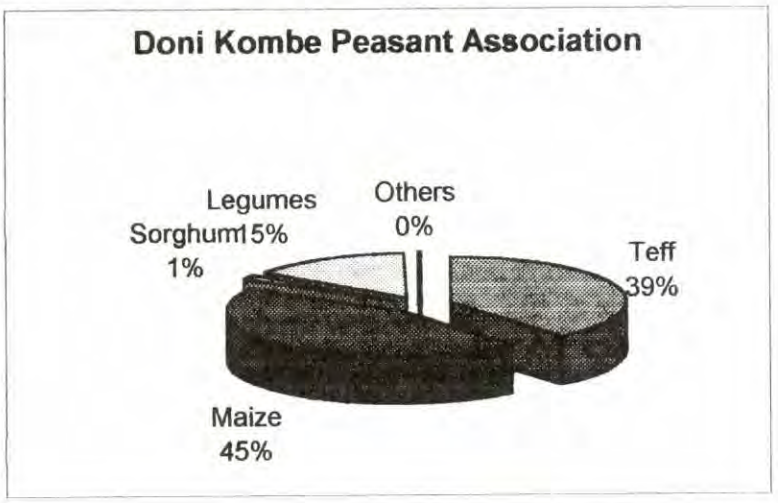
Source: MoA land use report of Doni Kombe Peasant Association

Only six percent of the total land is being used for cash crop production through irrigation. Other uses of land include bush land and communal grazing lands.

Food Crop Production

Production of food grain in Doni Kombe Peasant Association includes maize, *teff*, sorghum, haricot bean, horse bean, sorghum millet, etc. However, the major ones are maize and *teff* as shown in the chart below which was compiled based on the land use report of MoA for crop year 1998.

Figure 4.2 Food grains production by type



Source: MoA land use report-Doni Kombe Peasant Association

An average market price of different types of food grain in the local market was taken to value the amount of food produced by the sample households so as to see if there is difference between the two groups in the amount of food they produced. As explained earlier, there is no statistically significant difference between the two groups in size of land for food production. However, as shown in the table below, there is statistically very significant ($p<0.05$ at 99% confidence interval) difference between the two groups in the amount of food they produced.

Table 4.3 Food grain harvested in 1998 by household group
N=30 in both cases

Community	Average Land Holding	Average value of grain (ETB)	Average value of Fertilizer Used(ETB)	Average Value of Improved Seed Used(ETB)
Cash Crop	1.7	1147	108	125
Non-cash Crop	1.9	753	88	97

The cash crop households have been able to produce about 20% more food as compared to the non-cash crop households. Respondents suggested a number of explanations, one of which was the difference in the level of input used. However, as finding of this study shows in the table above there was no statistically ($P>0.05$) significant difference between the two groups in terms of the level of input used for food crop production. Input in this case was limited to chemical fertilizers and improved seed because these two were reported to be a good indicator of the difference between the two groups in this aspect.

The other explanation was that, due to shortage of food in the year, a good number of households from the non-cash crop group began to consume their maize product right in the field before the crop was matured enough for harvesting. This significantly reduced the final harvest which respondents reported to have harvested. The survey team noticed that there was a difference between the two groups in terms of performance of their field crops, however the Author felt that the difference might have been exaggerated due to possible under-reporting by the non-cash crop group. The group, although the team repeatedly explained otherwise, might have under-reported hoping that the survey would help them get some kind of assistance from CARE which is a relief organization operating in the area and also host organization of the study.

Comparison of HH Food Consumption from Own Production

Local production of food certainly contributes to increased availability of food in an area. However, this can be translated to improved food security only if the people can have enough access to it. Often it is

taken for granted that small holder farmers engaged in more or less a subsistence type of crop production consume most, if not all, of the food grain they produce. However the result of this survey, as summarized in the table below, shows that this is not always the case, not at least in Doni Kombe Peasant Association.

Table 4.4 Average value of production and consumption by group of households(N=30 in both groups)

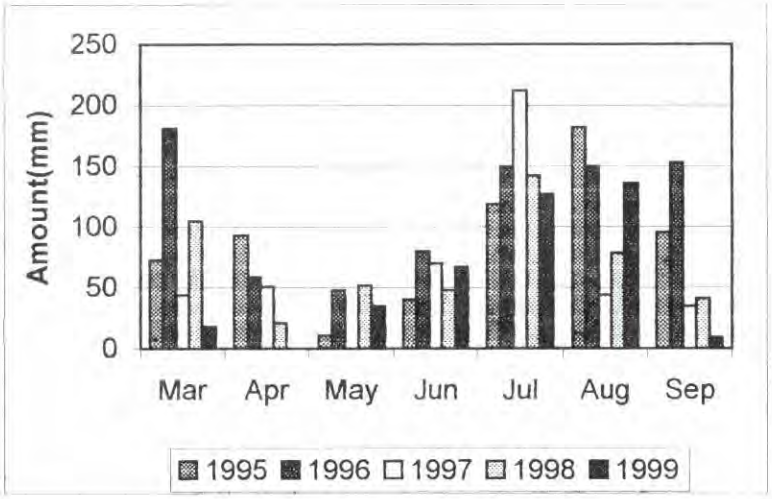
Community	Average Land Holding/HH for Food Production	Average Value of Food Grain Produced (ETB)	Average Value of Food Grain Sold(ETB)	No. of HHs who Sold Food Grain
Cash crop Non cash crop	1.74 ha. 1.90 ha.	1147 753	658(57%) 502(67%)	6(20%) 24(80%)

Once again an average market price of food grain in the local market was used to value the quantity of food produced and consumed. As shown in the table, 80% of the non-cash crop group sold about 67%(or consumed about 33%) of what they produced. Where as only 20% of the cash crop group sold about 57%(or consumed about 43%) of the food grain they produced. In each case only part or all of the *teff* harvest was sold out. Most of these households in both categories reported that they consumed all of their maize harvest with some exceptions where a very small portion of it(at milking stage) was sold out in the locality. The above evidence shows that cash crop community is doing better in terms of satisfying their consumption from own production. None of the two communities are self sufficient in terms of food production however, when it comes to comparison, the cash crop community is doing better in this aspect.

One would ask why farmers prefer to produce *teff* if it is only to sell so as to buy maize when they can produce maize directly. In response to this question, many of the villagers explained that they have always raised both *teff* and maize crops so as to diversify the risk of total crop failure due to shortage of rain and also to generate cash income from sales of *teff* for their other needs. However, recent trends and the proposition from the figures in table 4.4 above show that the proportion of *teff* is on the increase. Following is some explanation for that.

The local maize is a long season crop with growth period of up to seven months. It is usually planted in April during the *belg* season and harvested at the end of the *meher* season. However, as shown in the following graph the rainfall trend in the past four to five years has not been so suitable for maize production. For example, April is a planting time for maize and rain during this month is crucial for its germination and early growth. But, the rainfall record for the month of April in the past five years shows a decreasing trend leading to poor performance of the crop year after year. Therefore many of the farmers decided to plant more and more of *teff*.

Figure 4.3 Rainfall at Boffa center



Source: CARE Ethiopia's Food Information System

Attempts made to introduce short maturing varieties of maize have not been big successes. New varieties introduced by the Ministry of Agriculture and other organizations are usually in short supply and relatively more expensive. Many farmers can not afford them. In addition some of these varieties have often been rejected by the farmers because they are less vegetative than the local ones. Farmers in the study area are not willing to trade-off the crop vegetation for increase in its yield as the former is very important for their livestock particularly during the dry season when livestock feed becomes so scarce.

Teff is a short season crop with growth period of about four months. It is usually planted in July-August and harvested in November-December. As can be seen in figure 4.3 above, rain during this period is relatively more reliable.

Cash Crop Production

The term "cash cropping" in a way gives a distorted impression of the agricultural economy of the cash crop community in the study area. This is mainly because when cash crop production is associated with irrigation it often gives the impression of massive production of export or commercial crops such as cotton and sugarcane produced by state farms on a large-scale. This type of cash cropping has long been studied for its adverse impact on household food security in many cases.

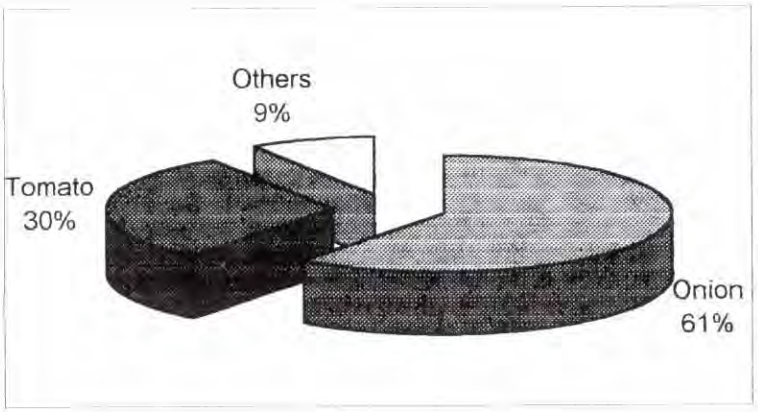
"Semi-cash cropping" could have been a better term to indicate that the type of cash cropping referred to in this study is one that is integrated with food and livestock production in a mutually beneficial way. However, this was also found confusing because it can also apply to the non-cash crop community since they are also involved in some kind of cash cropping by selling a significant portion of their harvest of food grain as shown in section 4.5. Therefore, it was found better to stick to the term "cash cropping" and try to explain what it means in this context in relevant sessions.

As explained earlier, the irrigation community did not shift all their land from subsistence food production to cash crop production. Only a small part of their total farmland is used for irrigated cash crop production. To this effect the term "Semi-cash cropping" is used in this

document in few places only to indicate that the irrigation community is not a pure cash crop producing community.

Cash crop in this context refers to crops produced through irrigation for the sole purpose of monitization in order to increase the household cash income. As discussed in chapter two, cash crops in Doni Kombe Peasant Association include onions, tomato, popcorn, sugarcane and papaya. However, the major ones are onion and tomato (to a lesser extent). Most farmers prefer to produce onion because of the problem of storage of tomato products and due to a relatively higher incidence of disease in the latter case.

Figure 4.4 Cash crops of Doni Kombe Peasant Association by type



Source: MoA Land use report of Doni Kombe PA

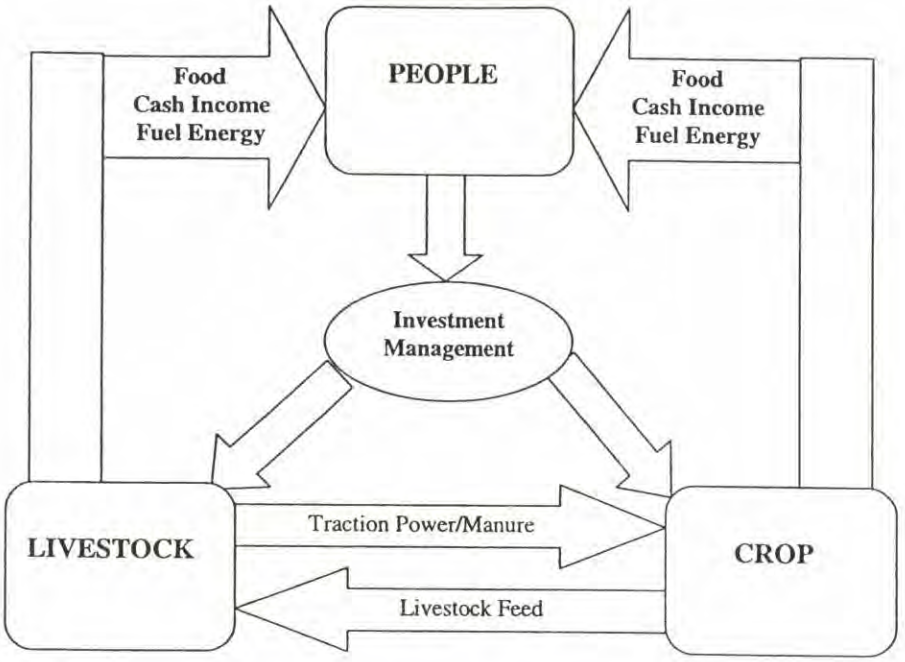
Crop and Livestock Integration

In spite of drought and severe shortages of animal fodder particularly during the dry season, livestock remains an integral part of the farming system in the study area. In both the cash and non-cash crop growing areas, crop and livestock are integrated in such a way that they are of mutual benefit to each other. Ethiopian farmers have a long history of using animal traction for cultivation.

The use of animal traction for land preparation, threshing and transportation of grains as well as manure to the field improves the quality of farming activities and thus, raising crop yield and income. Farm animals use crop residue, which might otherwise be wasted. The income generated from sales of livestock, and livestock products, on the other hand, is used to purchase agricultural inputs so as to improve crop productivity. Unlike that of food or cash crops, income from livestock is there through out all seasons of the year so long as the animals are there in good condition.

The following framework might be helpful in understanding the interaction between crop and livestock and how this affects people in the study area.

Figure 4.5 Crop and Livestock Integration



Source: Adapted and modified from Kennedy, 1992

Livestock contributes to household food security directly through provision of highly nutritious food elements such as meat, milk and milk products or indirectly through provision of cash income from sales of livestock and livestock products, which can be used to access food from the market.

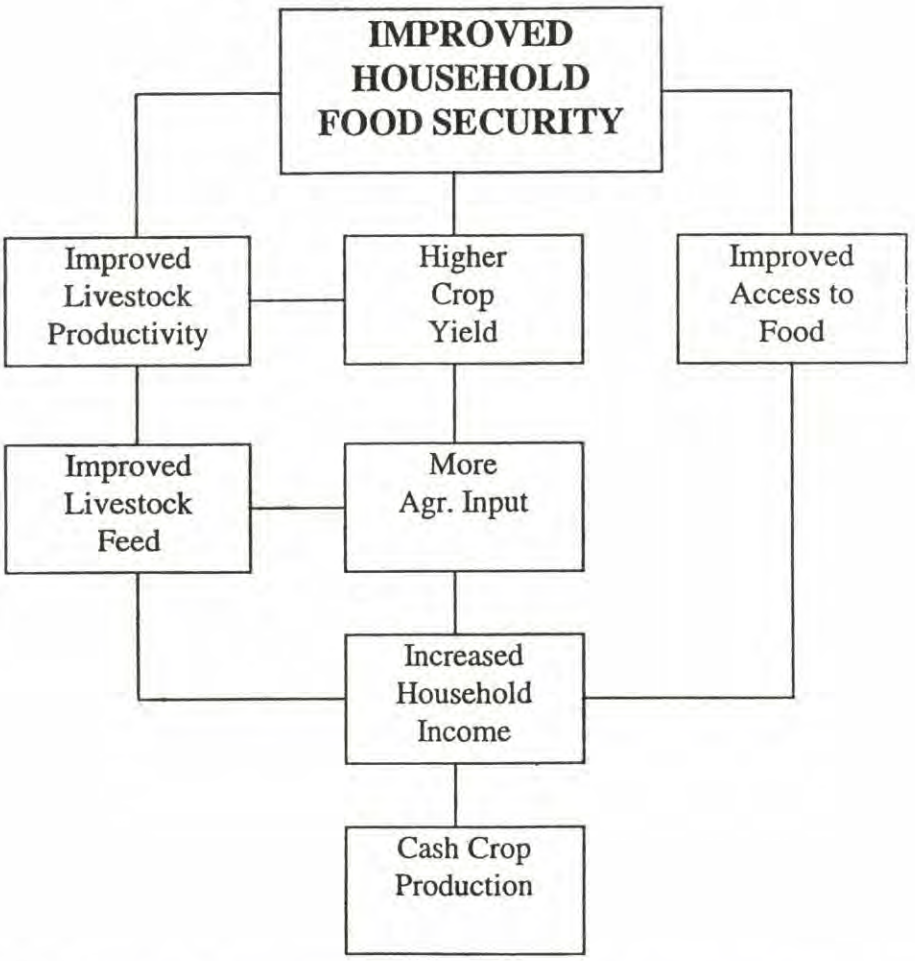
In spite of the extension work by a number of NGOs and MoA, farmers in Boset area in general have not adopted the use of improved fodder plants for on-farm forage production. During the wet season livestock are taken to the bush land in the area for grazing. When the pasture condition becomes very poor during the dry season, they are supplemented with feed, which traditionally is cereal residues such as maize and *teff* straw. Crop residue has now become a major share of livestock feed particularly during the late dry season.

The market for maize and *teff* straw has grown considerably. With its price moving up to ETB 200 per stack particularly during the late dry season, some wise farmers purchase as much crop residue as possible during the harvest time so as to save it for the dry season.

Effect of Cash Cropping on Crop and Livestock Integration

As outlined in the following model, cash cropping in the study area has affected the crop-livestock integration positively, resulting in a better productivity of food crop as well as livestock production. This is the result of investing income from cash crops in the two production systems. It is important to clarify that the model is applicable only in a situation where small level of cash cropping is coordinated with subsistence food production in an environment that can support small-scale livestock production. It does not apply to large-scale irrigation projects which often have adverse effect on livestock production.

Figure 4.6 Linkages between cash crop production and household food Security



In the following three sessions we will look at different parts of the model closely. And, later in session 4.15 we will look at issues such as distribution of income and access of women to different types of income and how all these are related to household food security on the other side of the model.

Effect of Cash Cropping on Livestock Holding

One aspect of this study is to look at the impact of cash cropping on livestock production as stipulated in the objective of the research. While there are no many studies on impact of irrigation in the country, the existing few studies have been limited to large-scale irrigation schemes established and run by the government. Such types of studies are often carried out too quickly for fulfilling government or donor requirements. The use of peasant based small-scale irrigation for semi-cash cropping has not been studied extensively although "it serves more than 40% of the irrigated land in the country" (Dessalegn, 1999). However, it is generally believed that irrigation of any scale has a drastic effect on livestock production because of the competition for land.

The following approach is used to look at how the livestock holding of individual households from the cash crop community have been affected as a result of their shift to semi-cash crop production. The data on livestock holding before cash crop production had been introduced to the area has not been properly recorded. And, attempt made to ask respondents to memorize their livestock holding many years ago resulted in controversial findings. Therefore, only the current livestock holding of the two groups is compared to see if there is a significant difference in this aspect.

Table 4.5 Comparison of livestock holding by type

Community	Ox	Cow	Heifer	Calf	Sheep/ Goat	Donkey	Total (TLU)
Cash crop(30)	53	59	51	35	61	25	168.4
Noncash crop(30)	60	71	45	26	137	37	196..9

As can be seen from table 4.5 above, the difference in livestock holding between the two communities is not very significant although the non-cash crop group has a little more in terms of total TLU. A T-test for mean difference of livestock holding in TLU revealed that the difference is not ($P>0.05$) statistically significant. However, there is a significant difference in the number of sheep and goats maintained by

the two groups. The main reason for this is that the non-cash crop group maintains as much small ruminants as possible in order to sell them so as to buy food at times of food shortage. As shown in table 4.6, goats and sheep are the first animals to be taken to the market at bad times or whenever the household is in need of cash.

This finding shows that the introduction of cash crop production to the community has not resulted in drastic effect on livestock holding. Instead, it helped the cash crop community maintain almost as much number of livestock as their non-cash crop counterparts but in a better condition. This can be attributed to complementarities of the cash crop and livestock production systems.

Effect of Cash Cropping on Livestock Feed and Productivity

The Doni irrigation has not displaced any of the grazing land in the area because the irrigable land had long been used for irrigated crop production. However, the shift to cash crop production reduced the total land available for food crop production and, hence, total crop residue available for the livestock.

It has been very difficult to estimate the proportion of crop residue from the total livestock feed because different units of measurement are used in different places. However, based on the number of weeks in the dry season when livestock is supplied with crop residue, the community estimated that in general crop residue accounts for 31% of the livestock feed in the area. The district office of MoA increases this figure to 35%.

As explained in section 4.4, however, cash crop community has relatively been able to produce more food crop, which means more crop residue. These findings show that the shift to semi-cash cropping actually has not reduced the total crop residue produced in the year. In the future it is likely that the cash crop community will be able to invest more on food crop production and produce more crop residue per unit of land relative to the non-cash crop community because of increase in the use of agricultural input.

On the other hand the additional income from cash crops together with shortage of livestock feed in the late dry season led to an opportunity for cash crop households to invest on livestock feed so as to improve their livestock productivity. Cash crop households are now beginning to learn to supply their livestock with oil-cake together with crop residue. The oil-cake which is locally known as *Furuska* is supplied from Nazareth which is the nearest city to the study area. At the time of the survey a total of eight households from the cash crop community have already been using oil-cake for their livestock although it is limited to only the dry season. Discussion with community members confirmed that the idea has a good future in the area. On the other hand none of the non-cash croppers purchased oil cakes.

However, it is important to note that in general the grazing land of the PA gets reduced year after year due to population pressure. According to the report from the district of the Ministry of Agriculture the grazing land in the PA has been reduced by 15% only in period less than six years. This shows how important livestock feed such as oil cake will be in the future.

Effect of Cash Cropping on Labor Market

The people of Doni Kombe like most people in rural Ethiopia had a culture of labor cooperation, which is known as *jigi,* where farmers in one community or peer group assist each other on plowing and other farm activities on a rotational basis. Some times *jigi* had also been used to assist economically weak and disabled households too. The household that hosts *jigi* is expected to prepare food and drink for the day the event takes place and, if capable, to participate in *jigi* events for partner households. *Jigi* has been such an important social asset of the people in the study area, which is used to solve labor shortage particularly during peak agricultural seasons. However, discussion with community members revealed that the recent trend of *jigi* is on the negative.

According to findings of this study, only 13% and 33% of the cash and non-cash crop households, respectively, have hosted *jigi* in the year 1999. Instead people have learnt to hire labor on contractual basis even for food crop production at times of peak cropping seasons. Wage laborers and cash for work activities on a daily basis are com-

mon in many parts of Ethiopia including the study area but, working on contractual basis is a new development. This shows the extent of advancement of the labor market in the study area.

The Doni irrigation project, which is of such a small scale can not be the only reason for this change. The free market economy being promoted in the country and the fact that the study area is located in the Awash valley where most of the large-scale irrigable farms run by the state are established are believed to have contributed a lot. According to the local people, the value of labor has moved from ETB three per day up to ETB ten per day in about seven years. However, this has not adversely impacted the people in the study area because of the increasingly high proportion of landless people in the area. According to Diriba 1995, 15% of the population of Doni and the surrounding PAs is landless. Most of this people live on the wage they earn from such activities.

A lot of women(mostly from the landless community) work on the cash crop fields as laborers during peak agricultural seasons however, almost all of the wives of the cash crop households spend their time in the cash crop field supervising daily laborers once they prepared and brought food to the field for their husbands.

Factors Affecting the Crop-Livestock Integration

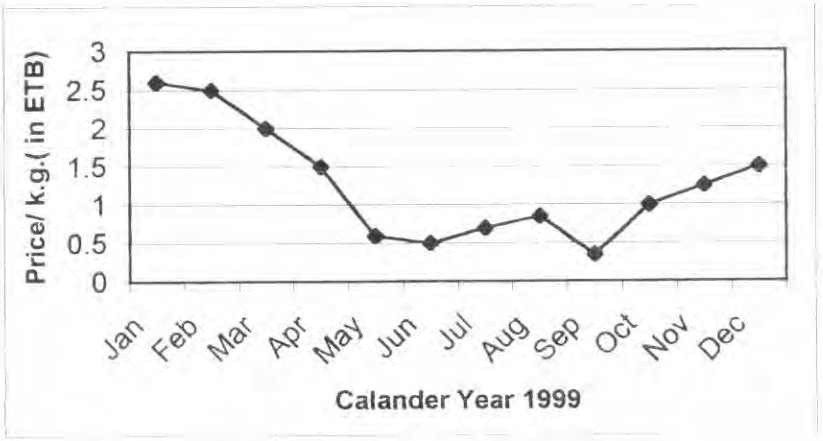
A number of internal and external factors that affect the interaction between cash crops, food crops, and livestock production have been listed by respondents however, the following four have been ranked as the major ones as they are very important for sustainability of the production system itself.

Market for Cash Crop Products

Income from cash crop production is entirely dependent on the availability of market for products. If the income from cash cropping is not good enough to support food and livestock production, the whole production system will be devastated.

There is a high competition for market as there are many vegetable producers in the region, some of which have professional marketing agency located in city centers so as to respond to the demand from within and outside the country on a timely basis. However, the cash crop community of Doni Kombe Peasant Association has not been properly organized to deal with marketing of their products and often their production suffers from low price dictated by brokers and middle men facilitating the sales of their products.

Figure 4.7 Price trend of onion at Doni center



Source: Record of MoA Development Agent at Doni

As shown in figure 4.7 above, the price of onion, for example fluctuates a lot with the lowest price being in June and July, which is part of the long rainy season. The main reason for this is that there is a high production of onions in the country in general during these two months because of the additional production that comes from rain-fed production areas in other parts of the region. On the other hand the highest price is in January and February where only irrigated vegetable products are available. Farmers need to adjust their production to this situation in order to make efficient use of their resources. In some cases it might not even be profitable to produce vegetables in the long rainy season.

Natural Disaster

Natural disaster such as drought may not affect cash crop production directly because of constant supply of irrigation water through out the year however, it affects productivity indirectly in a number of ways. For example, if harvest from food production is very low due to shortage of rain, more income from cash crops has to be used to supplement the household food instead of being invested on livestock and cash crop production in the following season. Drought may even lead to desperate situations where the people had to sell their valuable assets such as oxen, which are very difficult to replace.

As already explained in section 4.5, the year 1999 has not been a very good crop year in Ethiopia in general and in Boset district in particular. Many farmers had to sell their assets including their livestock so as to be able to purchase food for their family in the dry season. Following is the comparison between the cash and non-cash crop households in terms of how they responded to the drought.

Table 4.6 Livestock sold in 1999 by community

Community	Ox	Cow	Heifer	Sheep/ Goat	Donkey	Total (TLU)
Cash Crop (30)	19	34	26	66	7	78,2
Non cash crop (30)	44	23	10	134	10	97,8

Even the cash crop community had to sell so much livestock in order to cope up with shortage of food in the year. The difference between the two communities in the number of oxen sold is significant. Discussion held with respondents from the cash crop community revealed that cash crop growers find it very hard to loose their oxen in drought situation because of the intensive nature of cash crop production. The loss of assets such as oxen affects the productivity of crops as well as the efficiency of the farmers themselves. On the other hand, in both the cash and non-cash groups only small number of donkeys were sold out not only because they are more drought tolerant but also because they are vehicles supplying the household with water.

Supply of Input in the Local Market

As already explained in section 4.6, onion and tomato are the main cash crops in the study area which need an intensive cultivation. As elaborated by Williams, 1991, vegetable farming is different from other types of farming because of its intensive nature and, if correctly carried out, produces very high yields. Therefore, input in terms of fertilizers, manures, labor for planting, maintenance and harvesting, and crop protection are also very high – much higher than for field crops. According to findings of this study the mean expenditure on inputs for vegetable farming is also as high as ETB 1597 per household.

The availability of these inputs in the local market is crucial for sustainability of vegetable production. For example, the price of onion seed in the local market ones was ETB five hundred which many of the farmers failed to afford especially at the beginning of cash crop production. But now a lot of farmers have started producing onion seeds and it is now available at a price of ETB 125 per kg. Fertilizers and some pesticides are, however, supplied by the Ministry of Agriculture. Often these are not available in the right time or in the right quantity. This affects the income from cash crop production and, hence, its contribution to the crop-livestock integration.

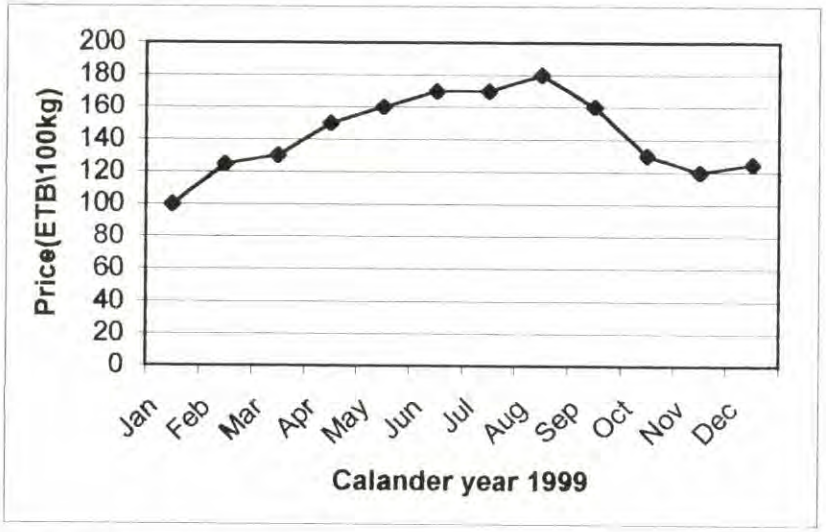
Food Supply in the Local Market

As explained in section 4.5, both the cash and non-cash crop communities depend on the market for their staple food such as maize and haricot bean. According to findings of this study, food purchased from market in 1998 accounts for about 58% and 87% of the total annual food consumption of the cash and non-cash crop households, respectively. This shows the extent to which both groups depend on the market, with the non-cash crop group being even more dependent. The cash income generated from cash cropping or sales of food grain such as *teff* can be translated to food only if there is enough supply of food in the local market.

Doni Kombe PA and the surrounding area has been known for many years as a cereal deficit production area. Increasing incidence of cli-

matic hazards and progressive land use for cash crops amplify the negative trend for food production. But the Doni market has a sufficient supply of main staple foods, originating from neighbouring surplus producing areas like Arsi, Bale and southern Ethiopia. Even in 1999, which was considered to be a bad crop year in many years, there was enough supply of food in the local market. For example, the price of maize, which is the major staple food, did not go beyond ETB 180 per 100 kgs as shown in the figure below.

Figure 4.8 Price trend of maize at Doni center



Source: Record of MoA office at Wolenchitti District

Household Income and its Sources

The year 1998 was selected for studying income of the sample households because 1999 was not completed at the time when collection of data for this study was started. As will be seen in the next two sections, the total household income for the sake of this study has been divided into four groups depending on the source, which it is generated from. These include; income from cash crop production, income from food crop production, income from livestock production and in-

come from other sources. The last three are common sources of income to both the cash and the non-cash crop communities but, the first one, as implied, is only of the cash crop community. Income from other sources in both cases refers to income from; labor wage, sales of firewood or charcoal, value of food from food aid or Food for Work activities, sales of local beverages and income from other petty trade activities, etc, as outlined in the survey questionnaire.

Income from food crop production refers to the value in ETB of the total food grain and crop residue harvested by the household in the year. Income from cash crop production on the other hand refers to the cash income generated from sales of cash crop produced by the household alone or through share cropping with partners. It also includes the income from occasional rent of the household's irrigable land for a short period of time. Income from livestock production includes; the cash generated from sales of the animals themselves and the value in ETB of their products sold out or consumed in the household.

Income of Cash Crop Households

As shown below, the average total income of the cash crop households is ETB 8879 which is the sum of average income from cash crops, food crops, and livestock production as well as the income from sources other than these.

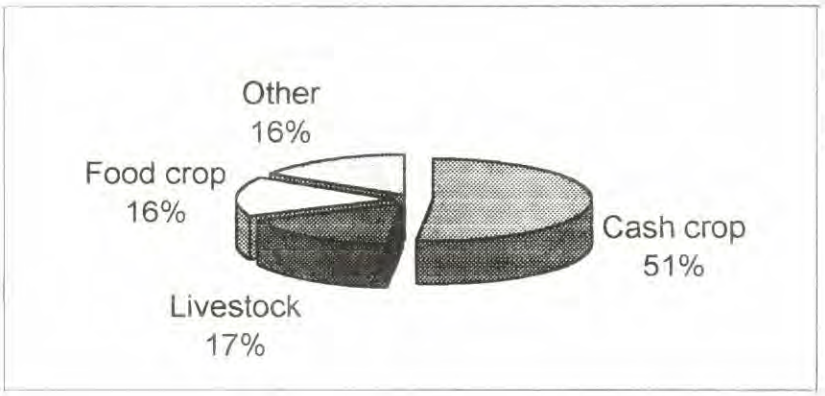
Table 4.7 Income of cash crop households

Variable	N	Mean	StDev.
Total Income	30	8879	6861
Cash Crops	30	4599	5304
Food Crops	30	1383	827
Livestock	30	1475	1455
Others	30	1421	2816

Comparison of the share of different sources to the total household income, as displayed in the chart below, indicates that cash crop production alone accounts for about 51% of the total income of the cash crop households. The remaining three sources all together do not contrib-

ute as much as the cash cropping alone does. This shows how important cash cropping is to the community however, it is also important to point out that cash cropping can not be such a big success without being integrated with the other two systems of production as explained in section 4.7.

Figure 4.9 Annual income of cash crop households by source



The contribution of livestock and food crops to the total household income is almost similar. This restates the fact that livestock is still an important source of household income even to the cash crop community as elaborated in section 4.8.

Income of Non-Cash Crop Households

As shown below, the average income of the non-cash crop households is ETB 3595, which is way below that of the cash crop households.

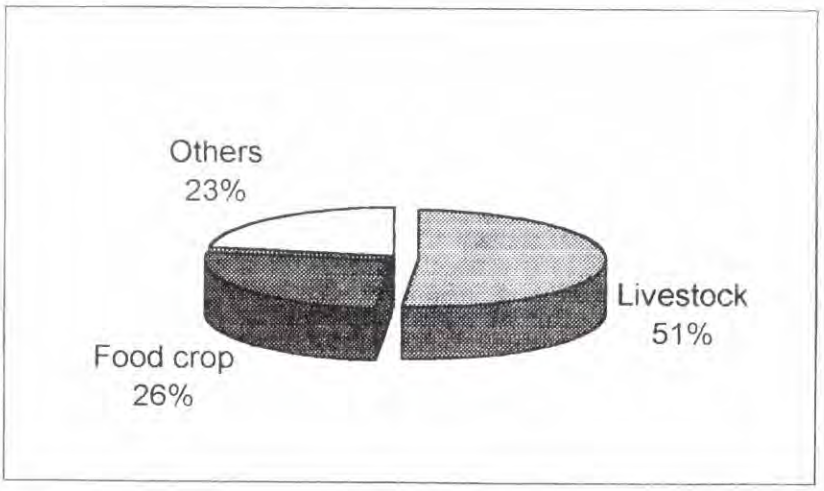
Table 4.8 Income of non-cash crop households.

Variable	N	Mean	StDev.
Total Income	30	3595	1270
Food crops	30	929	336
Livestock	30	1843	1392
Others	30	808	862

The major share of the total household income in this case comes from livestock production as displayed in the chart below. There has not been a reliable study of economy of the Doni Kombe Peasant Association at the household level in general, however among MoA and other development and relief organizations in the area the PA is considered to be what is known as crop-major and livestock-minor economy. This is often reflected in the reports of MoA and CARE. However, the findings of this study indicate that it is now time to question that "general understanding".

It would be too much to draw a conclusion about economy of the PA from this small study as it would be too difficult to call economy of the PA a livestock minor when majority of the household income in such cases comes from livestock production. This issue needs to be studied more comprehensively by stakeholders of development interventions in the area because the very design of their projects lies on this basic fact, which is determinant to the success of their projects in the long run.

Figure 4.10 Annual income of non-cash crop households by source



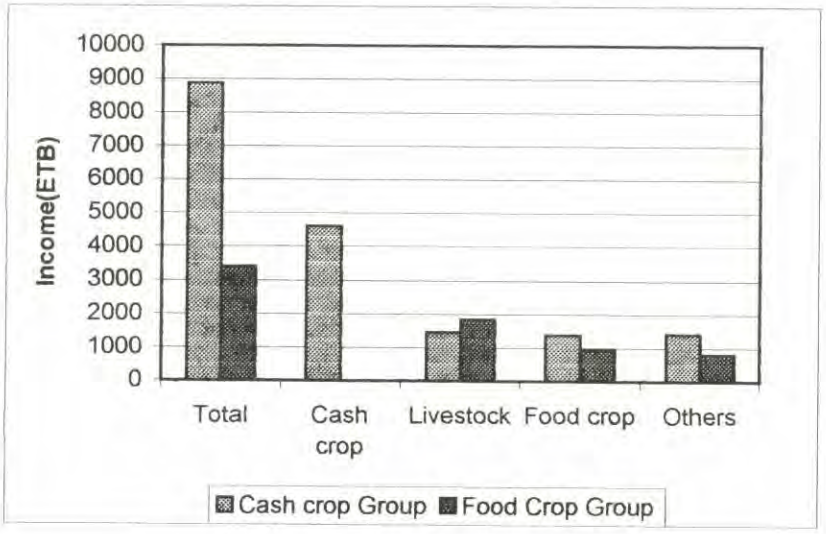
This issue was further brought up in a group discussion with community members where many respondents agreed with the finding. They

explained that the number of livestock in the area in general is increasing with the population so as to cope up with shrinking of individual land holding and precarious rainfall, which significantly affects the income from food crop production. "Livestock never deserts, even in bad days" said one of the respondents to explain how the income from livestock has been helpful during seasons of poor crop performance.

Comparison of Income of the Cash and Non-cash Crop Households

The following graph can be used to see the difference between the cash and non-cash crop households in the level of income they generate from different sources. The total household income of the cash crop households is over two times as much as that of the non-cash crop households.

Figure 4.11 Comparison of income by source



Contrary to the result in the other three cases, income from livestock production is significantly higher in the non-cash crop group than in the cash crop group. This is due to the fact that many of the non-cash crop households had to sell more number of livestock in order to cope

up with shortage of food in the year as explained in section 4.10.2. The average income obtained from sales of livestock alone for the cash and the non-cash crop groups is ETB 1075 and 1451, respectively. And this difference is statistically($P<0.05$) significant. But, there is no statistically($P>0.05$) significant difference between the two groups in the level of income they obtained from livestock products.

Income from food crop production is higher in the cash crop group than in the non-cash crop group because the former group has been able to produce more food for reasons explained in section 4.4. Income obtained from other sources is lower in the non-cash crop households than in the cash crop ones. Even with food aid and FFW included it is way below the corresponding income of the cash crop households. This can be attributed to the decision of cash crop households to invest their income on other income generating activities, which stimulate the local economy. These activities are predominantly petty trade activities including brewing local beverage. Following is comparison of the two groups in this aspect.

Table 4.9 Comparison of income by type of activitiy

Activity	No of Cash Crop HHs Participated	Average Income Obtained	No of Non-cash Crop HHs Participated	Avg. Income Obtained
Petty trade	13(43%)	ETB 1857	3(10%)	ETB 973
Food for Work	7(23%)	ETB 152	17(57%)	ETB 325
Food aid	0(0%)	0	8(275)	ETB 105

On the other hand none of the cash crop households received food aid during 1998 which was a very bad crop year in Ethiopia in many years. Only seven households participated in food for work activities, which actually was related to repair of the Doni irrigation canal. This shows how income from cash crop production has enabled the cash crop community to feed themselves through out the year. Cash crop households are no more on the list of periodic food aid beneficiaries of the Doni Kombe Peasant Association, which had been there for quite some time. This is a good evidence of how cash crop production en

abled some households break through the vicious circle of poverty and enabled them to feed themselves without external assistance.

Distribution of Income

The fact that a household has an increased income does not necessarily mean that the household is more food secured. Rather, how the income is utilized in the household to a large extent determines whether food security is improved. In some cases increased income may even have an adverse effect on food security. In the following four sessions we will look at how income from different sources has been utilized in the household and to what extent it affects the household food consumption.

To this effect, the role of women in the household and their access to the household income will be discussed in respective sections as it is crucial for household food distribution. Several studies have indicated that the more income is controlled by women the better will be food distribution in the household. Most of the findings in the following four sections are results of group as well as individual discussion with members of both the cash and non-cash communities through PRA exercises.

Distribution of Income from Food Crops

The major income from food crop production is the value of food grain itself which can be divided in to two parts namely; the cash income obtained from sales of part of the food grain and the remaining food grain which is brought to the house for household consumption. Food grain on threshing plot is usually considered to be the property of men and the cash income generated from its sales is primarily controlled by them. However, because it is the responsibility of men to make sure that staple food grain such as maize is available for the household, the first thing men invest their cash income on is to purchase as much maize as possible before food price is on the rise again in the dry season. But, they also make sure that they have kept aside some money for their other needs such as local beer, tobacco, and other personal expense.

The food grain for household consumption is stored in a number of gunny sacks, which are usually kept in the living house. While it is the responsibility of men to make sure these are available, it is the responsibility of women to make sure what ever made available by men is enough for the year even if they are not enough in the real sense. Therefore women must have other sources of income to complement the available food so as to sustain the family through out the year. Although the household food in general is managed by them, women are not allowed to move from one sack to the other without permission from their husband but, once the grain in a given sack is started, it is up to women to make efficient use of it, be it for consumption or sale. Women some times sell out part of the food grain, which is meant for the household consumption so as to be able to purchase consumer goods necessary for food preparation. But, this happens when they are really desperate.

There was no much difference observed between the cash and the non-cash crop households in the way income from food grain is utilized and the role of women in this aspect. But, one difference spelled out by many respondents is that women of non-cash crop households have more burden than that of the cash crop ones in years of poor crop performance because of the lack of other income opportunities to complement the income from food grain.

Distribution of Income from Cash Crops

Cash crop products are also sold by men right on the field and the cash income obtained is predominantly controlled by them. Almost all women do not know how much money their husband make from cash cropping. Only one woman among the cash crop households happened to know how much her husband made from cash crops. She is a very popular woman in the village for her effort to influence her husband in making decisions about their farms as compared to other women in the village. She explained that she usually joins her husband whenever their cash crop products are sold and actually receives the sales money to keep it with herself. However, she also explained that often she couldn't stop her husband from spending the money in

his best interest although she is usually consulted on that. In many cases men usually under report the income from cash crops and even hide part of the money in places that are not accessible by women.

However, this does not mean that men spend all the income from cash crops against the interest of their family. In fact the first thing they do with the money is to purchase as much food as possible so as to ensure that food grain is available for the family through out the year. They have to do so not only because it is their traditional responsibility, but also because it is a lot cheaper to buy food grain in some seasons of the year than in the other. As shown in figure 4.8, for example maize grain which is a staple food in the area is cheap in December and January which is a harvesting season for both food and cash crops.

Men always keep aside enough money from the income obtained from cash crops before they proceed to the other needs of the household such as clothing for their wife and children or holiday expenses. The money kept aside is often used for their local beverage, tobacco and in some cases *chat* consumption. It is also used for alcohol and meat consumed on market days as explained in section 4.17

Women are usually consulted on how the money from cash crops has to be spent and what priorities of the household are although many times final decisions are made in favor of what men think is in the best interest of the household. Some times there are disagreements between men and women on what priorities of the household are. For example women prefer to invest on livestock while some men prefer to invest more on cash crop production so as to make more income for the household.

When cash crop products are sold, only the best quality is selected by the buyers and the remaining portion which is of less quality and quantity is often left in the field, some of it with out even being removed from the soil. Women collect and sell these products for local consumers or even preserve them for their household consumption. Although it is small in amount, this is one more source of income in the domain of women.

Doni Kombe is no different from a typical African village where income of the household is predominantly controlled by men. There is no question about that. However, the point of this study is to see weather the introduction of cash cropping to the area has worsened or improved it. As elaborated earlier, cash cropping has actually increased the share of income that can be accessed by women. As a result, at times of food shortage, women of cash crop households have a relatively less burden of complementing the household food supply.

These can be an evidence for the positive impact of cash cropping on the household. Even looking at the physical condition of some of the women, one can tell that women of the cash crop households in general have a better life than that of the non-cash crop groups.

Distribution of Income from Livestock Production

With the exception of the sales of livestock themselves, income from livestock production is traditionally in the domain of women. That was why most of the women interviewed responded that one of their first priorities of investment is livestock production. The source of good quality protein which is essential for normal growth of children in rural areas of Ethiopia such as Doni Kombe PA is livestock product and only livestock product. In this aspect income from livestock improves both the quantity and quality of food consumed by the household. In addition, at a period of food shortages, women can sell part of livestock products so as to purchase food for the family.

Even in drought situation where some of the livestock have to be sold out, the money earned is spent directly on food for the household consumption. Therefore, the more the number of livestock a household has the more income will be at the disposal of women and the less food insecure the household will be provided that the number of livestock does not exceed the carrying capacity of the environment.

Distribution of Income from Other Sources

Income from sources such as local beverage and petty trade activities run by women can be considered as an independent income of women which they are free to spend on what they think is in the best interest

of the household. Women often use income from such sources to complement the household food supply. Occasionally they also use part of the income for other needs including clothing for themselves as well as for their children.

As elaborated in section 4.14, cash cropping has enabled cash crop households to generate more income from other sources as compared to the non-cash crop ones which in effect made more resource available to women. And, the more the household makes income from other sources the less food insecure it will be because of improved distribution of food within the household.

Relation between Food Consumption and Income

As explained in section 4.12, cash cropping accounts for majority of the household income. A linear regression run to see the relation between food consumption and household annual income gave the following result. In this case, the value of staple food consumed by all the sample households in both groups was used to measure the household food consumption.

Regression equation: Food Consumption = 1762 + 0,268 HH Income

Predictor	Coef	StDev	T	P
Constant	1761.7	245.7	7.17	0.000
HH INCOME	0.26835	0.02950	9.10	0.000

S = 1262 R-Sq = 58,8% R-Sq(adj) = 58,1%, n = 60

The above regression shows that a unit change in income will bring a change in consumption at a rate of 0.268, provided that all others factors that bring change in consumption remain constant. Since household food consumption is also related to family size, a correlation test was run to compare the relation between household food consumption and family size to the relation between household food consumption and income as shown below.

- Correlation of household food consumption and family size, r = 0,606; P-Value = 0,000

- Correlation of household food consumption and income, r = 0,767; P-Value = 0,000

The coefficient of correlation r in the second case is higher than that of the first case which shows that there is a relatively more strong relation between household food consumption and total income of the household. This finding substantiates that at higher level of income households in the study area are able to obtain and consume more food regardless of other factors.

In section 4.15 we have also looked at how power relation is important in distribution of income within a household. Cash cropping in this case contributes to increased proportion of income available to women but, it has not yet gone to the extent of affecting power relation in the household.

Comparison of Undesirable Household Expenditure

Discussion with women revealed that one of the expenditures women are concerned about is the expenditure of men on alcohol. In addition to their almost daily consumption of local beer, some men spend a significant amount of money on other kinds of alcohol drinks and meal sold on market days. Women believe that men, especially during harvest of cash crops, spend a lot of money for themselves and the people they invite on such occasions and that the amount of money involved increases with the increase in income from cash crop.

According to findings of this study, the average expense of men on alcohol and meal in town is ETB 657 and ETB 392 for the cash and the non-cash crop households, respectively. This difference is statistically very significant with p-value<0.05 at 99% level of confidence. However, when compared to the total household income it takes 7.4% and 10.9 % of the household income in the cash and non-cash crop households, respectively. It was observed that some women also spend some money on local beer especially during market days. However, the amount involved is insignificant compared to the expense of men in this aspect.

CHAPTER FIVE

CONCLUSIONS

The study area is one of the most drought prone and food insecure areas in Ethiopia. Many of the people have been regular beneficiaries of periodic cash crop production are now more income secured and better accessed to food (see section 4.4). They are no more on the list of periodic food aid beneficiaries in the area, which had been there for quite some time. . This is a good evidence of how cash crop production helped some households to break through the vicious circle of poverty and enabled them to feed themselves without external assistance.

Having been able to make twice as much annual income as their non-cash crop counterparts, households in use of the irrigation water for cash crop production are now more income secured and better accessed to food (see section 4.4). They are no more on the list of periodic food aid beneficiaries in the area, which had been there for quite some time. This is a good evidence of how cash crop production helped some households to break through the vicious circle of poverty and enabled them to feed themselves without external assistance.

The market oriented economic policy being implemented in the country has steadily improved the overall policy environment in Ethiopia. Cash cropping has considerably stimulated the economy within and outside the study area. It has created job opportunities for landless portion of the society and other vulnerable households in rural towns in the area. Activities such as the transportation and marketing of cash crop products, and cultivation of cash crops have employed a good number of people particularly during peak agricultural seasons. A study conducted in 1993 estimated the proportion of landless households in the area to be as high as 10% (Getachew, 1995: 212). With addition of new households to a community which has limited land resources, it is likely that this figure has now gone up to even a higher percentage.

The cash crop economy with its important cash flow offers a wider range of off-farm income possibilities as compared to subsistence farming. According to findings of this study 43% of the sample households from the cash crop community have been able to participate in off-farm

income generating activities while only 13% of the non-cash crop ones have been able to do so. And, on average households from the cash crop community have been able to make twice as much income from off-farm activities as that of the non-cash crop households involved in these activities (see section 4.4).

In an effort to tackle the chronic problem of food insecurity in the country, the Government of Ethiopia is implementing a five-year agricultural development program targeted to achieve accelerated and sustainable growth in crop production through intensive farming. However, several evidences indicated that this strategy has been successful only in areas with relatively good weather and soil conditions. Marginal areas including the dry land part of the country have not made big successes from the government's intensive farming strategy mainly due to moisture stress and lack of soil fertility.

On the other hand, the absorption of the major part of population growth within the agricultural sector has led to progressive land pressure and ever shrinking landholdings. Subsistence farmers have not been able to produce enough food for their family even during years of normal rain. Due to the scarcity of pasture land livestock is partly fed on crop residues, the production of which is gradually decreasing according to farm size and as a result of reduced land productivity, lowering the margin for livestock production. The joint effect of all these problems has led to decreased overall farm income augmenting the vicious circle of impoverishment.

The findings of this study show that the use of small-scale irrigation can reverse this tendency. Irrigated cash crop production integrated with subsistence food production in an environment, which can support small-scale livestock production is proved to be a good intervention for improving agricultural productivity (see section 4.8). The additional income obtained from cash cropping can be invested in food crop and livestock production so as to improve their productivity.

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