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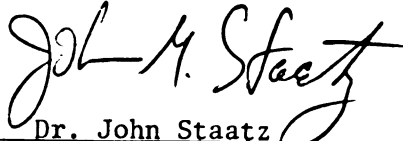
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FOOD SECURITY IN SOMALIA: THE CASE OF MAIZE AND
SESAME IN THE SHABELLE RIVER VALLEY
presented by

YASSIN JEYTE WEHELIE

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of the requirements for

Ph.D. degree in AGRICULTURAL ECONOMICS


Dr. John Staats
Major professor

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**THE EFFECTS OF POLICY ADJUSTMENTS ON
FOOD SECURITY IN SOMALIA: THE CASE OF MAIZE
AND SESAME IN THE SHABELLE RIVER VALLEY**

Volume I

By

Yassin Jeyte Wehelie

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1989

604613

ABSTRACT

THE EFFECTS OF POLICY ADJUSTMENTS ON FOOD SECURITY IN SOMALIA: THE CASE OF MAIZE AND SESAME IN THE SHABELLE RIVER VALLEY

By

Yassin Jeyte Wehelie

This dissertation sought to examine the effects of recent policy changes on domestic food production, productivity and food security among sample farmers in 10 villages in the Shabelle river valley. The study collected primary data on farmer, trader, and aggregate market behavior, and on key food policies during 19 months of field research (June 1986 - December 1987).

Major findings establish that both maize and sesame output have responded positively to the policy reforms. But this response was mostly in area expansion rather than increases in productivity. The country's food production capacity appears to have improved and its dependency on food aid reduced since the reforms. Urban consumers clearly pay higher prices for maize as a result of the reforms.

Despite Somalia's virtual aggregate self-sufficiency in maize by the end of 1986, half of the sample farmers were still unable to produce sufficient maize for household consumption needs. These farmers depend on off-farm income (especially on labor sales) to purchase the remainder of their food needs. The deficit farmers have shared very little in the direct benefits of higher commodity prices. Among the sample farmers, significant disparities were also observed in land ownership patterns and in the access to public support services.

Components of an improved maize technology package, which has the potential of doubling current average maize yields, are shown to be workable in Somalia. Furthermore, this technology is economically and financially viable. But institutional constraints and lack of inputs prevent most farmers from utilizing it. The analysis could not confirm the alleged yield superiority of the Somtux maize variety.

To get benefits more evenly distributed among farmers, the potential for a land reform program need to be examined. Future policy interventions also need to be assessed in terms of their equity implications. To complement reforms, solving existing institutional and input market constraints, and strengthening the agricultural research system, will be required to promote Somalia's future economic recovery and improved agricultural performance.

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DEDICATED

TO

My beloved parents,
Haji Jeyte Wehelie and Maka Ahmed Abdi,
for all of their blessings.

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Fieldwork in Somalia would never have been possible without the admirable contribution of the management and staff of the Ministry of Agriculture and its various departments and projects. And of course, I thank Dr. Mohamud A. Nur, the vice minister, for his commendable support of my efforts to carry out this study. I also wish to acknowledge my gratitude to the staff of the Planning and Statistics Directorate of the Ministry of Agriculture, whose team spirit made an onerous fieldwork seem like any easy job. A very special appreciation goes to the staff and research associates of the Food Security Project, to whom each and everyone of them I say 'Mahadsanid'. I am also indebted to the staff of the national extension service in the Lower and Middle Shabelle regions for their support and collaboration in the field data collection. Special appreciation is extended to the farmers and traders, who without any compensation, generously offered to share their wisdom with us.

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LIST OF ABBREVIATIONS

ADC	Agricultural Developement Corporation
ARI	Agricultural Research Institute
AFMET	Agricultural and Farm Management and Extension Training
AFIS	Amminstrazione Fiduciario Italo Somalo
CARS	Central Agricultural Research Station
CIMMYT	Centro Internacional de Mejoramento de Maiz y Trigo
CPI	Consumer price Index
CSD	Central Statistics Department
DLWR	Department of Land and Water Resources
ENC	Ente Nazionale Commercio
FAO	Food and Agriculture Organization of the United Nations
FEA	Field Extension Agent
FEWS	Food Early Warning System
FSP	Food Security Project
FYDP	Five Year Development Plan
GADP	Gross Agricultural Domestic Product
GDP	Gross Domestic Product
GSDR	Government of the Somali Democratic Republic
GTZ	German Agency for Technical Cooperation
HYV	High Yielding Variety
IBRD	International Bank for Reconstruction and Development
ICD	Industry Council for Development
IMF	International Monetary Fund
IRRI	International Rice Research Institute
ISNAR	International Service for National Agricultural Research
JOSR	Jowhar Offstream Storage Reservoir
LDC	Less Developed Country
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoH	Ministry of Health
MoLFR	Ministry of Livestock, Forestry and Range
MoMWR	Ministry of Mineral and Water Resources
MNP	Ministry of National Planning
MSU	Michigan State University
NPC	Nominal Protection Coefficient
ONAT	Organizzazione Nazionale Altressi Trattore
PIP	Public Investment Program
SCSB	Somali Commercial and Savings bank
SDB	Somali Development Bank
SDR	Special Drawing Rights
TAMS	Tibbet, Abbet, McCarthy and Stratton
UNCDF	United Nations Capital Development Fund
USAID	United States' Agency for International Development
USCM	Union of Somali Cooperatives Movemement
WAGAD	Wakaaladda Gadiidka Dalka

CHAPTER ONE

INTRODUCTION

" The most intractable food problem facing the world in the 1980s is the food and hunger crisis in the 45 states in sub-Sahara Africa - the poorest part of the world."

Carl Eicher, 1984

Sub-Sahara Africa today faces a food crisis of extreme proportion. More than 100 million Africans, or roughly about 25 percent of the continent's population, are currently estimated to be food insecure. Somalia is a prime example of the food crisis that plagues the continent. Fifty percent of the Somali population are currently believed to be food insecure (World Bank, 1988)¹. The majority of the food insecure are the poor, mostly living in the rural areas. Available estimates of per capita income in the country in fact show that average rural incomes are only about half of the urban income.²

¹. The World Bank defines food security as "access by all people at all times to enough food for an active and healthy life" (World Bank, 1988).

². FAO's (1982) "Review of Rural Development Strategies and Policies" estimated real per capita rural and urban incomes in Somalia as follows: So.Sh. 508 for the rural vs. So.Sh. 1101 for urban in 1972; So.Sh. 500 for rural vs. So.Sh. 1056 for urban in 1978.

Similar to many other sub-Saharan Africa countries, domestic per capita food production in Somalia sharply declined throughout the 1970s. From a position of virtual self-sufficiency in basic cereals up until the early 1970s, Somalia has since become the leading import-dependent country in all of Africa (World Bank, 1988). Because of the country's insufficient foreign exchange earnings, food aid became the leading source of grain imports. In 1970-74, food aid accounted for less than 20 percent of total grain imports. A decade later, almost 60 percent of grain imports were in the form of food aid. Despite the increased grain imports, available grain supplies in most years still do not satisfy total grain requirements, thus, leading to constant domestic food shortages. Lacking adequate resources for sufficient home production and/or the income to purchase food from the market, the poor have been the most vulnerable group to suffer from hunger and malnutrition.

1.1. Problem Statement and the Need for the Study

How to solve Somalia's food problems is a central question currently being debated in policy-making circles. To solve the food crisis would require dealing with both the food supply and demand sides of the problem. Necessary measures, therefore, include expanded domestic production, imports, poverty alleviation and child feeding programs. Because of

the ever-present balance-of-payment problems and the large external debt the country already owes to international creditors, the prospects are rather dismal for increased commercial food imports to preserve present per capita consumption levels. Food aid could provide some relief as a stop-gap measure in the short run. However, long-term solution of the current food crisis is to be found mainly in an expanded domestic food production and reduced poverty.

The Somali farmers are, therefore, acknowledged to be the key players in any effort to increase food production and reduce poverty. First, it is the farmers who are in charge of the task of domestic food production. Secondly, a significant portion of the population in Somalia derives its livelihood from farming. Third, poverty is primarily a rural phenomenon in Somalia and the farming communities represent "the poorest of the poor". And finally, farmers have for a long time suffered from ineffective government policies and a lack of investment attention which has contributed to the lag in agricultural production.

After the recent policy reforms, official figures show substantial improvement in the domestic food sector. Maize output, the major domestic cereal crop in the country, has more than doubled between 1982 and 1986, increasing from 150 to over 300 thousand metric tons. In recent years, emphasis on expanding domestic cereal production has shifted from sorghum towards maize. The main reason is that maize, in

contrast to sorghum, is mainly grown under irrigated conditions which makes the crop less prone to the vagaries of weather and droughts. Furthermore, the prospect for significant production expansion, based on existing technology in the relatively short run, are better for maize than they are for sorghum.

Sesame output also shows some modest improvement since the policy reforms. Sesame constitutes the most important traditional oilseed crop in Somalia in terms of area cultivated and output. It is cultivated as a companion crop to maize during the small rains season when climatic conditions are not adequate for the production of maize. Thus, the production and market conditions for sesame significantly influence maize production. Currently, more than two-thirds of domestic demand for vegetable oil is satisfied through food aid and commercial imports. In this respect, sesame is considered a potentially important oil seed crop which could be instrumental in helping close the large and growing edible oil gap. Furthermore, the Somali government aims at expanding the domestic production of oil seed crops, particularly sesame, for reducing this heavy dependence of imported vegetable oils.

But data limitations and incomplete understanding have often been a major obstacle in the design and implementation of effective national food policies to increase domestic food production and food availability. Insufficient data and

information gaps prevented the design of more well defined policies and programs in the recent Five Year Development Plan 1987-91 (MNP, 1987).

1.2. Research Objectives

This dissertation broadly aims at providing an improved understanding of the food production policy options open to Somali policy-makers in increasing domestic food production, farm productivity and rural incomes. The study focuses on maize and sesame as a case study of the inter-play between changes in policies, institutions and technology that affect the food sector in general, and the maize and sesame subsectors in particular.

Better understanding of the interaction between farm household resources, institutions, technology, and government policies on current and future potential domestic food output can assist policy-makers to design more effective policies, programs and projects for solving the country's food crisis, while improving rural income. This type of analysis is even more relevant today at a time when Somali policy-makers are re-evaluating past policies and implementing sectoral policy reforms. More specifically, the study has the following objectives:

1) Examine the aggregate supply response of maize and sesame to the recent agricultural policy reforms and cereal market liberalization. This will include a review of the evolution of agricultural policies in Somalia, the nature of recent reforms and the response of the two crops to the changes in relative commodity prices.

2) Examine the major determinants of household maize and sesame production in the Shabelle river valley. The hypothesized determinants include household resource ownership and the institutional environment under which farmers operate in producing maize and sesame for home consumption as well as for the market. This will help in understanding farmers' resource and institutional constraints to increasing household income and food security. This section identifies the magnitude of maize deficit households and discusses some of their characteristics.

3) Identify the existing maize and sesame improved technologies, farmer adoption rates and factors affecting this adoption. The investigation will examine the availability of yield-increasing

technology in the country, and study the potential to close the yield gap between current farmer yields and the potential achievable maximum yield. This will include analysis of the private and social profitability of adopting improved technology. The purpose of this section is to understand whether there are proven and profitable technologies that could increase domestic maize and sesame output in the short run if the needed public support in technology generation, diffusion, input distribution and other support services were put in place.

4) Examine the existing private marketing system for maize and sesame, its efficiency and competitiveness in performing the task of distribution and storage of commodities, and the potential role of government in improving market performance and reducing price instability. Included in this section is an investigation of the seasonality of maize and sesame prices, private trader gross margins, and the profitability of private storage of maize and sesame.

1.3. Research Questions

A number of research questions are used to guide the analysis. These questions refer to the interaction of policies, institutions and technology in understanding past, present and future potential decisions of farmers producing maize and sesame in the Lower and Middle Shabelle regions. The research questions are as follows:

Have farmers responded to new economic opportunities opened up by changes in product prices? Is there any indication that maize and sesame farmers in the Lower and Middle Shabelle regions have responded to the recent policy reforms? If yes, was this response mainly an expansion of cultivated area and/or improvements in productivity and yields? As population pressure on land exhausts the land suitable for farming, productivity increases would be a necessity for growth in output. Producer price policy is suggested as the important factor behind the stagnation of domestic grain output in the past. A better understanding of the supply response of farmers is essential for assessing potential future response to changes in the farmers' economic environment.

What explains the yield gap and differences in farm yields among the farmers? Farmers' access to credit, access to inputs and other essential services might offer some clues

to the productivity differences among farmers. If the reasons for these differential yields among farmers are understood, then overall average yields might be improved to at least the levels achieved by the more advanced farmers at least within the study area. However, to identify the farmers with the low yields and study their problems with a view of formulating policies, programs, and projects to increase productivity also requires the study of those with the better yields to offer the clues as to the reasons for both high and low productivity, and to suggest ways of raising overall productivity.

Are inputs available or applied sub-optimally? To achieve higher yields, technical inputs (including improved seeds, fertilizer, and insecticide) are required. Tractor services and water for supplemental irrigation are also required, and both of these will not function without imported fuel and spare parts. Supply of these inputs into the production process requires an effective input marketing system able to deliver the inputs at the appropriate times and at the needed locations. Obviously, some of these inputs must be imported, which also brings into discussion the availability of foreign exchange and the guidelines regulating its allocation. Unless required inputs are available at the right time and at the right place, the country's future capacity to feed an ever expanding population on limited suitable land would certainly be jeopardized.

Is there an extension service with appropriate messages to extend to farmers in these areas? Are farmers trained sufficiently enough in those new practices and in the proper application of such inputs? These questions refer to the institutional capacity of both the agricultural research and extension service. Obviously, agricultural research capacity depends on the stock of available scientists which, in turn, depends on the educational and training system of the country. Previous government and donor investment programs in Somalia may have put more emphasis on extension projects while the research program suffered from severe under-investment.

Who are the "small" farmers in the two regions? Current agricultural sector development focuses attention on small farmers cultivating a limited number of hectares³. A better understanding of farm resource ownership pattern is essential for identifying the landless and near-landless poor farmers who represent the most likely food insecure households.

Is the marketing system competitive and efficient in transmitting price information to decision-makers, and in carrying out the storage and distribution of food? The marketing and distribution system is an integral part of the search for improved food security. A mixed public-private marketing system of maize and other domestic cereal grains has

³. The official definition of small farmers by the Somali government is those cultivating 5 or fewer hectares of land.

developed since the marketing liberalization of the early 1980s. However, the private marketing sector still remains underdeveloped in its capacity to handle large quantities and store them for significant periods. Overall the system suffers from neglect in terms of support services, credit, and infrastructure for developing an adequate supply network.

1.4. Organization of the Dissertation

The remainder of this chapter reviews the theoretical framework to be used in the study. Chapter II presents the methodology of the study. The chapter also describes the physical, demographic and institutional environment of the farmers living in the Lower and Middle Shabelle regions. The major cropping patterns during the Gu and Der seasons are also described. The study design and data collection procedures are then discussed.

Chapter III examines the supply response of maize and sesame to the recent policy reforms. The purpose of this chapter is to shed light on the magnitude of supply response to price change. The investigation looks into the question of area response to the recent changes in relative commodity prices.

Chapter IV identifies and analyzes the sample farmers' household resource base and access to various institutional services. Farmers' resource endowments and their effect on output, sales and potential farm household food security are

analyzed. Findings about the distribution of farm sizes, household size, and ownership of livestock and farm machinery are presented. The chapter also presents survey results about differential access and participation in various government programs, such as extension and input credit programs. Regression techniques are used to examine the importance of resource ownership and institutional participation on farmers' maize and sesame output.

Chapter V examines patterns of household technology adoption, input use and yield differences. The relationship between technology and achieved yields is investigated, and the profitability of alternative technologies, associated risks and returns are analyzed. This chapter analyzes the various economic and non-economic factors that seem to either enhance or detract from adoption of new technology.

Chapter VI discusses maize and sesame price seasonality and the private marketing system. In addition to examining seasonal price patterns of maize and sesame, a few selected elements of the marketing system for these two commodities are reviewed.

Chapter VII summarizes the major findings of the study and their policy implications. The chapter highlights some of the important findings of the study and what they could mean to policymakers in future efforts aimed at increasing domestic food output in general, and maize and sesame production in particular.

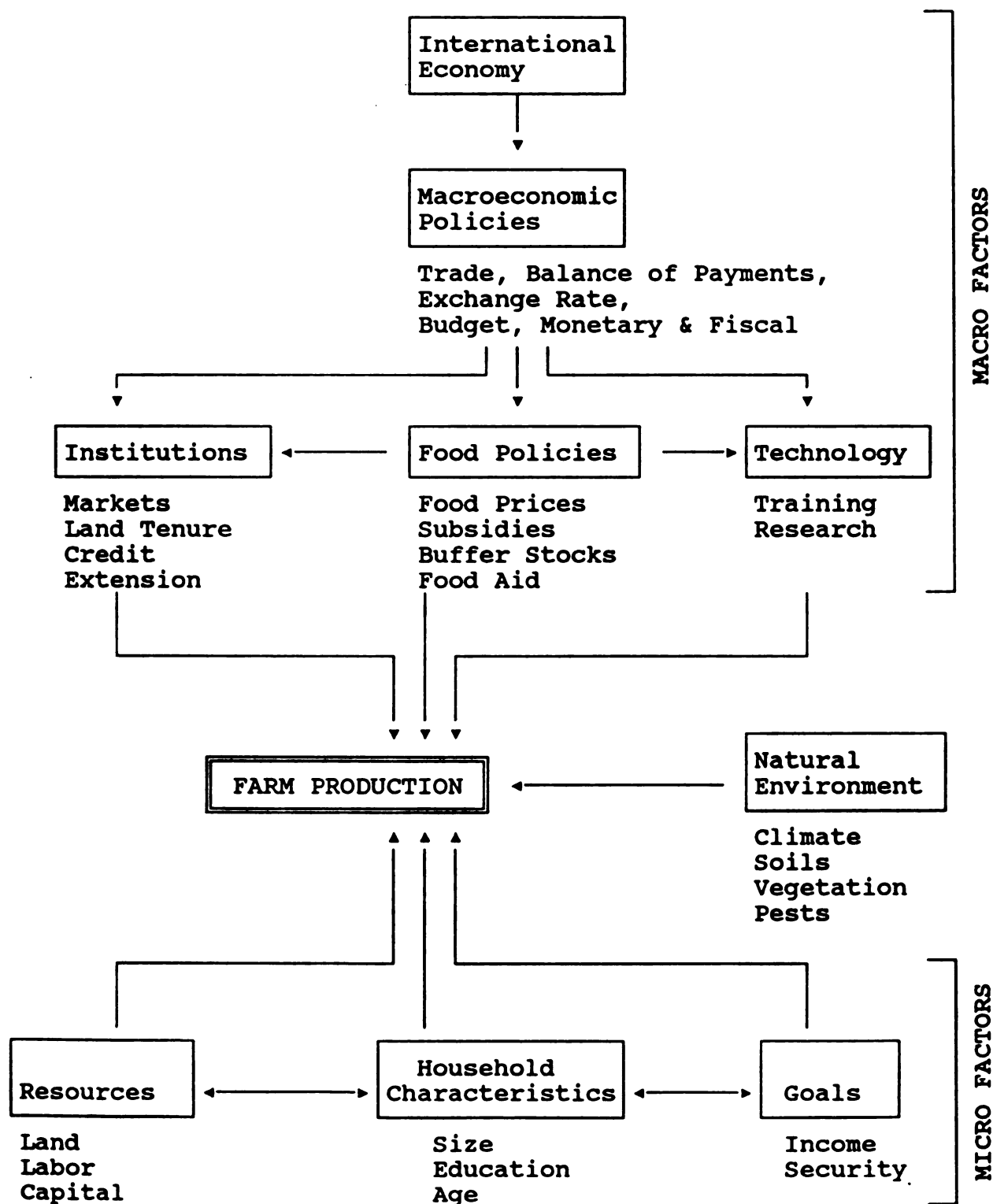
1.5. Conceptual Framework

Farmers' production and consumption decisions are influenced by a host of macro and micro factors. The macro-level factors include macroeconomic and other policies aimed at food, institutions and technology. The main micro-level factors include farm household resource base, household demographic characteristics and household goals. The conceptual model displayed in Figure 1.1 schematically shows the direction of linkages between the macro and micro-level factors.

The model provides a comprehensive view of the complex and pervasive linkages between macro forces and micro farm level circumstances, and how these affect household production. An unfavorable macro environment, for example, destroys farmers' production incentives and consumption possibilities and vice versa. Farm production and consumption is ultimately determined by the outcome of the interaction between farm-level micro conditions and macro-level policies, institutions and technology.

Figure 1.1

The Micro-Macro Linkages of Agriculture and Food Production



Beyond the country's boundaries lies the international economy which, through its effect on the country's balance-of-payments and the exchange rate, offers both opportunities as well as constraints on the performance of the national economy in general, and on the agricultural sector in particular. General macro-economic policies and those that are specific to the food sector further impinge on what and how much food is produced and consumed. Specific policies to the food sector include food price policies, buffer stocks, food and input subsidies, trade and food aid. The institutional framework governs access to the existing factors of production, and creates the incentive structure to develop technology, and is a major component of the ultimate system that shapes farmers' macro environment. The major relevant institutions include the domestic food market, land tenure arrangements, credit and extension. Training and research are grouped under the heading of technology, which by determining the productivity of the resources used in the production process, affect total farm output that is available for home consumption and for the market. Rainfall, temperature, soil types and fertility, vegetation and pests are some of the natural environment factors that have a substantial effect on farm production.

On the other hand, the micro-level factors include farm household resources, demographic characteristics and household goals. Focusing on the inter-relationships helps to discover how weaknesses or advancement in various parts of the system influence the achievement of increased food output and reduced rural poverty. The framework is discussed in further detail below.

1.5.1. The Macro-Level Factors

A. Policies and the Economic Environment

Policies are known to be the final product of, among other things, ideology and political power distribution among the different groups of the population. The influence of rural-urban power distribution significantly affects government policies on exchange rate, food import and price policies, and investments in infrastructure and public services, which in turn influence farmer decisions. The macroeconomic policies dealing with the markets for goods, labor, and assets have a powerful effect on the performance of the economy in general, and the agricultural sector in particular.

The application of macroeconomic theory to problems of policy has been an arena of keen interest of the great macroeconomists of the century, including Keynes, Milton Friedman, Franco Modigliani and others. The current structural

adjustment programs (SAPs) being undertaken in many African countries, with donors help and backing, are attempts to improve the macroeconomic environment. The reforms include the following: domestic resource mobilization, enhancing economic efficiency, reducing the share of public expenditures as a proportion of GDP, improving terms of trade of the rural sector, and improving the balance-of-payments. Exchange rate adjustments have been a main feature of achieving these latter two goals of improving the balance-of-payments and rural terms of trade.

A major component of the SAPs consists of agricultural price policy reforms. Price policy and its effect on agricultural supply and food consumption in the developing countries has received significant interest in the development literature. The dual nature of food prices as incentives to producers and determinants of the real income of consumers, what Timmer, Falcon and Pearson (1983) call the "food price dilemma", often requires conflicting strategies in attempting to increase food production and consumption at the same time. Higher commodity prices encourage production, discourage consumption, and reduce imports.

In contrast, "cheap food" policies have the opposite effect; they encourage consumption, discourage production and increase imports. That is, cheap food policies increase consumers' real income and, thus, improve "exchange entitlement". To simultaneously increase food production and

consumption, therefore would require a dual price policy of subsidizing both producers and consumers. Technological change offers a way out of this dilemma by allowing the production of plentiful food supplies while maintaining the profitability of agriculture.

Food prices affect net producers and consumers differently. In the argument for increased food prices in Africa, policy-makers have generally assumed that the vast majority of farmers were net sellers of food. Increased food prices, therefore, would benefit the rural majority and hurt the urban minority (Weber and Jayne, 1988). Rohrbach's (1988) study of maize production in Zimbabwe has empirically shown that only 45 percent of the households in 1984/85 season were net sellers of maize, and 10 percent of the total households accounted for more than 70 percent of the sales. Similar results in which less than 50 percent of the household being net grain sellers were also observed in studies in Mali, Senegal and Rwanda. It is currently understood that increased food prices do not exclusively benefit all rural households since a significant number of farmers are net buyers for some portion of their food need. Therefore, the strategy of making "prices right" in Africa may hurt some of the rural population whom policy-makers have previously assumed to benefit from improved rural-urban terms of trade.

Another area of price policy effect on agriculture concerns the magnitude of supply response to incentive price. In the 1950s and early 1960s, the discussion revolved around the argument of whether farmers in the developing countries were in fact rational decision-makers who would respond to incentives. Similar to the argument that "if you are smart, why aren't you rich?", poor farmers were assumed to be poor because they were not smart and rational to take advantage of the existing economic opportunities or future changes in the economic environment.

T.W. Schultz (1964) in his seminal book Transforming Traditional Agriculture has challenged development professionals with the concept that farmers in the LDCs were "poor but efficient". That is, farmers in the LDCs were maximizing their utilities given their constraints, and that there were no alternative ways of reallocating their resources which could increase welfare. Existing empirical studies in sub-Saharan Africa of positive supply elasticities for both individual crops as well as aggregate agricultural production support the premise that African farmers do respond to economic incentives (Bond, 1983). Almost everyone now accepts Schultz' point and the debate in supply response has currently shifted from the point of whether it is positive but how large is the response and what factors influence its size.

B. Technology and Institutions

The limits of relying on incentive prices alone led to the need to look at non-price factors, such as institutional and technological elements in increasing food production. Advocates of institutional and technological change hold that aggregate supply is relatively inelastic due to institutional and technological constraints which impede any significant response to incentive prices (Krishna, 1982). Although a favorable price environment is essential, solving infrastructural, institutional, and technological constraints could have a larger effect on agricultural supply response than price policy reforms alone. Areas where infrastructural improvement seem to be relevant in the African context include scientific education, research and extension, transportation, health, and land and water resource development.

A large body of empirical evidence from many parts of the world shows the high payoffs of investment in agricultural research. The earliest quantitative estimation of the economic return of agricultural research was carried out in the U.S. by Griliches in 1957 on the returns to hybrid maize research. Griliches reported that hybrid maize research had a 40 percent internal rate of return. Other similar studies done in the U.S. and elsewhere around the world also confirmed the high social returns of agricultural research in specific crops or aggregate agricultural production (Evenson, 1984).

Nevertheless, high rates of return of investment in agricultural research in certain parts of the world do not prove that the return is inevitably high in Somalia, especially where the complementary investments in supporting institutions and services are low. These complementary institutions and services include reliable input and output markets, the extension service, roads and other necessary infrastructure. Farmers' decisions concerning technology adoption are also affected by output and input prices policies. Furthermore, the type and nature of agricultural research is set by government policy. The orientation of research, for example, would be different if the government expressed the major priority as increasing crop yield in contrast to equitable distribution of rural incomes.

Another important source of growth, which transcends the growth resulting from increases in the factors of production and improvements in technology, is institutional change. This source of growth:

- a) governs who has access to existing factors of production and on what terms (incentive structure),
- b) creates incentives or disincentives to develop new factors of production (technological change).

The main institutions that have a direct bearing on farm output include: the market, formal credit, extension, and land tenure. The market is a central segment of the economic system and an efficient and progressive agricultural marketing system is a necessary component for economic growth. Shaffer (1979) describes the ability of the marketing system as a social institution "...is that it provides a mechanism for collecting and summarizing an enormous quantity of idiosyncratic information about the environment and preferences in an easily understood form (prices), which at the same time carries incentives to produce and conserve to the participants of the system" . Minimum cost of the exchange of products among the various economic agents in the vertical organization of the market, free flow of information between the market participants, standard measures and grades, and progressiveness in adopting cost-saving new marketing methods are but few of the conditions for efficient agricultural commodity markets.

Providing credit to farmers is an essential institutional instrument that facilitates farmers' adoption of new technologies. The provision of formal credit with low interest rate is commonly used in the developing countries as an income transfer mechanism. Charging an interest rate below the opportunity cost of capital has become a commonly used income transfer method of dealing with rural poverty despite the argument that it is counter-productive and often leads to

inefficiencies. Land tenure arrangements, by controlling access to farm land, represents another institutional arrangement that greatly affects farmers' food production capacity. The level of security of conditions farmers' willingness to invest in land improvements which, consequently, affect resource productivity.

1.3.2. Micro-level Factors

The farmer and his family have control over such micro-level factors such as household goals, while the household takes the macro-level environment at any given times as given. The farm household considers the macro-level environment as a fixed phenomenon in the short-run, over which the household has little control and opportunity to change. The relevant micro-level factors include household resources, demographics and goals.

Land, labor and capital are three main factors of production. Rural households differ in their resource endowments and, consequently, in their capacity to produce and/or trade sufficient food for home consumption. Theoretically, farmers can use various combinations of the above three factors in producing crops. Thus, farm size distribution of an area can provide a great deal of information on the number of farmers that are potentially food surplus and those for whom off-farm employment opportunities represent a major component of their earned income.

Particularly vulnerable to shortfalls in production and food price increases are the landless and near-landless peasants. If off-farm employment opportunities are limited, hunger most likely affects the landless and near-landless farmers more than any other groups.

Household demographics (such as household size, educational level of the family members, age and whether a household is headed by female or a male) are important in understanding the way the farm family operates. Family size determines the number of mouths to feed and the available family labor resource the farm household has at its disposal for agricultural production. Where labor represents the major input as is prevalent in traditional farming systems, and hired labor is scarce, farmers with larger families are able to cultivate larger plots than those with smaller family sizes. Thus, the available number of able-bodied household members sometimes determines cultivated area of the farm household.

Farmers' age and education might be important in explaining adoption of technology and farmers' disposition to try new methods of doing things. A relatively better educated and younger farmer could be expected to be less conservative in accepting new technology and, thus, less constrained by age-old practices. Similarly, the positive relationship between farming experience and extension training are least arguable in their impact on the correct use of modern inputs

and other farm practices. Farmers attitudes towards risk and work ethics similarly also play a significant role in farm decision-making on practices and labor use.

1.3.3. Farm Household Production Decisions

The farm household is the ultimate integrator of the constraints and opportunities stemming from the various micro and macro factors into a pattern of behavior and set of choices of enterprises and methods of production which help satisfy the household's goals. Goals are conditioned by the farm household's beliefs about what is attainable under the relevant environment and the level of desired maximum income - broadly defined here to include production for home consumption as well as for the market.

The household, before planting, decides what crops to grow and how much of each crop to grow. Depending on reliability and access to market, for example, farmers may opt to produce more or less cash crops in their goal of maximizing household income and food security, and to rely on the market for food supplies. Furthermore, changes in relative crop prices influence the crop mix.

Relative input costs and availability also influence the choice of technology. Yield-increasing technology shifts the input-output production surface outward; that is, more maize can be produced with any given level of resources. On the other hand, rainfall and the level of product prices at

harvest are unknown to the farmer at the time of planting. These unknown factors provide an element of risk that significantly influences farmers' production decisions. Therefore, the relevant environment in which the farmer makes decisions and sets his/her goals is dynamic and changes over time. Government policies, access to markets, input and output prices, credit, technology, and the natural environment itself may all change over time. The recent policy reforms in Somalia are a good example of a sudden discrete change of the economic environment. The analysis throughout this dissertation will investigate how changes or differences in macro-level factors affect farm household production.

CHAPTER TWO

RESEARCH METHODOLOGY

This chapter describes the study site and methods of primary data collection. The purpose is to provide an understanding of the environment under which farmers in the Lower and Middle Shabelle regions operate and the steps followed in the collection of the data used in the analysis. Thus, the first part of the chapter describes the physical, institutional, and socioeconomic conditions of the two regions. Because the study was exclusively conducted in the irrigated areas of the two regions, the description mainly refers to the irrigated zone in the two regions. The second part of the chapter is devoted to data collection procedures used in the study.

2.1. Study Site

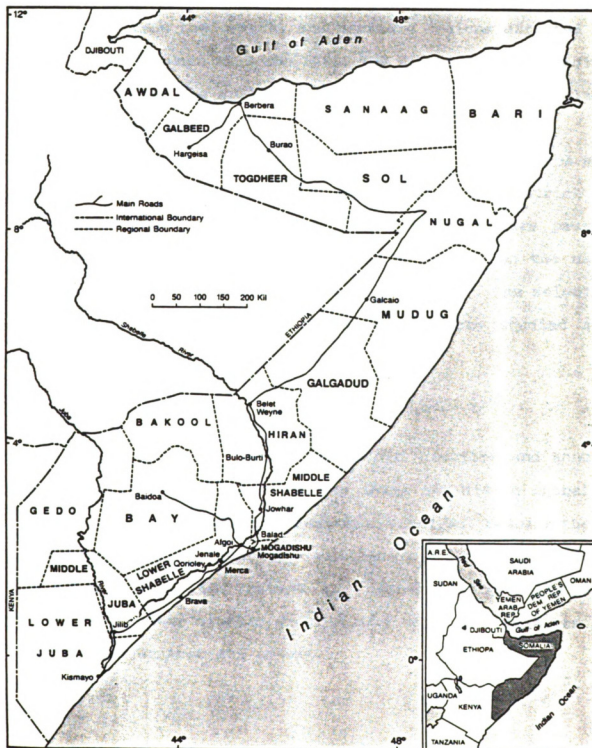
2.1.1. The Physical Environment

A. Location

The Lower and Middle Shabelle regions are located approximately between 2 and 4 degrees North latitude, and between 43 and 47 degrees longitude. The regions are adjacent to each other and represent two of the 18 administrative regions in Somalia. Map 2.1 shows the various regions of Somalia.

Map 2.1

Somalia



The Lower Shabelle is subdivided into the following seven administrative districts: Wanle Weyn, Afgoi, Merca, Qorioley, Brava, Kurtun Warey, and Sablale. The latter two districts were established only in 1975 as a resettlement area for the population from the central and northern regions affected by the drought between 1973 and 1974. The Middle Shabelle region is comprised of the following four districts: Jowhar, Balad, Adale and Adan Yabal.

Data for this study were collected from Afgoi, Merca and Qorioley in the Lower Shabelle region and Jowhar district in the Middle Shabelle region. All four districts are passed through by the Shabelle river, and are located on the main north-south paved highway route of the country. The selected sample of ten villages in the four districts studied are accessible by means of feeder roads.

B. Climate

On the basis of their geographical location and annual precipitation, the climate of the Lower and Middle Shabelle regions can be classified as semi-arid tropical. Despite their close proximity to the equator and the Indian Ocean, the Lower and Middle Shabelle regions are uncharacteristically dry relative to other similar areas around the world that lie so near to the equator and oceans.

The regions lie within the inter-tropical convergence zone (or ITCZ), which represents the area where the surface winds of the northern and southern hemisphere converge. The position and strength of the ITCZ which passes over the two regions twice a year influences the rainfall pattern and brings along two rainy seasons: the Gu and Der. Hence, the rainfall is marked by a bi-modal pattern of two rainy seasons, with a combined average annual rainfall of about 470 mm. (based on discontinuous 30-years period in which data are available)¹. Figure 2.1 shows the average monthly rainfall in Jenale during this period where data was available. The Gu rains are typically more reliable, of greater magnitude than the Der rains. Rainfall during the Gu season extends over a longer period of time than the Der season. These features make the Gu season the main cropping season.

Between the Gu and Der lies the Hagai season (July to September), which is a relatively dry season except for some coastal showers. These showers extends the rainy season in the Lower and Middle Shabelle regions. The dry Jilaal season is during the months of January-March.

¹. Rainfall data for Jenale are available for 1929-58 and 1980-85 periods (TAMS, 1986).

Figure 2.1

Average Monthly Rainfall in Jenale,
Lower Shabelle (1929-58 & 1980-85)

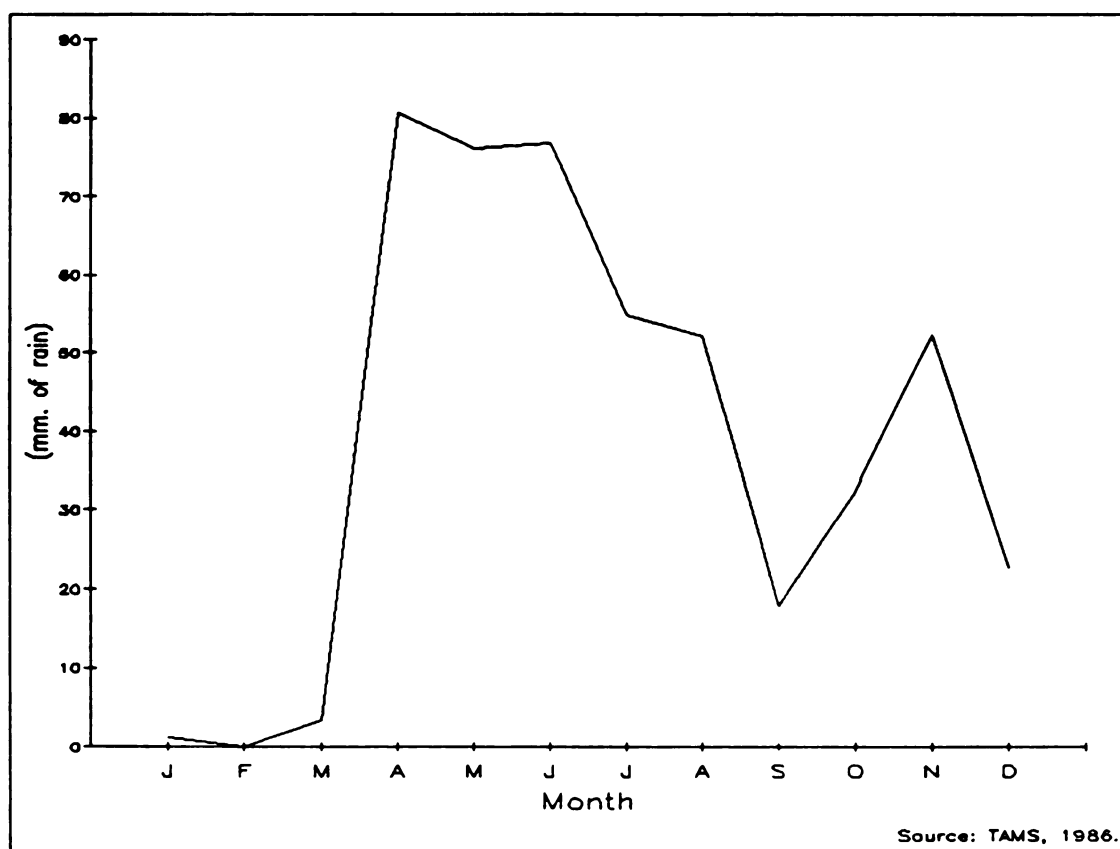


Table 2.1

**Monthly Evapo-Transpiration and Other
Meteorological Data for Jenale (1929-58 & 1980-85)**

Month	Temperature			Relative Humidity	Rainfall	ETo
	Max.	Min.	Mean			
	- - (Celsius) - -			-Percent-	- - mm. - -	
January	32.3	21.0	26.9	76	1.2	170.5
February	32.7	21.6	27.3	74	0.1	168.0
March	33.5	22.9	28.2	76	3.4	192.2
April	33.1	23.6	28.3	77	80.6	168.0
May	31.5	23.2	28.3	81	76.0	158.1
June	29.6	21.8	25.7	82	76.7	141.0
July	28.6	21.4	24.9	82	54.8	142.6
August	28.9	21.2	25.1	82	52.1	155.0
September	29.5	22.1	25.8	81	17.8	168.0
October	30.5	22.7	26.6	81	32.3	164.3
November	31.6	22.2	26.6	82	52.3	141.0
December	31.0	21.6	26.6	80	22.7	155.0
YEAR	31.1	22.1	26.6	80	469.9	1923.7

Source: TAMS, 1986.

The temperature stays fairly steady throughout the year, averaging approximately 27 degrees Celsius. During the dry Jilaal season, mean temperature and daily sunshine hours rise while the relative atmospheric humidity falls to about 75 percent from the 80-82 percent during the rest of the year. Estimated evapo-transpiration rate (ETo) in the area is over 1,900 mm. per year. This exceeds annual rainfall levels by more than four times. The average monthly rates of evapo-transpiration and other meteorological data for Jenale station in the Lower Shabelle is shown in Table 2.1. The rate of evapo-transpiration clearly indicates that most crops grown in the area require supplementary irrigation for cultivation. Maize and sesame require at least a minimum of two irrigations during the cropping season.

C. Soils of the Shabelle Valley

The Shabelle river valley is defined as the area roughly 30 kilometers wide on either side of the river. It extends from Ferfer district of the Hiran region to the Hawai swamps in Jilib district in the Middle Juba region. The soils along the Shabelle valley are derived from the meander flood plain sediments of the river. The sediments can be broadly divided into old, semi-recent and recent alluvium deposits.

These soils are generally classified as vertisols and consist predominantly of clay materials which are characterized by deep cracking when dry and becoming compacted

when wet. According to the USDA soil suitability classification system, which ranks soils according to four categories or classes ranging from highly suitable for farming (Class I) to non-arable (Class IV), the soils in the two regions have been found to rank from primarily in Class II, III and IV. The soils have been classified according to a) topsoil depth, b) water infiltration and drainage properties, c) salinity and sodium class limits, and d) topography and lack of erosion hazards. No Class I soil was identified in the Shabelle valley, and a total of 800,000 Ha. of Class II and 500,000 Ha. of Class III suitable for irrigated cropping were found (Lahmeyer, 1986). Suitable soils in the Merca and Qorioley districts under Class II and III were found to suffer from some types of profile and drainage deficiencies while very few areas displayed salinity and topography deficiencies (TAMS, 1986).

The physical properties of the soils in the study area make tillage operations difficult when the topsoil is dry and restricts soil permeability when it gets wet. Because of the fine texture of the topsoil, moisture penetration is generally limited to the upper 50 cm. and has a low water holding capacity. The compactness of the upper layers of these soils when wet, particularly under poor drainage conditions, cause poor aeration in the root zone and water-logging damage to crops (GTZ, 1984).

Despite the shortcomings of the physical aspects of the soils, most studies suggest a relatively good soil chemical fertility potential if fertilizer is appropriately utilized. The soils display some noticeable deficiencies in macro-nutrients. Both nitrogen and phosphorous levels are low, and the available potassium in the soil is generally rendered unusable to plants by the high levels of exchangeable calcium and magnesium in the soil. Therefore, crop response to NPK fertilizer is expected to be high. Phosphate and potassium fertilizer, however, are rarely used now except in plantations. Boron and other micro-nutrients levels have been found as sufficient (TAMS, 1986).

D. Land Use Patterns and Land Tenure

Somalia has a total land mass of about 63.8 million hectares, of which nearly 13 percent is suitable for crops and 45 percent for grazing livestock, while the remaining 42 percent consists of barren land that is unsuitable for any kind of agricultural production (MNP, 1987). Table 2.2 shows the 1982 estimated cultivated area and potential cultivable area.

Table 2.2

Actual and Potential Land Use in Somalia

Land Use Type	Potential Total	Land Use Percent	Actual Total	Land Use % of Potential
	- - - -	000 hectares	- - - -	
Total land area	63,765	100.0	--	--
Range land	28,850	45.2	--	--
Non-agricultural	26,765	42.0	--	--
Land for crop production	8,150	12.8	700	9
Rainfed	7,900	12.4	540	7
Flood Irrigation	110	0	110	--
Controlled Irrigation	250	0.4	50	20
Shabelle river	86	0.1	35	41
Juba river	160	0.3	14	9
North-West region	4	0.0	1	25

Source: Ministry of National Planning, 1987.

Table 2.3
Gu 1987 Land Use in
Lower and Middle Shabelle Regions

Region/ District	Agricultural Area	Controlled Irrigation	Flood Irrigation	Total Irrigated
- - - - - 000 Hectares - - - - -				
LOWER SHABELLE	207.4	29.9	12.0	41.9
Afgoi	47.4	5.1	10.0	15.1
Wanle Weyn	48.2	0	0	0
Merca	55.3	12.0	0	12.0
Qorioley	19.5	9.2	0	9.2
Brava	19.1	0.5	0	0.5
Sablale	6.7	1.4	0	1.4
Kurtun Ware	11.3	1.7	2.0	3.7
MIDDLE SHABELLE	113.7	9.3	8.6	17.9
Jowhar	76.3	5.8	6.0	11.8
Adan Yabal	1.1	0	0	0
Balad	36.3	3.5	2.6	6.1
TOTAL	321.1	39.2	20.6	59.8

Source: FEWS Food Outlook No.6, December 1987.

Table 2.3 shows total agricultural area, and Gu 1987 total cultivated area with flood and controlled irrigation in the Lower and Middle Shabelle regions.

According to the official estimates, less than 10 percent of the potentially cultivable land is presently cultivated. Only 3 percent of the total potentially cultivable land is irrigable, of which about a fifth is presently cultivated under controlled irrigation. This land is found mainly along the two rivers, the Shabelle and Juba. In addition to the current 50,000 hectares under controlled irrigation, it is estimated that another 110,000 hectares are available for flood irrigation, mostly along the Shabelle river.

The Shabelle river passes through six of the total nine districts in the two regions. In the three outlying districts without access to the passage of the river, farming is mainly under rainfed conditions. A total of about 19 percent of the aggregate cultivated area was cropped under irrigation during Gu 1987 in the two region; out of which approximately 65 percent was under controlled irrigation and the remainder under flood irrigation. Most of the flood irrigated area is situated in Afgoi and Jowhar districts. Area under controlled irrigation in the country is expected to significantly expand in the near future after the completion of the Bardhere dam on the Juba river. Nevertheless, expansion of the irrigated

area in the Shabelle regions awaits the construction of one or possibly two upstream water reservoirs that are necessary to satisfy the growing demand of water.

There are indications that a substantial part of the presently irrigated land in the two regions is under-utilized. These areas were developed in the 1930s and 1940s, and currently suffer from salinity due to poor drainage and soil management, and many have been abandoned. The abandoned areas require substantial reclamation work while only about half of the land held by most farmers is actually cropped during any season. Therefore, the Shabelle river valley represents a major part of the country's strategy for increasing domestic food production and food security.

Legally in Somalia land cannot be sold, mortgaged, leased or transferred to others. Private titles to land can be inherited by the family of the deceased in accordance of the inheritance law which provides equal shares to both male and female children. Physical improvements on the land are allowed to be sold. In practice, however, there is an active market for either improved and non-improved land as well as land leasing and renting land.

E. Water Resources

The Shabelle river currently provides virtually all of the irrigation water used in the Lower and Middle Shabelle regions². The river's headwaters are in the Ethiopian highlands, and flows through Somalia at a length of about 1000 km from its entrance at the border at Ferfer to its junction with the Juba river near the town of Kamasuma. Approximately 90 percent of the river discharge water comes from the catchment basin within Ethiopia, and this discharge declines further downstream. The channel capacity of 400 m³/s at the upstream town of Belet Weyn declines to about 55 m³/s at Falkeerow located in a downstream direction (TAMS, 1986). The river discharge is reduced by seepage, overbank spillage, evaporation, and irrigation.

Two weirs and six barrages at present control and regulate river water flows. These structures are used to lift the water level to permit gravity irrigation. The Jowhar Offstream Storage Reservoir (JOSR) is currently the only structure that stores water, and has a maximum capacity of 205 million m³. The JOSR is intended to store excess seasonal flows and to augment the river discharge during the dry season. Upstream from the JOSR is a flood relief channel that

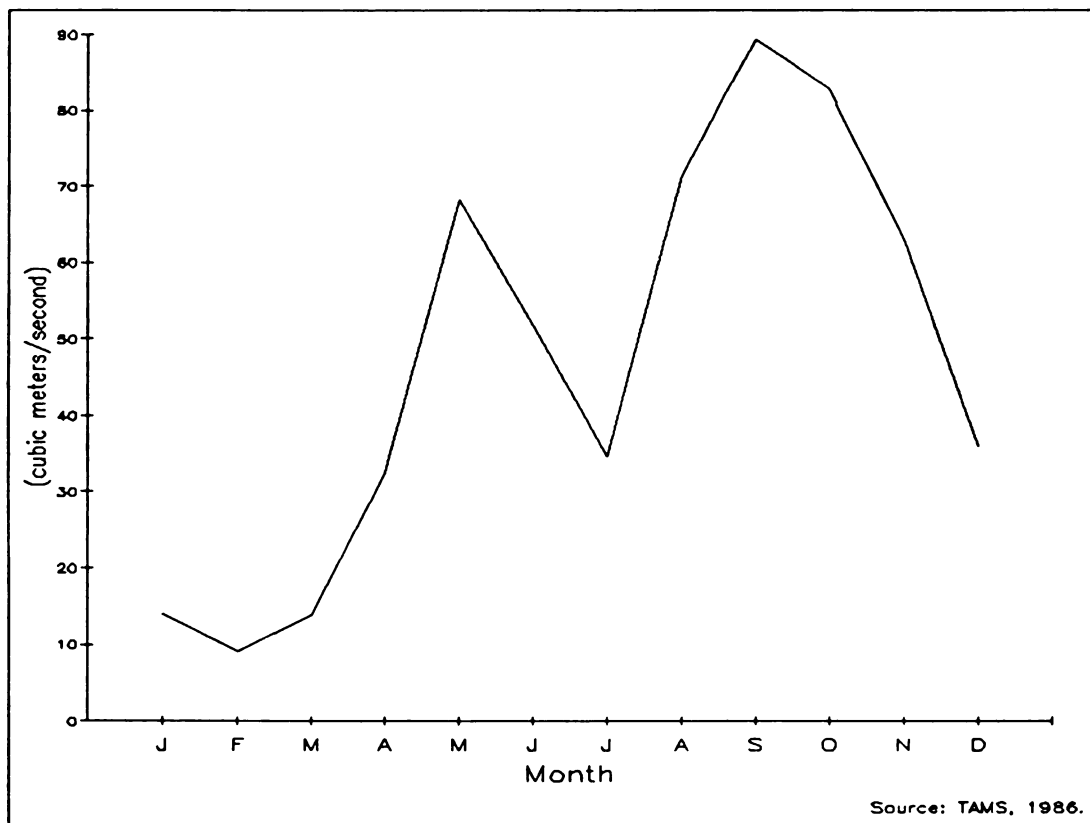
². There are a few tube wells in the Lower Shabelle region which provide supplemental irrigation to banana and other perennial crops during the years when the river dries up completely.

releases excess river water beyond 120 m³/sec discharge level. The channel is built as a flood prevention measure.

The Shabelle river mean monthly discharge follows a pattern similar to the two rainy seasons; the river flow rises during the Gu and Der rains, and sometimes completely dries up during the Jilaal season, particularly at downstream areas. Figure 2.2 shows mean monthly flows at two gauging stations situated in the Lower and Middle Shabelle regions. This shows that approximately 95 percent of the total annual flow takes place between May and December, with a peak during the months of September, October, and May. Only 5 percent of the run-off occurs during the Jilaal months between January and March. Thus, the low river flow coupled with the dry weather during the Jilaal season is the limiting factor for more than two crops per year.

Figure 2.2

Shabelle River - Mean Monthly Flows,
Afgoi Gauging Station, 1951-84



2.1.2. Demographic and Socio-economic Characteristics

Reliable population figures are non-existent for the region as a whole as well as for the irrigated zone of the two regions. Rough estimates are derived using the Ministry of National Planning regional and area distribution of the country's population. On the basis of the 1975 regional distribution of the Somali population, 18 percent of the country's total population live in the two regions; 11.4 percent in the Middle Shabelle region and 6.7 percent live in the Lower Shabelle region. Using the 1986 official population estimate of 8.5 million for the country, the two regions would roughly have 1.53 million total population. Out of the 970,000 people in the Middle Shabelle, an estimated 64 percent (620,000) are settled rural, 16 percent (150,000) transhumant nomads, and 20 percent (194,000) urban. On the other hand, the 560,000 people in the Lower Shabelle are classified into 48 percent rural, 38 percent nomad, and 14 percent urban (MNP, 1987).

According to the occupational and spatial differences, the rural population in the Shabelle valley can be classified into the following five groups:

- 1) Traditional sedentary farmers with no or only few livestock.
- 2) Sedentary farmers of nomadic origin, some of whom may own a significant number of livestock in which case

part of the family members lead a nomadic life except during the Jilaal season when they bring the herds closer to the river.

3) Newcomer farmers, who consist exclusively of urban dwellers who recently began farming and may also own a considerable number of livestock.

4) Sedentary trading and craftsman families who run small village shops and may also own farmland and livestock.

5) Transhumant nomadic groups which sometimes are closely associated with group 2 and who practice exclusive nomadic livestock herding lifestyles with no or very little rainfed farming.

A majority of the settled rural population in both regions is concentrated in settlements along the Shabelle river. Hence, the irrigated zone in the two regions has a higher population density than surrounding drier rainfed farmland and grazing land. During the dry Jilaal season, the nomads move into the Shabelle valley to graze their livestock herds on the crop residues of the Der season. Thus, population in the irrigated zone is sometimes doubled with the inflow of nomadic groups during the dry Jilaal months of January to March.

The economic need for larger families encourages the widespread practice of polygamy among the rural population in the Shabelle valley. Farm labor requirements makes it more attractive for farmers to have relatively large families. With more family labor to count on, the farm household is able to cultivate more land. Among the control sample farmers, about 31 percent of the married men had more than one wife compared to the national average of 21 percent (or 24 percent for national rural average). Furthermore, sedentary rural women at the end of their childbearing age (i.e., 45-49 years) had given birth to an average of 6.9 children³.

Even though most farm work is shared by both men and women, there is a clear division of labor within farm households. Land preparation, irrigation and maintenance of the irrigation canals are generally men's work. The wife's main duties are taking care of the children, cooking and cleaning, and fetching water and firewood. Women also play a major part in the main labor-intensive farm tasks of planting, weeding, and harvesting. Marketing functions, selling or buying foodstuffs, either in the village or neighboring small town markets, is the domain of women. While men might help in the transport of heavy marketed surplus products, it is the

³. For nomads, the average number of children borne by women at the end of childbearing age is 7.9 (MNP, 1986).

women who do the vending and purchases. Women-headed households, which result either from divorce or the death of a husband, have a greater responsibility for the family farm than do others. The few milking cows kept on the farmstead are often tended by the village herdsman for a small charge, but sometimes it is the older children's responsibility to graze the animals outside the village farmland.

2.1.3. Cropping Patterns

Present cropping patterns in the Lower and Middle Shabelle regions are dominated by maize during the Gu season and sesame during the Der season. Maize is grown both for home consumption and for the market, while sesame is generally produced as a cash crop. Approximately 90 percent of the farmers in both regions cultivate maize during the Gu season. However, the percent of farmers growing maize is lower in the Jowhar where rice is also becoming an increasingly important cereal. Table 2.4 shows the regional cropping patterns of the selected villages in the four study districts during Gu 1986 and 1987, and Der 1987.

Table 2.4

Sample Household Cropping Patterns in Selected
Villages in the Lower and Middle Shabelle Regions -
Gu 1986, Der and Gu 1987

Crop	Gu 1986 Season		Der 1987 Season		Gu 1987 Season	
	Mean Area	% of Farms Growing	Mean Area	% Of Farms Growing	Mean Area	% of Farms Growing
	-Ha.-		-Ha.-		-Ha.-	
<u>1. Lower Shabelle</u>						
<u>A. Grains</u>						
Maize	4.4	93	1.4	34	3.3	96
<u>B. Non-Grains</u>						
Sesame	6.0	7	4.8	68	4.2	5
Vegetables	1.1	6	1.5	20	4.2	8
Fruits	61.0	2	7.5	5	1.6	3
Others ^{a/}	1.0	5	1.7	2	5.8	7
<u>2. Middle Shabelle</u>						
<u>A. Grains</u>						
Maize	2.1	86	1.3	75	1.5	92
Rice ^{b/}	1.1	42	1.3	38	1.5	15
<u>B. Non-Grains</u>						
Sesame	0	0	1.8	43	2.8	16
Vegetables	1.7	7	2.7	19	0	0
Fruits	0.5	4	1.3	8	0	0
Others ^{a/}	0	0	5.0	1	0	0

a/ Other minor crops include tobacco, cotton, and peanut.

b/ In the study area, rice is grown only in the Jowhar district.

Source: FSP Surveys, calculated from the control sample.

Rice has gained importance in several villages in the Jowhar district, where a small West German project (Agro-Action) has recently promoted first time rice growers with free inputs for growing one hectare of rice. The project participants are after one season of assistance left on their own, and those farmers wishing to continue growing rice did it in subsequent seasons at their own expense.

In Der 1987, 75 and 43 percent of the Jowhar farmers cultivated maize and sesame, respectively. In contrast, only 34 percent of the farmers in the Lower Shabelle grew maize again during the Der while 68 percent had cultivated sesame. In addition to maize and sesame, farmers in the study area also grow several other minor crops including vegetables, fruits and other minor crops. Tomatoes represent the main vegetable crop grown, while fruit crops include watermelon, papayas, mangoes, and lemons. More farmers cultivate vegetables and fruits during the Der than in the Gu season.

There is no identifiable crop rotation practiced in the two regions. The basic cropping pattern of annual crops consists of a maize crop in the Gu, followed by a combination of maize, sesame, tomatoes and watermelon during the Der. The general low usage of fertilizer coupled with the lack of an effective crop rotation with nitrogen-fixing species such as legumes steadily depletes the natural soil fertility. This is

probably the main reason for the widespread practice observed in the study area of fallow of a substantial portion of the total cultivable land during any given season. Table 2.5 shows the proportion of cropped area in the four study districts during Gu 1986 and Der 1987 broken down by three farm size groups.

Table 2.5 shows that farmers fallow greater portions of their land during the Der season than in the Gu season. At any given season, smaller farmers cultivate a greater proportion of their available land than larger farmers. Farmers who own 2 or fewer hectares cultivated 85 percent of their land in Gu 1986 and 59 percent in Der 1987. In contrast, farmers with more than 5 hectares cropped 42 and 30 percent of their land during Gu 1986 and Der 1987 respectively. This indicates that smaller farmers, with less available land at their disposal, can not afford to fallow as much land as do the relatively larger farmers.

Table 2.5

Proportion of Total Area That is Cropped in the
Study Area by Farm Size Groups, Gu 1986 and Der 1987 Seasons

District	Total Cultivable Area (Ha.)	Cropped Area					
		Gu 1986 Farm Size Group			Der 1987 Farm Size Group ^{a/}		
		1	2	3	1	2	3
		% of Farm Cropped			% of Farm Cropped		
Afgoi	894	86	50	47	48	35	39
Merca	487	88	86	29	68	38	13
Qorioley	68	70	65	30	29	27	3
Jowhar	223	87	55	53	64	50	35
Total	1,672	85	68	42	59	40	30

a/ Farm size: Group 1 (0 to 2 Ha.), Group 2 (2.1 to 5 Ha.), and Group 3 (more than 5 Ha.).

Source: FSP Surveys, calculated from the control sample.

2.1.4 Government Organizations and Agencies Serving the Agricultural Sector in the Lower and Middle Shabelle

Government support in the form of planning, organization and support services, even though above the national average in most aspects, is still generally weak in the Lower and Middle Shabelle regions. It would appear that an accelerated pace of improved national and farm household level food security will hardly be possible without a greater contribution of the formal government support services.

Several public sector institutions are responsible for the agricultural development in the country. These institutions include the ministries of agriculture (MoA); Livestock, Forestry and Range (MoLFR); Mineral and Water Resources (MoMWR); Health (MoH); Education (MoE); and Industry (MoI). A number of autonomous projects, parastatals, and banks, some of which are satellite organizations to these and other ministries, are also involved in the agricultural sector. The MoA and its subsidiary agencies play the leading part in the agricultural development of the country as well as in the Lower and Middle Shabelle region.

A. Crop Research and Extension

A successful program of increasing food production and alleviating poverty in the two regions implies increasing agricultural output and reducing unit costs. This is achieved by the generation of technologies appropriate to the particular conditions of the farmers in the area, and the diffusion of such technologies to the majority of the farmers. The generation of appropriate technology is the responsibility of the agricultural research service while the diffusion of technology falls under the responsibility of the extension service.

The Agricultural Research Institute (ARI) under the MoA is primarily responsible for crop research in Somalia. Few other autonomous public agencies including agricultural projects (e.g. Bay Region Agricultural Development Project and North-West Region Development Project), the Faculty of Agriculture and the Extension project (AFMET) are also involved in some aspects of crop research. There is no formal research unit within the MoLFR that is responsible for livestock research, and current information collection and research are separately carried out by several scattered units within the MoLFR and the Faculty of Veterinary Medicine and Animal Production.

Historically, there was virtually no public sector involvement in crop research before independence in 1960. In the 1920s, some Italian farmers established at Alessandria in

Jilib a station for evaluating the performance of tropical crops to produce for the home market in Italy. Then in 1954, the Amministrazione Fiduciaria Italiana Somalo (AFIS) trusteeship administration in the south established an animal traction training center for local farmers' at Bonka in the Bay region. With the exception of these limited initiatives by colonial farmers, the establishment of a formal crop research program did not begin until after independence was gained in 1960.

The ARI currently coordinates crop research at four experimental stations located in the three major agro-ecological zones of the country. Two of these stations are for irrigated crops and the remaining two conduct rainfed crop research. The four stations are:

- 1) The Central Agricultural Research Station (CARS) established in 1964 under a USAID contract at Afgoi for irrigated crops is the main center for crop research,
- 2) The Jilib station established in the mid-1920s as an evaluation center for tropical crops now serves as a regional experiment station for irrigated crops,
- 3) Bonka experiment station for dryland farming at low elevations (less than 800 meters above sea level), is currently administered by Bay Region Agricultural Development Project,

4) Aburrein experiment station for dryland farming at high elevations (above 800 meters above sea level) is currently administered by the North-west region Development Project.

To date, the crop improvement research has concentrated on agronomic trials carried out at CARS in Afgoi, which test a range of new crops and varieties. Since 1976, the CARS activities have been expanded to include research on farming systems, plant breeding and on-farm research. Most of the crop research has concentrated on maize, and the major achievement of the breeding section has been the development of a new maize variety known as Somtux, which has been released to the seed multiplication center and distributed to farmers. Even though some progress has been made in the 1980s on crop research, the overall impact of the research program in terms of the developing technological packages that can be widely adopted by farmers has been very limited.

The level of public funding for the research program has been extremely low. As a result, the little research so far accomplished has been largely carried out during two short periods of external donor assistance. A USAID funded project in crop research began in 1964, with the University of Wyoming as the sub-contractor in supplying on-site technical assistance and material needs. This project was abruptly terminated following the military take-over in 1969 and subsequent political shift towards the communist countries.

Very little work was done on crop research until 1976, when another project funded by FAO began training local personnel, improving the physical facilities of the central experiment station, and carrying out crop improvement work on several major food crops. In 1983, Somalia spent, excluding external donor funding, a total of about US \$ 240,000 on research or roughly 0.33 percent of its Gross Agricultural Domestic Product (GADP) attributable to crops⁴ (ISNAR, 1983)⁵. This level of agricultural research funding is extremely low for a country so dependent on agriculture as Somalia.

Research output in the country has thus far been rudimentary, at best, in terms of laying the groundwork for the needed increases in productivity and food output. Even after more than a quarter of a century since the establishment of formal public involvement in crop research, the national agricultural research program still displays severe scientific, technical and managerial immaturity in establishing and running an effective national agricultural research program. Trained personnel shortages, inadequate physical facilities, and lack of adequate financial resources are some of the major limiting factors currently facing Somalia's agricultural research program.

⁴. Kenya, for example, spends about 1.1 percent of its GADP (Source: *ibid*).

⁵. Estimated GADP in 1983 was US \$ 640 million of which about US \$ 72 million was attributable to crops.

It was during FAO's assistance between the years 1976-1983 that the foundation for maize improvement work was laid. The first improved maize variety (Somtux) was released for multiplication in October 1983 and for eventual distribution to farmers⁶. At the time of its release, Somtux variety was found to outperform local traditional variety in terms of yield by about 57 percent under experiment station conditions and 38 percent under farmers' field trials (Mokhtarzadeh, 1985). Except for this limited achievement of breeding and agronomic practices on maize, very little research output has come out for sorghum, oilseeds, and other major crops.

Responsibility for extension services for crops before 1980 primarily rested with the Department of Production and Extension of the MoA. From 1981 to the present, the extension services were greatly expanded both in terms of resources and scope, and made a component part of the autonomous multi-donor funded Agricultural and Farm Management and Extension Training Project (AFMET) under the MoA. But problems of coordination with the research program have hampered the effectiveness of the extension service in transferring appropriately tested technologies to farmers. The organizational fragmentation of the research and extension services into separate agencies with separate management and priorities restrict their

⁶. Somtux improved maize variety was developed from the crossing of Afgoi Composite, a local variety, with Tuxpeno, an imported variety.

with separate management and priorities restrict their mutually supporting and complementary activities.

Thus, there is the general feeling that the extension service lacks sufficient appropriate technologies to diffuse. As a result, the combined impact of crop research and extension on yields has thus far been limited at the national level. This is not to say, however, that farmers have not adopted any improved technologies. As will be shown from sample results, a small number of farmers, particularly in the Lower and Middle Shabelle region where extension service activities have been concentrated in recent years, have adopted improved technologies and obtain yields of up to three times the national average yield.

The extension project has recently shifted its area and crop focus to the irrigated region. The impetus of this shift of extension has been based on the increasing realization of the dim prospects for any real breakthroughs in finding improved technologies adapted to rainfed conditions. The Lower and Middle Shabelle regions became the cornerstones for this shift and emphasis was placed on increasing the productivity of the irrigated agriculture.

The ten selected sample villages in the two regions have a resident field extension agent. The extension program uses the training and visit (T and V) method, where each field extension agent (FEA) is assigned to 48 selected contact farmers to whom he pays a visits once a month. To test the

appropriateness of different technologies at farm level conditions, the extension service began its own on-farm trials. These trials provide training materials to the extension agents and also serve as demonstration plots to the contact farmers. In spite of the limited available technologies that could be extended to farmers, it is generally felt that the extension service has played an important part in putting across the important basic messages of the benefits of using improved seed, fertilizer and insecticide.

B. Land and Water Resource Department

Land reform law No. 73 of 1975, which declared all land as state property, provides the existing legal base for the present land tenure system in Somalia. Individuals and/or organizations could only have usufructuary 50-year renewable leases which allowed for inheritance. Maximum farm sizes for individual ownership in irrigated areas was in theory limited to 30 Ha and 60 Ha. for rainfed land. All land is in theory to be registered with the Ministry of Agriculture and annual farm taxes are paid on a per hectare basis: So.Sh. 10 and 5 per hectare for irrigated and rainfed land, respectively⁷. The regional and district offices of the Department of Land and

⁷. The official market exchange rate in 1986 was
US \$ 1 = So. Sh. 110 (IMF, 1987).

Water Resources (DLWR) of the Ministry of Agriculture is responsible for the registration of land and administration of the law.

Individuals wishing to register land submit an application for registration to the district representative of DLWR complete with a description of the area, location and boundaries of the piece of land. Each claim is then inspected and checked to assure that there are no prior claims on the land. After the district DLWR officer is satisfied with legitimacy of the applicant's request, the piece of land is registered in the applicant's name both in the local and the national registers which gives him/her the legal title to the land. Leaseholder are expected to cultivate the land within two years after the title is granted or otherwise face the prospect of losing their title to the land. This provision is aimed at avoiding usable land to be left idle and unproductive. Table 2.6 shows the incidence of land registrations and corresponding size of farms of the registered and unregistered farms in the selected villages of the four study districts.

Table 2.6

**The Incidence of Land Registration of Selected
Villages in the Lower and Middle Shabelle Regions, 1987**

District	No. of Farms	No. of Farms Registered	Mean Farm Size of Registered	Mean Farm Size of Unregistered	Percent Registered
			- Ha. -	- Ha. -	
Afgoi	57	20	19.6	5.7	35
Merca	70	55	8.0	3.1	79
Qorioley	25	9	2.4	2.9	36
Jowhar	73	18	2.7	3.2	25
Total	225	102	8.9	3.9	45

Source: FSP Farm Surveys, calculated from the control sample.

This shows that the majority of the farmers still hold their land under the traditional land ownership system without a legally secure title. Farmers with registered land had on average 8.9 hectares of farm land compared to 3.9 hectares for those without registration. The highest incidence of registered land was found in Merca while Jowhar farmers reported the lowest incidence of registration among the four study districts. While the control sample farmers shows that only 45 percent of all sample farms have registered their land, a previous study in parts of Merca and Qorioley have shown that a smaller incidence of land registration (27 percent) for non-cooperative farmers (TAMS, 1986). Compared to the rest of the country, land registration in the study areas probably stands as the upper margin of the incidence of land registration.

So far, only 45 percent of cultivated land in the two regions appears to be registered. The obstacles to a large number of small farmers registering their land are the cumbersome procedures, which require the farmer to spend several days traveling back and forth to the district office of MOA, and the hidden cost of payoffs to the land registry officials. Land grabbing is a common phenomenon in the two regions, and it is encouraged by the large number of unregistered farms for which someone could illegally obtain a title. Land disputes and conflicts have dramatically

increased in Somalia in recent years, particularly along the densely cultivated Shabelle valley. In the past several years, a number of government arbitration committees were set up to settle such land disputes. If land grabbing continues unabated, a situation might arise in the near future where a steadily growing number of small holders may lose their land, thus, becoming marginalized landless peasants.

C. Formal Credit Institutions

In addition to the central bank, Somalia has two other publicly owned banks; the Somali Development Bank (SDB) and the Somali Commercial and Savings Bank (SCSB). As a result of nationalization, there are currently no private banks in Somalia. The two public banks come under the Ministry of Finance and represent the only credit institutions in the country that provide financing to all sectors of the economy. The SDB operates out of its main offices in Mogadishu and branch offices in Kismayo and Hargeisa while the SCSB has numerous branch offices throughout the country. There is one SCSB branch office in each of the various districts in the Lower and Middle Shabelle regions. In principle, the SDB extends medium- to long-term agricultural loans while SCSB deals only with short-term credit for recurrent expenses for up to a period of one year. Even though both banks have agricultural credit units, agricultural credit is not a primary component in either bank's operations.

The SDB extends investment loans for industry and agriculture to both private individuals and public enterprises. While loan applications for public enterprises rely on state guarantees, private investors have to meet rigorous screening procedures to qualify for loans. Private agricultural loans applications exceeding So.Sh. 2 million (e.g. tractors, irrigation pumps, etc.) from the SDB are required to submit a feasibility study, provide collateral in the form of fixed assets, and furnish other private sponsors as cosigners. Obviously, these stringent procedures for private loans and the lax requirements for public financing disfavor private loans. Only large commercial farmers with sufficient fixed assets and adequate connections with the management of the bank are able to obtain loans. Therefore, the majority of private farmers looking for a medium- to long-term investment loans are forced to look elsewhere for their financial needs.

The short-term loans given by the SCSB to the farming sector are primarily intended for the purchasing of production inputs such as fertilizer. Because of the collateral requirements (usually ownership of farm equipment such as tractors) to qualify for a short-term working capital loan, only larger commercial farmers are again able to obtain formal credit. Until recently, the SCSB provided virtually no credit to the working capital needs of small farmers and traders

involved in the domestic marketing of food, which the bank also considers as high risk groups.

For the first time in Somalia, the SCSB in conjunction with United Nations Capital Development Fund (UNCDF) established in 1984 a special pilot loan program exclusively designed for small farmers cultivating less than 5 hectares. The credit facility was started as a pilot programme to establish a foundation for a nationwide rural credit system. A total of 5,000 farmers in the Lower and Middle Shabelle regions cultivating about 14,000 hectares were expected to benefit from the seasonal input loans over the three-year lifetime of the programme.

The lending program started with a US \$ 1 million revolving fund to capitalize a seasonal credit-in-kind program for small farmers residing in the Lower and Middle Shabelle regions. In each region, the loans are administered by a committee consisting of SCSB branch officers, representatives from the MoA and cooperative organizations, and village committees. The loan term is up to a maximum of one year.

Farmers apply for the seasonal credit through their village committee and/or cooperative organizations. Credit project beneficiaries receive seasonal credit for a basic package of inputs (improved Somtux maize seed, fertilizer, and insecticide) aimed at increasing yields, overall production, and net income. The farmer specifies the type of input he/she

wants to get as a loan and the number of hectares for which they want to use the inputs⁸. Standard quantities of seed, fertilizer, and insecticide are given per hectare (up to a maximum of 5 Ha.) based on the extension's recommended rate of application: 20 Kg. of maize seed, 5 Kg. of Diazinon insecticide powder and 100 Kg. of urea per hectare.

No collateral of fixed assets is required to qualify for the loan. Collective responsibility by the village through its council of elders or through the existing cooperative guarantee the loans. Due to its characteristics of being credit-in-kind, credit administrators were freed from the need of supervising whether the credit was productively used by farmers to assure repayments. This is not to say that inputs may possibly be diverted to another crop or resold to other farmers. Despite the known difficulties of recovering loans from large numbers of poor farmers, repayments up to date has been over 90 percent according to unpublished SCSB reports. The involvement of the village committee has been instrumental in the successful high repayment rate.

The maximum loan term is one year, and these loans are repaid through the village council after the harvest. The village committee and/or the cooperative organization are collectively responsible for collecting outstanding loans from

⁸. Framers obtain credit only for maize and rice. In the study area, rice is grown in the Jowhar district only.

village farmers and bear final responsibility of non-repayment. Recovery action is taken by the village committee and/or the cooperative organization against willful defaulters. In case of crop failure, the money lost from the revolving fund is replenished by the Ministry of Finance from specially appropriated funds.

To date, credit has been given for an average of 2.4 hectares per farm household in the form of improved maize seeds, fertilizer and insecticide against the maize stalk-borer. About 90 percent of the credit is given during the Gu season when rainfall is more reliable and the probabilities of droughts and crop failures are least. Because of the higher demand of fertilizer on rice, Jowhar farmers have received more fertilizer credit over the years than those in the Lower Shabelle.

Table 2.7 shows the annual distributed inputs by the UNCDF project. The number of farmers receiving credit and the quantities of inputs distributed to farmers have steadily increased over the years since the special pilot credit program was established in 1984. In 1987, distributed fertilizer declined due to lack of urea fertilizer in the country as a result of both the breakdown of the Urea Factory combined with the import ban on nitrogenous fertilizer that remained in effect despite the plant shutdown.

Table 2.7
UNCDF Seasonal Credit Program Features, 1984-87

Year	# of Farms	# of Ha.	Seed	Fertilizer	Insecticide
				- - - - kgs - - - -	
1984	583	1,123	6,700	67,000	3,769
1985	786	1,882	16,137	122,650	2,413
1986 ^{a/}	1,063	1,902	22,190	136,450	2,498
1987	1,521	4,525	60,626	29,400 ^b	3,618
Total	3,953	9,432	105,653	355,500	12,298

a/ These figures are the reported 1986 credit from the Afgoi and Jowhar SCSB branches. Data for the Merca branch of the bank could not be located.

b/ Seventy five percent of the distributed fertilizer in 1987 consisted of TSP while in all other years it consisted exclusively of urea.

Source: From Scofield and Hairston (1986) for the 1984 and 1985 data. Somali Commercial and Savings Bank unpublished data for the 1986 and 1987 data.

A total of 5,000 farmers located in the two regions were expected to be reached by 1986. But this expected number of beneficiaries, however, was soon found to be over-optimistic; only 3,953 farmers were reached by 1987, four years after the project began. Out of the 1,521 farmers who had received credit in 1987 from the project, 76 farmers (or roughly 5 percent) were interviewed during the course of this study.

The pilot credit program was expected to achieve the twin objectives of relieving farmers of the financial constraint of purchasing farm inputs, and of enhancing the use of modern yield-increasing inputs. Despite its limited coverage, it is believed that the project has been instrumental in encouraging the adoption and use of yield-increasing inputs (particularly seed and urea) which farmers would have otherwise been unable to get. Important lessons, therefore, can be learned by carefully evaluating the effects of the pilot credit programme on farmer productivity and income.

D. Public Tractor Hire Services (ONAT)

An autonomous public agency, ONAT, under the MoA provides tractor hire services for land preparation (ploughing and harrowing) and land development (land leveling and irrigation canals) to private farmers as well as to state farms⁹. The

⁹. ONAT is the Italian acronym for Organizzazione Nazionale Attressi Trattore.

agency was established in 1953 and reorganized in 1964. ONAT maintains a fleet of farm machinery at several stations throughout the main agricultural areas of the country, including the Lower and Middle Shabelle regions. The agency has workshops in all four study districts; Afgoi, Merca, Qorioley, and Jowhar.

Previously, ONAT was involved in the importation and distribution of such agricultural inputs as tractors, fertilizer, insecticides and spraying equipment. The importation of agro-chemicals by the agency was transferred in 1983 to AFMET and later to ADC while the National Transportation Agency (known by its Somali acronym, WAGAD) took over the responsibility of tractor and equipment importation. ONAT's operational inventory in 1984 was estimated at 438 wheel tractors and 125 earth moving machines (i.e. bulldozers and scrapers). About a third of the operational units are, however, idle due to age and lack of spare parts (COWIconsult, 1984).

The agency's hourly rental rates for different types of equipment are publicly set at a fixed and subsidized low rate. These are typically lower than private tractor rates during peak demand periods. Because of over-staffing, high-cost operations, and fixed low rental rates, the financial situation of the agency has been precarious for a long time with losses of about So.Sh 1.5 million per year. As a result,

the financial difficulties have adversely affected ONAT's capacity to repair and replace its old fleet (COWIconult, 1984). Because of the agency's limited number of units coupled with its fixed low rental rates, ONAT tractors for hire are generally unavailable to the bulk of farmers during critical land preparation times. Therefore, the agency covers a small proportion of the total demand for tractors in the country.

E. Farmer Cooperatives

The Somali government, with the enactment of the Cooperative Law of 1973, began a cooperative movement in the country. In agriculture, about 400 agricultural ujeedobadan (multi-purpose) and tacabwadaq (collective cultivation) cooperatives were formed with a total registered membership of 94,000 farmers (COWIconult, 1984). Ujeedobadan or multi-purpose cooperative members owned and farmed their individual plots but were, theoretically, expected to form work exchange groups and provide members a collective organization for such needs as bank loan applications. The tacabwadaq cooperative type was formed from formerly landless poor farmers who were granted plots of land by the government either from newly developed areas or former plantation land. The government gave each cooperative one tractor as a grant, and group farming cooperatives were additionally supplied with fertilizer and

insecticides when available. The two types of cooperatives are found throughout the Lower and Middle Shabelle region. Cooperative member farmers belong to either one of these two cooperative types.

Initially, the Department of Cooperatives of the MoA administered the farm cooperatives. All types of cooperatives (i.e. agriculture, transport, fisheries, retailing, pharmaceutical) were later joined together under the independent newly formed Union of Somali Cooperatives Movement (USCM). The farm cooperatives, however, exist only in theory since these do not really provide any services to member farmers such as the provision of agricultural inputs or marketing facilities. Several missions have investigated the overall performance of cooperatives in Somalia, and each of these missions found that the performance of the cooperatives disappointing and prospects for short-term improvement dim (COWIconsult, 1984; FAO, 1982).

Only after the UNCDF seasonal credit program began in 1984 did farmer cooperatives began to carry out a useful purpose. The cooperatives fulfilled the function of guarantor of credit for members. The UNCDF required farmers to organize themselves for obtaining and repaying input loans. This function, however, is similarly being carried out for cooperative non-member farmers by the village committees which furnish the necessary guarantees in obtaining the input credit from the bank.

F. Product and Input Markets

Before agricultural market liberalization in 1983, cereal grains were marketed through the Agricultural Development Corporation (ADC). The parastatal was established in 1971 as an autonomous parastatal under the MoA with the mandate of being the sole authorized trader of domestic produced food crops including cereals, oilseeds, and cotton¹⁰. Other less important food crops such as fruits and vegetables were left in the hands of the private sector. The ADC constructed a number of regional, district and village warehouses, and established during the harvest seasons numerous temporary buying stations at major producing villages throughout the country.

Since liberalization, a dual market structure consisting of ADC and private traders for cereals has developed. Oilseeds and other food crops, however, continue to be marketed exclusively through private sector channels. ADC still maintains its presence and organization throughout the country and directly competes with private traders. The parastatal agency has changed its position from monopsonist to that of an active market participant competing with private grain traders, with the mandate of maintaining food reserve stocks and promoting farmer/consumer price stabilization.

¹⁰. ADC, however, concentrated its' mandate on maize and sorghum only.

Farmers now have the liberty to sell their products to whomever provides they wish. A number of marketing options are open to farmers for selling maize and sesame in the study site. These include selling maize through the ADC village buying station, selling maize and/or sesame to traders/assemblers coming into the village from nearby town markets, or directly transporting the products to the major markets and selling it there. With the exception of villages that are very close to a larger town market, most villages in the Lower and Middle Shabelle have their own small market for meat and milk, vegetables, and other consumer goods. Each of the villages is located on a feeder road which links it to the main paved roads and the rest of the country.

The importation and domestic marketing of farm inputs such as fertilizers and insecticides is primarily carried out by public enterprises. Private sector involvement in input importation and distribution is currently limited to tractors and livestock agro-chemicals. In contrast to the formation of the various parastatals in the 1970s, no particular agency was established for inputs distribution and marketing in the country. Input importation, distribution, and marketing responsibilities were instead relegated to ONAT, then to AFMET, and later on to ADC. At some point, these three institutions were all involved in inputs, but none organized it as one of its major activities. In addition to the

confusing mandates of several public agencies to distribute farm inputs, the lack of foreign exchange allocations to input importation has been a major constraint for public agencies to acquire inputs. As mentioned above, more recently the pilot UNCDF seasonal credit project began in 1984 to supply inputs as credit to a small number of farmers in the Lower and Middle Shabelle regions. The project imports by itself insecticide and purchases urea from the local factory and improved maize seed from the seed multiplication farm in Afgoi.

The construction of a urea plant was completed in 1983, and this plant was expected to satisfy all local demand for urea and possibly export some surplus. Plant break-downs and a host of other problems, however, have reduced the actual output of the plant. Imports of nitrogenous fertilizers into the country were banned after the construction of the urea plant as an infant industry protection measure. In 1987, the UNCDF project was unable to distribute adequate quantities of urea to farmers during Gu 1987 because of plant break-down. The irony here is that farmers were still able to purchase almost all kinds of luxury imported consumer products (e.g. imported spaghetti, cigarettes, Coca Cola, etc.) while, at the same time, they are unable to find a bag of fertilizer at the village markets.

2.2. Methods of Primary Data Collection

Somalia has a very weak data base in general, and in agriculture in particular. Except for the minimum essential aggregate annual domestic output indicators and a limited number of project related data, there is very little data on farmers' access to land and other services, on production, methods and technologies of production, on agricultural marketing and other necessary baseline information useful for food policy purposes. Furthermore, the limited data that are available are often times inaccurate or outright inconsistent.

In view of the unavailability of farm-household-level information, the Food Security Project was designed to compile a broad range of information that included systematic primary data collection at both the farm and market levels. The Department of Agricultural Economics at Michigan State University in collaboration with the Ministry of Agriculture and USAID Mission in Somalia undertook a 19-month applied food security study. A team of researchers from the Planning Division of the Ministry of Agriculture and others from the Somali National University collaborated with the researchers from Michigan State University in the implementation of the research project.

2.2.1. Study Calendar

Primary data collection included the application of formal interviews with farmers and traders, and collection of weekly market and village price information from sellers in several major market towns in southern Somalia and from the sample villages. Secondary data were collected from various government agencies, and were supplemented with informal discussions with key people in the government, international donor agencies, and private individuals involved in the production and trade of agricultural inputs.

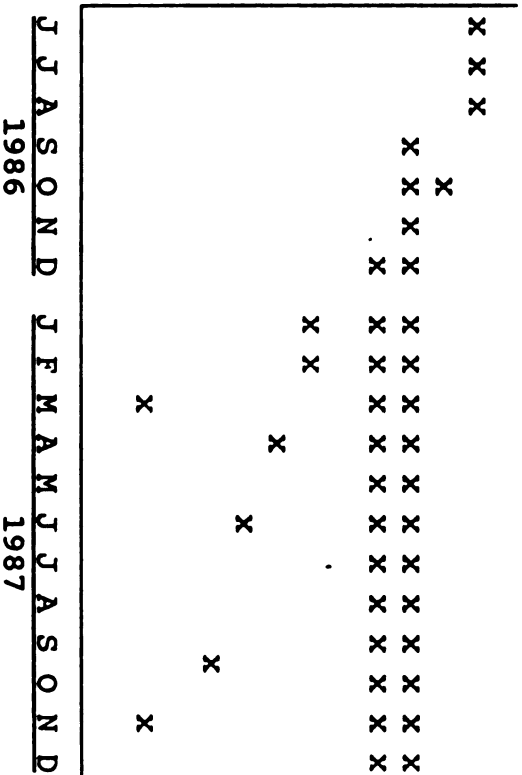
Nineteen months (June 1986-December 1987), including one full agricultural calendar year covering the two cropping seasons of Gu and Der, were spent in field data collection. Figure 2.4 provides an overview description of the research activities conducted during the project time frame. The project objectives were similar to those outlined in Chapter One.

The first three months of the fieldwork were spent setting up an office, hiring study staff, procurement of vehicles and office equipment, administrative activities, and the collection of relevant secondary information. Primary data collection began in earnest in September 1986 and continued through December 1987.

Figure 2.4

Study Task Calendar

- TASK**
- Preparations for Fieldwork
 - Reconnaissance Survey
 - Market Price Data Collection
 - Farm Price Data Collection
 - Farm Surveys:
 - 1. Farm Survey I
 - 2. Farm Survey II
 - 3. Farm Survey III
 - 4. Farm Survey IV
 - Trader Surveys:
 - 1. Trader Survey I
 - 2. Trader Survey II



Note: A summary of the data collected in each of these surveys and the questionnaires used in the study are presented in Appendix 1.

2.2.2. Sampling Procedures

Primary data were gathered from farm households, rural and urban markets, and traders involved in the domestic marketing of maize and sesame. Therefore, the study team needed to make choices on the various sites for the gathering from each of these data sources. The following sections describe the selected sites and the reasons for their selection.

A. Selection of the Lower and Middle Shabelle Regions

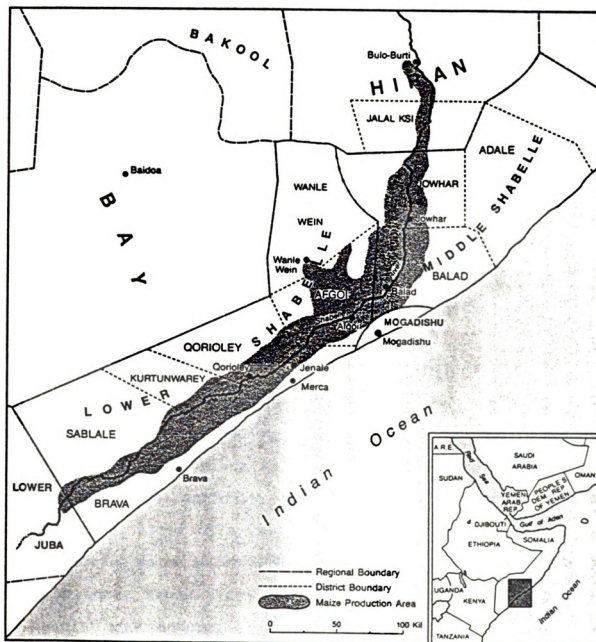
The Lower and Middle Shabelle regions were selected as the study site for the farmer and trader level data collection for two primary reasons. First, maize and sesame are the most important food crops grown and traded heavily in this area of the country. About 80 percent of the maize and sesame domestic output in Somalia are produced in the Lower and Middle Shabelle (See Map 2.2).

Second, several projects are under way in the two regions as part of the reorientation of public investment to the irrigated areas. The unique concentration of public investment programs in the two regions provides a natural experiment to assess the effect of these government interventions on farm output, farm productivity and farm household incomes. The first seasonal credit in-kind project

in the country began providing farmers limited supply of fertilizer, improved seed, and insecticide in 1984. Furthermore, the national extension program has shifted emphasis towards irrigated agriculture in recent years and concentrated its farmer training efforts in these two regions.

Third, the main national agricultural experiment station and the only seed multiplication farm for improved seeds in the country are all located in the Lower Shabelle region. Fourth, preliminary reports indicated that a number of farmers in the two region who have adopted improved maize technology were obtaining yields far above the average for all farmers. Therefore, the two regions provided an opportunity to investigate more fully the interaction between changes in policy, institutions, and technology on farm production far better than in other regions.

Map 2.2
The Study Site



B. Selection of the Primary Relevant Markets

In addition to one market town in each of the two regions (Jenale for the Lower Shabelle and Jowhar for the Middle Shabelle), weekly price information was gathered in Mogadishu and four other urban markets in southern Somalia (Baidoa, Jilib, Kismayo, and Bullo Burte).

The Mogadishu market, perhaps, affects price levels in the two regions more than any other market. In addition to being the largest urban center in the country, Mogadishu is located within less than 100 kilometers radius from the two regional capitals of the Lower and Middle Shabelle. The capital city also represents the most important distribution center for both domestically produced and imported foodstuffs in the country.

Before the selection of these sites, the study team visited each of the market towns. During this visits the network of enumerators was established and trained in methods of gathering the price information. Particular emphasis was placed on the commodity grades for which prices were to be collected. After this initial contact, the market price data collection began in September 1986. Price information gathered from these urban sites was expected to provide sufficient spatial and temporal variation of prices. Other more distant markets in the central and northern Somalia were assumed to be so far away as not to influence demand and supply

conditions for agricultural inputs and outputs in the Lower and Middle Shabelle regions.

In addition to these attributes, communication radios were available in the branch offices of the Ministry of Agriculture in these selected market towns. The communication radios greatly facilitated the timely transmission of the price data within a few hours of the time when it has been observed in the market. This provided the study team an instant method of monitoring weekly market town price variabilities.

C. Selection of the Villages

To select the sample villages, a reconnaissance survey was first carried out during September 1986 aimed at generating baseline information on cropping mix, participation in the UNCDF credit and MoA extension programs and familiarizing the research team with the area. Information was collected during the exploratory survey on the cropping patterns, farmers' use of improved technologies, and participation in the credit and extension programs.

Thirty-nine villages were purposively selected from a possible list of all villages which lay within the boundaries of the irrigated areas. Twenty-eight villages were situated in four districts in the Lower Shabelle region and 11 villages located in two districts of the Middle Shabelle region were visited during the reconnaissance survey. These villages were

selected on the basis that a) maize was a major crop, b) the village was situated inside an irrigation boundary, and c) the village was accessible by road. Coastal fishing villages, rainfed villages, and towns were excluded.

The lack of detailed village lists and maps of the irrigation infrastructure were impediments to conducting systematic selection of the villages to be included in the exploratory survey. The available 1975 military topographical maps to the scale of 1:100,000 and 1:200,000 were outdated with respect to the more recently established irrigation infrastructure. Thus, a sketch map of the currently irrigated areas of the two regions was developed for the planning of the exploratory survey. The sketch map was developed by superimposing the irrigation map produced by the consulting firm of Lahmeyer International for the "Shabelle Water Strategy Study" on top of the village map sketched out for the preliminary census enumeration areas by the Ministry of National Planning for its upcoming 1986/87 national census. Table 2.8 shows the 39 villages visited during the reconnaissance survey.

Table 2.8

**Villages Visited During
the Reconnaissance Survey**

Region	District	Village	District	Village
Lower Shabelle	1. Afgoi	1. Gaalware	2. Merca	11. Ugunji
		2. Sabid/Anole		12. Sigale
		3. Mordinle		13. Mishani
		4. Marerey		14. Wagaday
		5. Barire		15. Bulo
				Marerta
		6. Awdhegle		16. Golweyn
		7. Darasalam		17. Mukay
				Jalle
		8. Mubarak		18. Samey
	3.Qorioley	9. Jambalul	4.Kurtun Warey	19. Majabto
		10. Baqdad		
		20. Gaiwaro		26. Uranurow
		21. Haduman		27. Afgoi
				Yare
		22. Bulo Sheikh		28. Bombasa
		23. Jerow		
		24. Farxane		
		25. Abdi Ali		
Middle Shabelle	5.Balad	29. Walamoy	6. Jowhar	34. Dudunle
		30. Xawadley		35. Mahadday
		31. Jameco Misra		36. Burfule
		32. Baqdad		37. Barrow
				Weyne
		33. Raqaylow		38. Kallundi
				39. Kongo

Source: FSP Surveys.

In each village, interviews were held with the village chiefs using a formal questionnaire. Before the interview, the village chief was given a short briefing on the purpose of the interview. During the interview schedule, some village chiefs got help on certain quantitative questions from village elders who were also present during the interview. The village chief, however, was able to adequately answer most of the questions without any help. The findings of the exploratory survey were instrumental in assessing the potential collaboration of the village council and village extension agent for the final selection of villages for the intensive study.

Ten villages were purposively selected for the intensive farm study. Villages were selected on a number of criteria. The most dominant selection criteria for village selection were:

- a) maize was a major crop in the village;
- b) the village participated in the UNCDF or other seasonal input credit program;
- c) the village was situated within the boundaries of the existing irrigation infrastructure;
- d) the village was covered by the extension service;
- e) the village was accessible by vehicle all year round.

Nine villages from 21 villages covered by the UNCDF "Seasonal Credit for Small Farmers" pilot project and the only village which participated in the FAO "Fertilizer Programme" were selected for intensive study. All 10 selected villages were covered by the credit programs listed above. Seven of the ten villages were located in the Lower Shabelle and the remaining three were situated in the Middle Shabelle region. Each village had a resident field extension agent and was located on a feeder road. The ten selected villages consist of the more accessible villages with relatively better government services.

D. Selection of the Sample

At the farm level data collection, the household represented the primary sampling unit. A household is defined as those related individuals living together in the same homestead and eating together from the same pot. This definition of the household often included a husband, his wife (or wives), children, and members of the extended family living with them and working with them on the farm¹¹.

Two separate samples of farmers, based on credit program participation, were selected for the study. A random selection of households from village lists was assumed to not include a sufficient number of farmers using improved technology

¹¹. Wives, and their children, living outside the village were excluded in the calculation of household size.

(largely accessible through the credit program). Therefore, the control sample was selected from the village list while the other sample was chosen from the farmers on the credit program list for each village. Therefore, participation in the credit program was used as a proxy for technology choice; the credit participants were believed to be adopters of improved maize technology. The two sub-groups of farms were assumed to differ in their technology use, yield, and income. This assumption was justified given the fact that the credit projects were the only distribution system for the delivery of farm inputs operational at the village level.

The control sample was selected from the list of village residents that was readily available in the sample villages. The selection was done on an equi-probability random sampling basis from these lists by the application of a selection interval. The total population in the list of each particular village was divided by 25 to obtain the interval¹². For example, the interval for a village of 600 residents was 24 while for a village of 300 it turned out to be 12. Every Nth (N being the interval) name on the village residents' list was then selected to obtain the desired sample of 25 control

¹². Twenty-five farmers who did not participate in the credit program were selected in all villages except Awdhegle, Darasalam, Samey Samey and Bananey where fewer than 25 non-participating farmers were selected. In Awdhegle and Bananey, the number of non-participants were reduced to include more participating farmers, while non-response reduced the number of farms in the other two villages.

sample farmers. Credit participants chosen in the random sample were removed from this selection and were replaced with the next household appearing in the list.

Credit program participation lists were obtained from field extension agents (FEAs) and village councils were used to select the sample of farmers participating in the credit program. A list of the farmers who had received credit during previous seasons was available in each village. However, there were three different credit lists corresponding to credit of each specific input type: improved maize seed credit, fertilizer, and insecticide. Only a few farmers had requested and received credit for all three different inputs. To obtain the greatest possible number of farmers using the complete improved technology package, an attempt was made to select those farmers who had received credit on at least improved seed and fertilizer during the Gu 1986. If the number of selected participants receiving credit for fertilizer and seed in any particular village exceeded ten farmers, a further selection step was then performed based on insecticide credit. Because the credit sample was chosen in favor of those farmers who have used two or three inputs in Gu 1986, the credit participants illustrate the maximum impact a credit program could have if it reached the bulk of the farmers. In the analysis of technology adoption and input use, differences among the credit receiving farmers are compared with the control sample.

No sampling frame of private traders was available, and the interviews were held only with consenting traders. Traders in Somalia, as in many parts of the world, are generally more suspicious and unwilling to cooperate in survey interviews than are farmers. Almost half of the traders requested to be interviewed refused to respond and even those who were interviewed first required to be unequivocally assured that the information they provided was not meant for government tax purposes or any other harmful purposes. Through the self-selection process, no systematic pattern of refusal by either large or small traders was observed. Despite the lack of systematic sampling design of the traders, each trader in the selected market sites had an equal probability of being chosen for interview. Nineteen traders were interviewed during the first trader interview, and 50 in the second trader interview. Interviews were conducted in 5 different market locations.

E. Sample Size Selection

The selection of the sample size is a major decision in any study because it affects the precision that can be obtained in the estimates and the cost of enumeration. Statistical theory provides a method of determining the optimum sample size in a particular study, once the level of precision and accuracy required are decided. However, the usefulness of statistical theory is limited for a study of this kind which involved a multitude of variables whose

variability was not at all known beforehand. Therefore, it was impossible to apply formal statistical methods in the determination of the sample size because each variable would have required a different sample size depending on its variance (provided prior knowledge of the variances existed, which they did not).

A rough rule of thumb of 35 households per village (25 control and 10 credit participating farmers) were considered sufficient to provide reliable estimates for the analysis. In the determination of the sample size, consideration was given to keeping the total number of farmers interviewed manageable to allow the research team to be able to supervise adequately data collection work. Furthermore, the sample was assumed to be sufficiently large to provide suitable diversity of technology choices and input use, yields and income among the selected farmers. Table 2.9 shows the size of the sample farmers in the selected villages.

A total of 225 control sample farmers and 83 credit participants were interviewed consistently over the study period. In 1987, a problem arose because some of the 83 selected credit-receiving farmers from the 1986 credit list did not receive credit again in 1987, while some in the control sample did so. Thus, the 1987 credit participant sample consisted of 44 original credit participants and 32 from the control farmer samples. Table 2.10 shows how these changes affected the control and credit samples in 1987.

Table 2.9
Selected Villages and Sample of Farmers,
Gu 1986

Region	District	Villages	Number of Interviewed Farmers		
			Control Sample	Credit Sample	Total
1.Lower Shabelle	1.Afgoi	1.Barire	21	6	27
		2.Awdhegle	12	12	24
		3.Darsalam	24	7	31
	2.Merca	4.Ugunji	25	10	35
		5.Sigale	25	7	32
		6.Samey Samey	20	4	24
	3.Qorioley	7.Bulo Sheikh	25	9	34
	2.Middle Shabelle	4.Jowhar	8.Kallundi	25	9	34
9.Bananey			24	11	35
10.Barrey			24	8	32
T O T A L		225	83	308	

Source: FSP Surveys, calculated from the Gu 1986 control and credit samples.

Table 2.10

Selected Villages and Sample of Farmers,
Gu 1987

Region	District	Villages	Number of Interviewed Farmers		
			Control Sample	Credit Sample	Total
1.Lower Shabelle	1.Afgoi	1.Barire	18	6	27
		2.Awdhegle	10	13	23
		3.Darsalam	12	17	29
	2.Merca	1.Ugunji	25	10	35
		2.Sigale	19	6	25
		3.Samey Samey	17	6	23
	3.Qorioley	1.Bulo Sheikh	25	9	34
2.Middle Shabelle	1.Jowhar	1.Kallundi	22	5	27
		2.Bananey	24	0	24
		3.Barrey	21	4	25
	T O T A L		193	76	269

Source: FSP Surveys, calculated from the Gu 1987 control sample and credit samples.

Several factors have to be kept in perspective in interpreting the analysis of the sample results and in making inferences from the control and credit samples to the rest of the farm population in the two regions. First of all, the ten selected villages were selected purposively. Because of their greater accessibility and government services, these villages likely portray the situation in the relatively better off areas of the region.

Second, the control sample households were selected randomly from the list of village residents who did not participate in the credit program. This was done by replacing with non-participants those households that were randomly selected, but found to be participating in the credit program. A very small number (perhaps less than 2 percent) of the original randomly selected sample were replaced. This fact means that the sample of non-participants is a very good estimator of the general characteristics of the households in the sample villages.

To the extent that input credit raised the yields achieved by the 32 farmers in the control sample who received credit in 1987 (compared to the average year and without credit), the overall yields of the control sample might be biased slightly upward. However, this is not expected to be a major difficulty and does not warrant the dropping of the 32 households entirely from the control sample. Obviously, when comparing the direct effects of participating in the

credit program the sample to be used will be the 76 credit program participants in 1987, and 193 non-participants. When describing the general characteristics of households in these sample villages, the control sample will contain 225 households.

Considering the above factors, sample statistics (whenever possible) are presented according to farm size categories rather than as sample-wide estimates. This is because it is more illustrative to talk about typical farmers of certain farm size than typical villages or districts. Small farmers, in whichever villages they may be located, have more in common in terms of output, income and food security than widely different villages within the same district would have in common.

2.2.3. The Response Rate

The problem of non-response by some individuals during a sample survey is well known. Furthermore, the list frame for which the sample was selected was outdated and possibly included invalid households who no longer lived in the villages. Even though the final desired sample size was 300 farms, the selection target was increased to 350 households to take account of these contingencies. As it turned out, a number of the selected farm households had since moved out of the villages or refused to be interviewed. Out of the initial 350 selected total number of farmers, 20 households

were found to be away from the villages while 6 farmers refused to be interviewed during the first farm survey. Of the remaining 326 farmers who were interviewed during the first farm survey, 18 of them eventually dropped out from one or more of the remaining three farm surveys. At the end of the study, a total of 308 farmers (225 control sample and 83 credit participants in 1986) were consistently interviewed throughout the four surveys.

As culture dictates in Somalia, similar to many other traditional societies, the active involvement of the village council (which in most cases consists of the respected community elders) throughout the study was instrumental in gaining this high response rate and in improving data quality.

2.2.4. Questionnaire Design and Pretesting

A. Questionnaire Design

Six questionnaires, one for each of the four farm surveys and the two trader surveys, were designed and administered during the course of the study. Warwick and Lininger (1975) state the two basic goals of questionnaire design as relevancy and accuracy. That is, the survey questionnaires used must be useful in obtaining the relevant information given the objectives of the study, and must help collect such information with maximum reliability and validity. Both of these goals were carefully considered during the research design and at the time of actual data collection.

The relevant information for the study, both primary and secondary data, was initially sorted out during the research design with the use of a research planning matrix. Research objectives and the appropriate amount of information required to address the objectives were carefully clarified. The research problem was broken down into conceptually consistent components, questions, and specific pieces of data. A matrix of the research data needs (i.e., research planning matrix) is reproduced in Appendix 2. Then, the sources of the data were spelled out into primary data collection (either formal and informal) and secondary data collection from other sources. Primary data to be collected during the various surveys was, therefore, indicated in the matrix. Therefore, the questionnaire design in the field consisted of the sequencing of the body of information that was to be collected in each survey. The research task calendar, as shown in Figure 2.4, provided a further tool in displaying the schedule of surveys and the appropriate timing of each one of them.

All farm survey questionnaires were written in the Somali language and the trader survey questionnaires were written in English. Because of the general difficulty of getting information from traders, the trader surveys were conducted by the senior research staff. In the farm surveys, responses to questions related to acreage were allowed to be given either in local units of measure (i.e. Jibaal and Darab) or in standard hectares if the farmer was familiar with it.

B. Pretesting

Questionnaires were pretested twice; once with the enumerators alone for training and again in the field with farmers. The first pretesting mainly involved discussions with the FEAs at their weekly meeting in the regional extension service offices about the appropriateness of the questionnaire wording and uses of local terminology. This first pretesting provided the opportunity of training the enumerators on the questionnaire and to gain their insights about the completeness of the various farm operations and terminology. The first draft was later revised taking into account the FEAs comments and suggestions. The second pretesting was conducted in the field, with each enumerator filling out two (dry runs) sample interviews with actual farmers. The second pretesting was conducted in a village that was not one of the sample villages. The idea of holding the pretest in villages that were not in the sample was to reduce the burden of intrusion of the study in the selected villages.

This second pretest provided the opportunity of testing the proficiency of enumerators in administering the questionnaire and to gain useful experience regarding the appropriateness of the questions being asked to the farmers. The final draft of the questionnaire was then prepared after final revisions and corrections were made on the second draft.

2.2.5. Data Collection

A. Level of Enumeration

Financial and manpower resources had to be considered in the determination of the level of enumeration and number of surveys to be conducted during the study. Four sequentially linked farm surveys and the two trader surveys were deemed adequate for the purpose of the study. The adopted frequency of enumeration allowed most of the data required to address the research questions to be adequately collected (a summary of the types of data gathered is shown in Appendix 1). A more frequent enumeration would have reduced measurement errors but would also have increased the cost of data collection. Therefore, the adopted level of enumeration implicitly made a trade-off between the advantages of shorter recall time, i.e. reduction of measurement errors, and the cost of enumeration.

All of the enumerators had secondary school certificates and were adequately and sufficiently trained on how to conduct the interviews. Several of them were familiar with survey research as a result of their participation in Farming System Research conducted by the national extension (AFMET) project in 1985 and 1986.

For each survey, the interviews were begun in all villages on the same day and completed around the same time in order to strengthen the reference period and correspondence of the data. Only farm household heads were interviewed. Out

of the total 308 farm households interviewed, 284 were male-headed and 24 female-headed. The enumerators worked part time in filling the questionnaires given their other responsibilities, and two to three questionnaires were completed each day.

B. Supervision

The regional and district extension staff, in addition to the research project staff, paid supervision visits to each village almost every other day through the course of each survey period. The rigorous supervision was called for not only to ensure the correct filling of the questionnaires, but also to remind the enumerators and village council about the high priority and the seriousness of the study. After each survey was completed, the enumerators were evaluated on readability of the responses, mistakes, and frequency of non-response in the questionnaires. To instill a competitive spirit, the top five ranking enumerators were given a money bonus.

A number of actions taken enhanced the accuracy and quality of the collected information: the enumeration of the farm surveys by the FEAs who were very knowledgeable about farming and were accepted members of the village community, the village community involvement in the study, the appropriate pretests and training, and the rigorous supervision during the surveys. Furthermore, the FEAs not only

knew which farmers were using what practices but were also part of the village credit selection committee and, thus, knew the farmers who had received inputs from the credit program.

The village council members often attended the interview sessions. Their presence during the interviews did not arguably introduce any systematic biases in the responses but have helped dispel suspicion about the intent of sensitive questions on the part of respondents. Furthermore, the village council members helped enumerators in setting up the interview appointments.

2.3. Chapter Summary

The Food Security Project undertook the first systematic research covering all aspects of maize and sesame production ever carried out in Somalia. The research project launched a collaborative program of applied research aimed at assisting the government of Somalia build a framework for better design of food security policies. The field work was carefully planned, and data needs and potential sources determined before the actual data collection activities began.

The Lower and Middle Shabelle regions represent the highest agricultural potential area in the country. In acknowledgement of this fact, the Somali government has recently shifted its investment emphasis to these two regions. Nevertheless, the existing services to farmers still remain rudimentary, at best, in terms of influencing a major

turnaround in food production and farm productivity. The natural environment of soils, sunshine, rainfall and the Shabelle river water allows the two regions to be able to contribute even more to the country's domestic food production needs if the necessary technology and support services are made available to farmers.

CHAPTER THREE

ANALYSIS OF MAIZE AND SESAME FARMERS' SUPPLY RESPONSE, GIVEN RECENT POLICY REFORMS

Somalia, similar to many other Sub-Sahara African countries, embarked in the early 1980s on a structural adjustment program to revitalize its economy. In the agricultural sector, the policy reforms included the privatization and liberalization of the markets of the major staple foods, the restriction of the parastatal involvement in food marketing, and the provision of higher producer prices.

Several questions, however, arise on the scope and effectiveness of such policy reforms. The first concerns the political feasibility for many Somali and other African governments to pursue policies that turn the terms of trade against the politically more vocal urban populations and in favor of rural producers. On the other hand, the potential effectiveness of policy reforms to reverse the poor agricultural performance depends on whether farmers can and will positively respond to economic incentives. The first issue mainly falls under the realm of political economy while the second (i.e., the debate on agricultural supply response) is primarily a technical issue. This chapter will focus on the second issue, the responsiveness of maize and sesame to recent policy reforms in Somalia.

The responsiveness of farmers to incentives is extremely important because it involves examining the question of whether the on-going policy reforms in Somalia have been effective in the past and will continue to reverse the 1970s food crisis and the decline of per capita maize and sesame production in the country. Twenty years ago, Behrman succinctly put the policy relevance of supply response in LDCs as follows:

"Only with knowledge of this responsiveness can better predictions of short run domestic food and raw materials supplies be made... Only with knowledge of this responsiveness can the effects of various specific policies on agriculture and on over-all growth be responsibly examined." (Behrman, 1968 pp. 10).

The analysis of the supply response of maize and sesame to policy reforms in Somalia is important in assessing the government's ability to affect agricultural production through appropriate changes in prices and import policies. Because Somalia has witnessed the largest reduction in per capita food production on the African continent in the last decade, the study on the supply response of maize and sesame to economic incentives provides an interesting case study for observing the effects of agricultural policy reform on domestic food production. The evolution of agricultural policies and the

performance of maize and sesame production before and after the policy reforms is discussed. Government marketing, price, and trade policies during each of the two eras are discussed. Then, a model is developed to examine maize and sesame supply responses to price incentives, and the policy implications of the model are discussed.

3.1. Policies and Performance Before the Reforms, 1971-81

3.1.1. Government Agricultural Policies, 1971-81

Somalia has evolved from a socialist economy to a mixed economy during the last decade. Since the military take-over in 1969, the country has undergone significant political, economic, and institutional changes that have had profound effects on the economy of the country. In 1970, the new government proclaimed that it would follow the "scientific socialism" path for the development of the country. As is typical in a socialist economy, private enterprises in almost all sectors of the economy were discouraged and replaced in most instances with public enterprises. Nationalization of foreign enterprises and establishment of new public enterprises to replace the private sector greatly extended public sector ownership in the economy. The evolution of the agricultural policies during the last decade, thus, reflects this transition from a mixed economy to a socialist one, and back again to a mixed economy.

In 1971, the Somali government banned private trade of food and agricultural commodities. Private food marketing was replaced with two parastatals, ENC (Ente Nazionale Commercio) handling imported food products and ADC (Agricultural Development Corporation) handling major domestically produced food crops "... to protect the interests and wellbeing of the producer and consumer and eradicate the deplorable system of exploitation" (Law 51, 1971). Private traders were denounced as being exploiters of the farmers and consumers alike and the state tried to assume the functions of trade and distribution of food products.

In addition to the intended parastatal monopoly of food marketing, all new public investment in agricultural production went into the formation of state farms. Abundant fertile irrigable areas were allocated to state farms; 46,000 hectares according to recent estimates (Conze & Labahn, 1986). More than \$600 million was invested in state farm projects in these years, which absorbed an estimated 48 percent of core Public Investment Program (PIP) budget. The huge invested capital to public farms represents more than one-third of the total \$1.5 billion debt Somalia owes to foreign creditors. The magnitude of the capital invested in agriculture (mostly in state farms) provides firm support to the argument that lack of financial resources was not a main factor in the dismal performance of the food sector in the 1970s and early 1980s.

No major effort was made during the 1970s and early 1980s to improve the productivity of the agricultural sector through introduction of new improved technologies. An ISNAR report in 1983 to the government indicated that: "Presently, there does not appear to be widespread awareness that Somalia needs an 'industrial research' capability to support the development of its major industry, agriculture". In that year, the country was investing an estimated 0.5 percent of the Gross Agricultural Domestic Product (GADP) in crop and livestock research, and since then no notable changes have taken place in the level of funding of agricultural research.

3.1.2. Maize and Sesame Marketing and Price Policies, 1971-81

ADC concentrated its efforts mainly on maize and sorghum (the two major staple cereals) and left the marketing of oilseeds (including sesame), cotton, and the small quantity of domestically produced rice in the hands of the private food merchants. Real official maize producer prices in the early part of the 1970s remained somewhat stable as a result of frequent government price increases and a low inflation rate. However, ADC's good reputation among farmers began to evaporate from 1977 onwards, as ADC prices remained fixed in nominal terms for several years while annual domestic inflation chipped away at real producer prices. Table 3.1 shows ADC nominal and real buying prices between 1971 and 1986.

Table 3.1

ADC Maize and Sesame Purchase Prices, 1971-86

	M A I Z E		S E S A M E	
Year	Nominal Purchase Price	Real Purchase Price	Nominal Purchase Price	Real Purchase Price
	- So.Sh./Quintal -		- So.Sh./Quintal -	
1971	35	1,590	155	7,045
1972	35	1,670	150	7,380
1973	45	1,960	150	6,520
1974	50	1,850	180	6,670
1975	55	1,720	200	6,250
1976	60	1,670	240	6,670
1977	75	1,875	240	6,000
1978	75	1,700	240	5,450
1979	75	1,190	240	3,810
1980	120	1,130	300	2,830
1981	180	1,420	450	3,540
1982	180	1,060	700	4,120
1983	220	880	870	3,480
1984	360	780	910	1,980
1985	1,500	2,500	5,000	8,330
1986	1,500	1,900	5,000	6,330

Source: Price data were obtained from ADC, and the CPI from the MNP.

Note : Real prices are constant 1987 prices.

The table shows that domestic real producer prices remained fairly steady between 1971 until 1977. Real producer prices began to decline sharply after 1978. By 1984, real producer prices for maize were just about 50 percent of the 1971-75 price level. For sesame, these were even lower. The pattern of ADC maize purchases closely follows the real producer price levels. The agency was able to purchase a significant portion of domestic maize output during the early 1970s when real official maize producer prices remained at reasonable levels. As ADC's purchased quantities and market share declined, the parallel market emerged as the major market channel for most producers. Table 3.2 shows ADC's maize purchases and the share these represented as a percentage of domestic production.

By 1980, most of the grain trade was being handled through the parallel market at prices much above the official producer prices. As the official maize price became less and less attractive to farmers, ADC resorted more and more frequently to terror tactics and tried to force farmers, sometimes at gun point, to sell their maize and sorghum food stocks to the agency.

Table 3.2
Historical Pattern of ADC Purchases, 1971-86

Year	Purchases	Purchases as % of Production
- Metric Tons -		
1971	55.0	55.3
1972	60.0	52.2
1973	37.0	37.4
1974	33.0	34.1
1975	20.0	19.3
1976	30.0	27.9
1977	21.0	18.9
1978	31.0	28.8
1979	11.0	10.2
1980	4.0	3.6
1981	6.0	4.2
1982	2.0	1.3
1983	4.0	1.7
1984	0.7	0.3
1985	12.4	4.4
1986	18.0	5.4

**Source: Planning Department/Food Security Project Working
 Paper No.4, 1987.**

Under the law, a farmer was not allowed to retain more than 100 kg. of grain per household member. The 100 kg. limit of grain allowed for food per household member was clearly below the average per capita consumption requirement per year. The study results indicate that farmers need an average of 157 Kg. of maize per household member. Therefore, farmers prefer to store at harvest (if they can) more than their annual household grain requirement as a household food security strategy. Forcing farmers to sell to ADC more than they desired implied large food security risks to farmers, in the event that the next season turned out to be a drought.

Over the years when ADC attempted to monopolize grain trade, sesame trade remained in the private sector and prices were mostly determined in the private vegetable oil market. Thus, farmer incentives in the production of sesame were less affected by ADC pricing. Both maize and sesame production, however, were equally taxed by the over-valued domestic currency and the large food aid quantities that made competing imported substitutes relatively cheaper.

3.1.3. The Under-pricing of Domestic Output

Maize and edible oils have for a long time been under-priced by the Somali government. Commodity prices throughout 1970s were constantly kept under import parity prices. During this decade, there was no active parallel grain market to

mitigate the official under-pricing of maize. Strict grain movement controls, forced farmer sales, and strong police presence in the main grain markets deterred the development of an active and unofficial grain market in the country. As a result of this, ADC virtually had an absolute monopoly in the grain trade. Asser et al. estimated that ADC had a grain market share of over 80 percent up until the end of 1970s. Only in the early 1980s did the agency's dominant market began to fade as the government began increasingly to tolerate the emerging parallel grain market. Official producer prices remained less than 50 percent of the import parity prices throughout the 1970s.

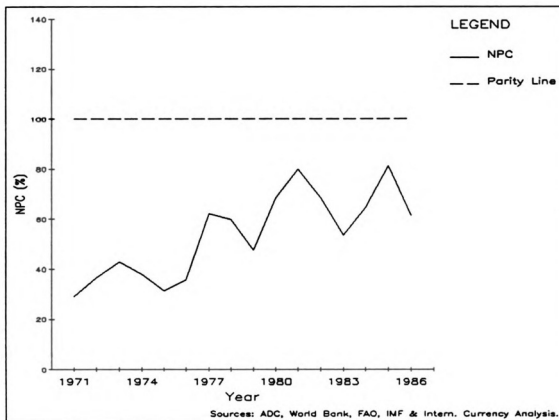
As the private market began to emerge in the early 1980s, the official producer price was no longer important to farmers. The private grain market offered relatively higher prices to farmers, and most of the farmers shifted their sales channels from the parastatal to private grain traders. But as official producer prices were raised by more than 400 percent in 1985, the divergence between official and actual market prices began to narrow. Thus, farmers sought to sell grain to ADC during the harvest periods when private market prices were lower than the official price. Official maize purchase prices at harvest time during both 1986 and 1987 were in fact higher than private market prices. During the early 1980s, most of the marketed grain shifted to the parallel private market.

Figure 3.1 shows the nominal protection coefficient (NPC) for maize from 1971 to 1986. The NPC indicates the extent of the divergence between domestic and border prices. An NPC of below 100 percent indicates that domestic prices are lower than import parity prices, and vice versa. Between 1971 to 1986, the estimated NPC was lower than import parity prices. The highest divergence between domestic and border prices were in the early 1970s. Between 1971 and 1976, official maize producer price were less than 50 percent of the import parity prices. The NPC rose to 62 percent in 1977 after ADC maize producer prices were raised by 25 percent. The highest increase in maize producer price occurred in 1985 when ADC raised its price by over 300 percent. As a result, the nominal protection coefficient rose for the first time to over 80 percent in 1985.

Since sesame is mainly consumed in its processed form as sesame oil for cooking, the under-valued imported vegetable oil potentially pose a greater threat to sesame production than official producer prices. Because Somalia does not import sesame seed or sesame oil, the degree of under-pricing of domestically produced sesame can be alternatively assessed by comparing the domestic prices of sesame oil with the import parity prices of imported edible oils. Unfortunately, because of data scarcity on edible oils price in the country, the magnitude of this under-pricing cannot be sufficiently estimated.

Figure 3.1

Nominal Protection Coefficient of Maize, 1971-86



Notes: 1) Import parity prices are computed c.i.f Yellow No. 2 maize from U.S Gulf ports and a \$ 50/MT freight rate. The c.i.f prices are converted to Somali Shillings using the parallel market rates to account for possible currency overvaluation. These rate were obtained from various issues of the World Currency Yearbooks.

2) The nominal protection coefficient is the ratio between domestic and border prices.

But reports are available that edible oils imported by ENC (another parastatal involved in food marketing) were sold at government retail outlets for half of the estimated import parity price (ICD, 1985).

3.1.4. The Increased Dependence on Imports

As in many LDC's, data limitations and inconsistencies of the available data abound in Somalia. While production data are more consistent and seem more reliable, there are significant inconsistencies in the food import data (See GSDR-World Bank, 1984; Holtzman, 1987). The numerous commercial importers (some of which lack import licenses) and the several ports of entry of commercial imports cause a portion (perhaps large) of food imports to be undetected and unrecorded (Jaffee, 1985).

The inconsistencies in the import data, thus, make it difficult to assess the relative dominance of cereal and edible oil imports in domestic consumption and production, and the conclusions drawn from the data are tentative. However, the available information indicates that the volume of cereal imports and edible oil in the country are staggeringly high. Farzin (1988) indicates that Somalia's import dependence has significantly increased in recent years to the point where Somalia has become the leading import-dependent country in Sub-Saharan Africa. Farzin asserts that:

"... Somalia has become alarmingly, and more than any other country in Sub-Saharan Africa, dependent on imported food. This is particularly striking when one notes ...that, up until early seventies, it was self-sufficient in food grains."

Table 3.3 shows the increasing dependence on grain imports between 1971 and 1985. Maize imports accounted for about 30 percent of total supply between 1971-1975, and almost 50 percent in 1981-85. The volume of cereal imports increased more than four times, while maize food aid rose by over 10 times between this two periods. The results show that maize availability rose sharply during the 1981-85 period, partly due to good production performance (mainly after 1982) coupled with a large increase of food aid maize.

Table 3.3

Somalia's Increasing Dependence on Grain Imports, 1971-85

Grain Supply	Period Totals		
	1971-75	1976-80	1981-85
Total Grain Supply	1,464.7	1,963.1	3,623.5
Domestic Production	1,196.9	1,294.1	2,182.1
Imports:	431.8	918.7	1,749.4
Commercial	324.3	518.3	610.7
Food Aid	107.5	400.4	1,138.7
Imports as % of Total Grain Availability	29.4 %	46.8 %	48.3 %
Imports as % of Marketed Grain ^{a/}	47.4 %	64.0 %	66.7 %

Source: Agricultural Sector Review (1985).

a/ Assumes 40 % of domestic production is marketed.

Taking into account that only a portion of the domestic grain production is marketed while virtually all imported grain ends up in the market, the striking dependence on grain imports in satisfying domestic grain demand becomes more clear. Note that these imports are net of the refugee assistance imports. Assuming that 40 percent of total domestic grain production is marketed, the share of maize imports as percent of marketed maize rose from almost 50 percent to two-thirds during the same period.

The dramatic increase of cereal imports appears to reflect the grain deficits that have developed from the mid-1970s as per capita domestic production declined from 1971 to 1981 (See Table 3.5). The supply situation was even made worse by the influx of a large number of refugees from Ethiopia into the country. Even though help for the majority of the refugees was provided for in the existing refugee camps by donor agencies, a significant number of refugees moved into the urban centers.

Much of the volume of imported food aid cereals was reportedly dumped into the domestic market at below commercial value, depressing domestic grain prices. Conze and Labahn (1986) reported that domestic grain prices fell sharply during 1985 as result of the volume of food grain released into the market. Furthermore, informal interviews with maize farmers in the Lower Shabelle region in September 1985 confirmed the

depressing effect of food aid grain on domestic cereal prices. Farmers reported to the FSP researchers that their biggest concern at the time of the interview was the food aid maize stocks in ADC warehouses which they feared would again be dumped onto the market.

Cooking oil in Somalia consists mainly of imported refined oils and domestically produced crude sesame oil. Consumers prefer the traditional crude sesame oil over imported edible oils as reflected by the two-to-one price ratio of the sesame oil relative to imports (FSP prices, 1986/87; ICD, 1985). Almost two-thirds of cooking oil consumption comes from imported vegetable oil.

Table 3.4 shows the dependence on edible oils imports. The table shows that 63 percent of the 1984 estimated total consumption of cooking oil was imported. Food aid contributed to more than 61 percent of the imported edible oils in 1984. Most of the food aid edible oil is either auctioned to private dealers or distributed to civil servants at prices well below import parity prices. The Industry Council for Development (ICD) projected that by 1990 almost 75 percent of the cooking oil requirement would be satisfied by imports (ICD, 1985).

Table 3.4

**The Importance of Edible Oil Imports
in Somalia - 1984 Supply and 1990 Projection**

Edible Oil Supply	Period	
	1984	1990 ^{a/} (Projection)
Total Edible Oil Supply	45,000	65,000
Domestic Production	16,600	16,600
Imports	28,400	48,400
Commercial	11,000	--
Food Aid	17,400	--
Imports as % of Total Edible Oil Supply	63.1 %	74.5 %

a/ Estimated at present rates of population growth and edible oil demand. The 1990 projection also assumes that domestic production will remain constant over that period.

Source: Industry Council for Development (1985).

If the country's capacity to import commercially the difference between demand and local production remains at similar levels, it is clear that most of the imports will be in the form of food aid. This further raises the issue of domestic edible oil production incentives. As long as the large food aid imports are under-priced relative to what its price would have been if imported at realistic exchange rate levels, the present disincentives for consumers to consume and farmers to increase domestic edible oil production will likely continue.

3.1.5. Maize and Sesame Output, 1971-81

In one decade, the country retrogressed from self-sufficiency in maize to a virtual dependence on imported maize and other cereal products for a major portion of domestic consumption (Farzin, 1988). Somalia witnessed a drastic decline in per capita food production throughout the 1970s and early 1980s (See Figure 3.2).

Between 1971 and 1981, per capita domestic production of maize and sesame declined by about two percent a year. Table 3.5 shows the performance of maize and sesame output before and after the policy reforms. Maize and sesame production stagnated throughout the 1970s and early 1980s, averaging approximately 109.1 and 39.6 thousand metric tons per year respectively.

Figure 3.2

Index of Per Capita Maize and
Sesame Production in Somalia, 1971-86

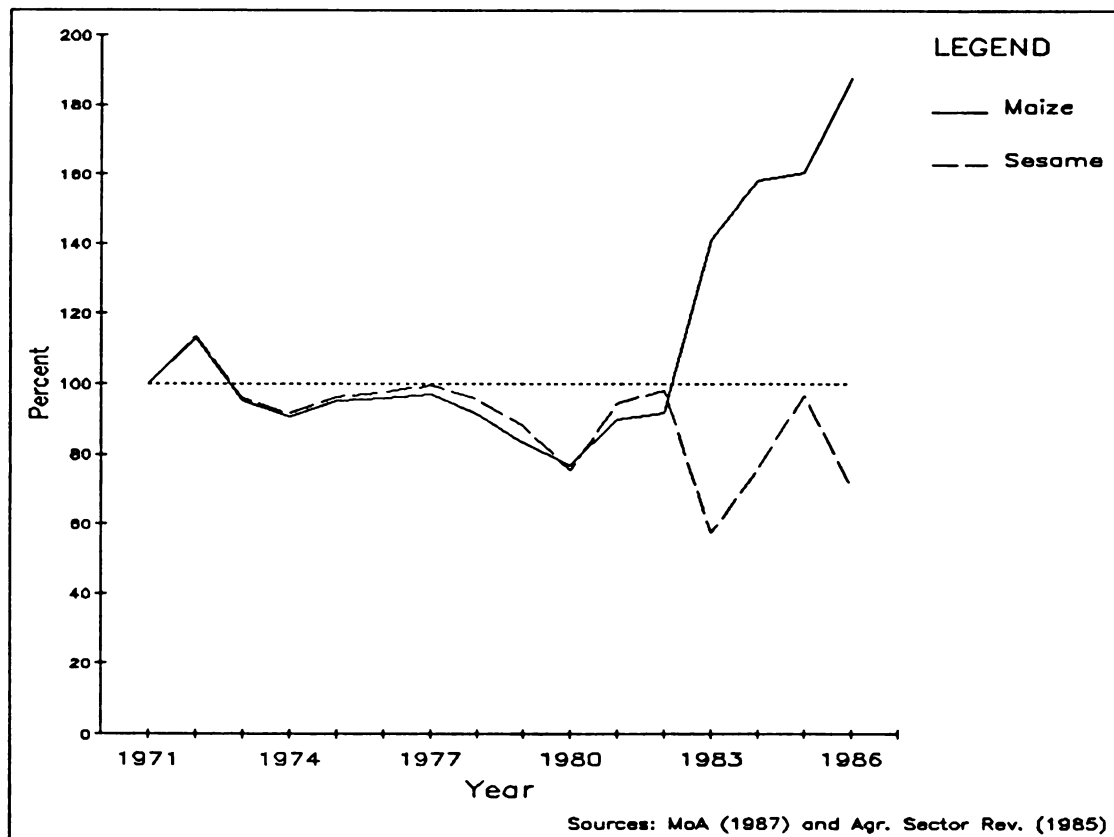


Table 3.5

**Somalia's Average Annual Output
and Growth of Maize and Sesame, 1971-86**

Commodity	Time Period		
	1971-86	1971-81	1982-86
Domestic Output			
Maize			
Total (1000 MT)	154.5	109.1	254.4
Per Capita (kg.)	29.5	24.9	39.5
Sesame			
Total (1000 MT)	42.2	39.6	48.1
Per Capita (kg.)	8.6	9.0	7.5
Output Growth Rates (%)¹			
Maize			
Total	7.8	2.0	17.9
Per Capita	3.3	- 2.2	15.6
Sesame			
Total	2.2	2.3	0.0
Per Capita	- 2.2	- 1.9	- 1.6

Source: Production data are from the Ministry of Agriculture (1987), and population figures are from Agricultural Sector Review (1985).

¹. Annual trend growth rates are OLS estimates of the following relationship:

$$\ln Q_{it} = \text{const.} + aTR_t + e_t$$

where $\ln Q_{it}$ denotes output of crop i (i =maize, sesame) in year t , TR_t is the trend, a is the annual trend growth rate to be estimated, and e_t is the error term.

Population grew at an annual rate of more than 4 percent between 1971 and 1981. This growth was mainly swelled by the influx of refugees who settled in the urban areas and became permanent residents in the late 1970s. It is during this period when per capita output of both maize and sesame have declined the most.

3.2. Policies and Performance After the Reforms, 1982-86

With increased pressure from donors (through tied aid) to implement policy reforms, in 1982 the Somali government finally began to implement corrective economic measures and made major shifts in policies. The reforms included attempts to improve the overall macroeconomic environment as well as sectoral adjustments to redress declining economic output. Devaluation of the domestic currency, agricultural price policy reforms, and greater liberalization of the marketing of agricultural products were some of the items included in the reforms. State control of the economy was eased and steps were taken to move towards a more mixed economy in which the private sector played a greater role.

Between 1971 and 1981, the Somali government continued to maintain an unrealistic fixed exchange rate in the face of severe balance of payments problems and relatively higher inflation rates relative to Somalia's major trading partners. Imported food products became relatively cheaper, therefore,

increasing the demand for imported foods. The volume of grain imports (including aid) more than doubled in the ten-year period between 1975 and 1984. The annual trade balance (merchandise exports minus imports) worsened from a debit of approximately \$40 million in 1973 to a debit of over \$300 million dollars in 1982 (IMF, 1988).

Between 1981 and 1986, the Somali government devalued the Shilling by more than 1,500 percent through successive steps as part of the World Bank/IMF mandated adjustment program². The Somali Shilling, which was allegedly pegged to the SDR³ after the 1973 demise of the fixed gold standard regime, remained fixed for ten years between 1971 and 1981. The devaluations of the domestic currency to more realistic levels represented a significant step towards redressing the underpricing of domestic produced food products. The domestic price of imported food products, particularly the commercial component of imports, after the policy reforms has sharply risen as a result of the increased exchange rate.

In the agricultural sector, the government initially stopped its forced grain purchases from farmers, thus, tacitly approving a greater portion of marketed surplus of grains to

². In 1981, the exchange rate between the US \$ and the So.Sh. in 1981 was US \$ 1 = 7.3 So.Sh. In 1986, the exchange rate was at US \$ 1 = 110 So.Sh (IMF, 1987).

³. The SDR (or Special Drawing Rights) is an international currency created by the World Bank, which consists of an index of major convertible currencies.

be exchanged in the parallel private market. A 1982 Presidential Circular put to an end ADC's forced purchases of grains from farmers. For the first time in more than a decade, the circular allowed farmers to store as much grain for household consumption as they wanted. Even though the new legislation stopped the forced sales to ADC, it did not legally sanction private grain trade. Thus, legally sanctioned private grain trade did not come until late 1984 when the government finally removed the remaining restrictions.

The lack of legal sanction and the frequent police raids of the "black market" before early 1985 created a great deal of confusion and uncertainty among farmers and traders alike about the government's policies. During this time, ADC continued to maintain a strong market position by its handling of large quantities of maize food aid. The government finally announced in late 1984 that farmers were free to sell their commodities to whomever they wished and at the best price they could get for their products. Official producer prices for all major staple food crops were allowed to rise significantly in 1982 and onwards. ADC's function was redefined to price-stabilization and holding strategic cereal food security reserves.

A series of other economic management steps, reform of public enterprises, and private-sector trade were also carried out as part of the recovery under the structural adjustment programme. Aroused by the new economic opportunities for

investing in agriculture, a large number of individuals and private companies began or went back to the production of food crops. Aggregate maize cultivated area increased by more than 130 percent between 1982 and 1986. Sesame cropped area also increased by about one third during that period. Furthermore, the government abandoned many of the inefficient state farms and divided up their land to individual private farmers.

The government's role in providing services to agriculture was intensified. Steps were taken in the 1980s to increase farm productivity. For the first time in Somalia's history, a locally developed composite maize variety (Somtux) was released in 1983. A large extension project was also begun in 1980 with the assistance of IBRD and USAID funds. However, the lack of improved technology for sesame appears to have severely limited productivity gains in sesame. A pilot seasonal agricultural production credit project was also initiated in the Lower and Middle Shabelle regions. The credit program offered farmers input loans in kind, consisting of fertilizer, insecticide and the improved maize variety seeds.

After the policy reforms, annual domestic output of maize increased by a phenomenal 18 percent per year during each of the following five years (See Table 3.5). In contrast, sesame production stagnated during this period mainly due to declining yields, even though area cultivated increased modestly. The relative lack of response of sesame output, in contrast to maize, to the policy reforms is thought to be

mainly due to the fact that sesame trade was not previously monopolized by ADC. Therefore, the policy reforms had less effect on sesame price levels and, consequently, on farmers' incentives to increase sesame production. Furthermore, the injection of large quantities of food aid maize was stopped beginning in 1986 but imports of edible oil food aid have continued.

Per capita maize output increased by an annual average of more than 15 percent while per capita sesame output continued to decline after the policy reforms. Annual domestic output of maize in 1986 reached an all-time high of 336,000 metric tons. The increase in maize production after liberalization was, thus, significant enough to permit some recovery of the lost ground during the 1970s and early 1980s. Both maize and sesame cultivated area have increased after the policy reforms.

Table 3.6 shows the average annual cultivated areas and yields for maize and sesame between 1971 and 1986. After the policy reforms, maize cultivated area has more than doubled while area cultivated to sesame increased by about 28 percent compared to those recorded for the period 1971-81.

Table 3.6
Average Annual Cultivated Areas
and Yields of Maize and Sesame, 1971-86

Crop	Time Period		
	1971-86	1971-81	1982-86
Maize			
Area (000 Ha.)	178.2	127.0	290.8
Yield (Kg./Ha.)	885.6	884.0	889.2
Sesame			
Area (000 Ha.)	75.8	69.7	89.2
Yield (Kg./Ha.)	577.8	595.0	540.1

Source: Ministry of Agriculture (1987).

The lack of historical data on area cultivated data disaggregated into the various regions and districts prevent us from understanding exactly where the increased maize cultivated area has occurred. The Food Early Warning Department established within the MoA in 1980, and which was aimed at improving the quality of the food balance data and its components, has improved official estimates of area planted. Thus, it is believed that the reported increase in aggregate cultivated maize area in the 1980s most likely reflects an actual acreage increase rather than simply an improvement in the quality of area measurements in the official statistics.

To complement the estimated aggregate increase of area planted in maize, the FSP gathered farm-level information from sample farmers in January 1987 about whether they increased their holdings during the previous five years and, if so, from where they obtained the land. Table 3.7 shows the percentage of farms that reported that they expanded area planted over the five-year period 1982-86 and the proportion of those who reported expanding into previously uncultivated land.

Even though the available national level data do not provide answers to the question about the location of the expansion in maize cultivated area, the survey results indicate that within the study area most of the expansion was in the relatively more accessible districts of the Lower Shabelle. The highest measure of reported expansion took place in Afgoi. Among the Afgoi farmers, those with more than five hectares reported the highest frequency of expansion of holding onto previously uncultivated land since 1982. No farms in either Qorioley and Jowhar reported expanding onto previously uncultivated land.

Table 3.7

**Expansion of Cultivated Land Between 1982 and 1986
in the Study Area by District and Farm Size Category**

District	Farm Size Categories ^{a/}	Valid No. of Farms	% of Farms Expanded	% of Farms with Cleared Land ^{b/}
Lower				
<u>Shabelle</u>				
Afgoi	1	19	31.6	15.8
	2	15	26.7	13.4
	3	23	52.2	34.8
Merca	1	45	6.7	4.5
	2	12	0	0
	3	13	23.1	7.7
Qorioley	1	17	11.8	0
	2	6	16.7	0
	3	2	0	0
<u>Middle</u>				
<u>Shabelle</u>				
Jowhar	1	42	7.1	0
	2	18	11.1	0
	3	13	7.7	0
TOTAL		225	16.4	7.1

a/ Farm size categories: 1 = 0 to 2 Ha.,

2 = 2.1 to 5 Ha.,

3 = greater or equal to 5.1 Ha.

b/ Excludes farms that have reported expansion with previously cultivated land.

Source: FSP surveys, computed from the control sample.

Table 3.8 displays the historical production, area and yield data of maize and sesame from 1971 to 1986. Overall, maize yields declined from the mid 1970s to the early 1980s. Surprisingly, maize yields show substantial increases only in years of drastic decline of area cultivated. This happened both in 1980 and 1986. It is hard to say whether these unexpected occurrences are due to errors in the reported data. In any case, it is difficult to explain how maize output increased by 20 percent while area cultivated declined by 30 percent, especially in a normal rainfall year such as 1986. With the exclusion of the outlier years of 1980 and 1986, the recent dramatic increase in maize output was mainly achieved through the expansion in cultivated area.

Table 3.8

Production, Area, and Yields of
Maize and Sesame in Somalia, 1971-86

Year	M A I Z E			S E S A M E		
	Output	Area	Yield	Output	Area	Yield
	-000 MT-	-000 Ha-	-Kg/Ha-	-000 MT-	-000 Ha-	-Kg/Ha-
1971	99.4	102.0	974.5	35.3	44.0	802.3
1972	114.9	117.0	982.5	41.0	57.0	719.3
1973	98.9	101.0	979.2	35.4	77.0	459.7
1974	96.8	99.0	977.8	34.7	84.0	413.1
1975	103.8	106.0	979.2	37.3	57.0	654.4
1976	107.6	119.0	904.2	38.8	45.0	862.2
1977	111.3	150.6	739.0	40.6	75.0	541.3
1978	107.7	148.7	724.3	40.0	75.0	533.3
1979	108.2	147.5	733.6	40.6	80.0	507.5
1980	110.0	109.0	1009.2	38.4	83.0	462.7
1981	142.0	197.0	720.8	53.0	90.0	588.9
1982	149.9	209.0	717.2	57.1	90.0	634.4
1983	235.7	300.0	785.7	33.8	91.0	371.4
1984	270.1	350.0	771.2	45.6	92.0	495.7
1985	280.0	350.0	800.0	59.7	92.0	648.9
1986	336.2	245.1	1371.7	44.5	80.9	550.1

Sources: Agricultural Sector Review (1985) and Ministry of Agriculture (1987).

3.3. Future Demand and Supply of Maize and Edible Oils

As maize output increased dramatically during the five years since the policy reforms, the country's heavy dependence on imported maize has been drastically reduced. For the first time in more than a decade, Somalia imported no maize in 1986. The country's food balance sheets for the maize and edible oils, however, show that annual maize and oilseed output fall below national requirements in 1986. Table 3.9 shows the official estimates of maize and edible oil requirements, net availabilities, and the surplus or deficit position of the country for these two commodities for 1986.

As indicated, Somalia had an estimated deficit of about 62,000 metric tons of maize and 12,000 metric tons of edible oils in 1986. Carry-over stocks of maize totaling 344,800 metric tons from 1985 to 1986 more than filled the gap. However, no such carry-over stocks were available for edible oils (MoA, 1987). The large carry-over stocks of maize in 1986 are perhaps due to inventory buildup from several years of good rainfall combined with large food aid shipments. In any case, current domestic maize output is at a level where Somalia may soon reach, under normal weather circumstances, basic self-sufficiency in maize. This raises the need to examine the question of future demand for maize and the likely price behavior if maize production continues to increase.

Table 3.9
Maize and Edible Oils Balance, 1986

Item	Maize (000 MT)	Edible Oils (000 MT)
A. Total Requirement ^{a/}	330.9	45.0
B. Supply		
1. Net Output ^{b/}	269.0	17.3
2. Imports	0	15.8
3. Total Available	269.0	33.1
C. Deficit	61.9	11.9

a/ Total 1986 food requirements were estimated at the officially revised population figure of 8,245,000 (excluding refugees). Food requirements are estimated on the basis of per capita annual requirements of 40.1 and 5.5 kgs. of maize and edible oil, respectively.

b/ Net output was estimated as 80 percent of production after deducting 20 percent for post-harvest losses and seed use.

Source: Food Early Warning System, Ministry of Agriculture (1987).

In the long run, maize prices would likely decline as domestic demand for maize gets saturated and if no other alternative outlets for maize appear. These possible alternatives include using maize as livestock feed, exports, and/or as import substitution for other imported cereals. Even though maize is currently not utilized for feed, demand for grain-fed meat would perhaps emerge in the future as per capita income grows in the country. The possibility of maize for export would, to a large extent, depend on whether Somalia has a comparative advantage in maize production and, if so, whether the country could build the necessary technical and institutional capacity to compete in the international grain market.

Through appropriate import and exchange rate policies, maize consumption in the country could also be raised from current per capita consumption levels if competing imports are priced at actual border prices. Furthermore, survey results suggest that urban maize consumption could be significantly increased if maize could be made available in processed form as desired by urban consumers (See Wehelie and Wehelie, 1987).

The existing large gap of edible oils in the country indicates that Somalia is a long way from achieving self-sufficiency in edible oils. Obviously, now is the time to lay the necessary foundations for achieving self-sufficiency in the future.

3.4. Aggregate Maize and Sesame Supply Response Analysis

A number of observers of Somali agriculture have attributed the growth of maize and sesame production in recent years to the improved economic opportunities for farmers brought about by the recent government policy reforms (Abikar, 1987; Holtzman, 1987; World Bank, 1988). Area cultivated in both maize and sesame have increased significantly after market liberalization. Also maize and sesame yields in 1985 and 1986 show a slight improvement over the record low yields observed in the 1980-84 period. Since the late 1970s, most of the marketed grain moved through the private parallel grain market, while ADC never entered into sesame marketing. Therefore, the relevant prices for estimating the supply response are the actual market prices where most of the transactions took place. Historical private market prices for maize and sesame, however, were available only after 1977. The Central Statistical Department (CSD) of the Ministry of National Planning began collecting consumer prices in Mogadishu in 1977 for the purpose of computing a consumer price index (CPI) to monitor domestic inflation. The CSD collected price information of major food items at the private retail level.

3.4.1. The Supply Response Model

The effect of the policy reforms on maize and sesame supply is an important policy issue because it concerns the effectiveness of past and future policy changes in increasing domestic food production. In this section, a supply response model is developed to examine the response of maize and sesame producing farmers to the recent policy reforms, the magnitude of the response and its policy implications.

After several alternative specifications, the following distributed lag model was chosen:

$$A_{it} = f(A_{it-1}, DP_{it-1}, RN_t, DV)$$

where

- A_{it} = Area cultivated of crop *i* (*i*=maize, sesame) in year *t*, expressed in hectares;
- A_{it-1} = Area cultivated of crop *i* (*i*=maize, sesame) in year *t-1*, expressed in hectares;
- DP_{it-1} = Price of crop *i*, deflated with the CPI in year *t-1*, expressed in So.Sh./metric ton;
- RN_t = Total rainfall in critical months (April to July for maize, October to December for sesame) in year *t* in Jenale (Lower Shabelle), expressed in mm. of rain;
- DV_t = Dummy variable of policy reforms (0=before 1982, 1=1982 and afterwards).

This supply response model hypothesizes that area cultivated for crop i (i =maize, sesame) in year t is a function of the price of the crop in year $t-1$ deflated with the CPI, rainfall in critical months in year t , the policy reforms, and the error term. Lagged area cultivated (A_{t-1}) was included in some equations to explain the response of farmers to other variables not specifically measured by the other variables in the model. The inclusion of the lagged dependent variable in the model also assumes that farmers respond to a weighted sum of past and present prices, where these weights diminish successively for the more distant past.

Based on theoretical consideration, area cultivated was chosen as the dependent variable rather than actual output. This choice was made because cultivated area is generally less affected by exogenous factors which influence realized output and which are beyond farmers' control (Behrman, 1968). Droughts and outbreaks of diseases and insects are some examples of the exogenous factors that cause a discrepancy between the farmers' planned and actual output. Therefore, cultivated area is thought to be a better proxy for planned output than is realized output.

Theoretically, crop cultivated area during the current year is based on past crop prices. In other words, current area cultivated is a function of lagged prices. Several alternative price series were possible to use in the model. These prices include either official or actual market prices,

undeflated or deflated in several ways (i.e., using the urban consumer price index (CPI) or some other basket of consumer goods, and the ratio of the price of the crop to the price of major input prices). The choice of each price series ultimately entails a different set of assumptions about farmer behavior. For example, using the price of the crop deflated by the Mogadishu CPI assumes that farmers respond to crop prices relative to the price of the basket of consumer goods and services on which the CPI is based. On the other hand, the use of undeflated crop prices assumes farmers do not have much sense about inflation and respond to the money illusion of nominal price levels.

Another relevant price ratio is the crop price to major inputs such as fertilizer. Unfortunately, no price series for fertilizer (or other input) was available for the period under analysis. Total rainfall during the critical months of the Gu season for maize and the Der season for sesame cultivation was included as an explanatory variable in the model. Finally, a dummy variable to capture the effects of the recent recent policy reforms on supply was also included in the analysis.

3.4.2. Estimation of the Supply Response Model

The model was estimated with the Ordinary Least Square (OLS) method. Two regression equations were estimated each for maize and sesame supply response. Table 3.10 shows the results of the four regression equations. The standard errors

of the parameters are given in parenthesis. Equations 1 and 2 are for maize, while Equations 3 and 4 are for sesame. Among all estimated equations, Equation 1 (for maize) and Equation 3 (for sesame) are selected as the "best" both from the standpoint of statistical properties and economic theory.

These two equations explain the variation of area cultivated relatively better than the rest of the equations. Equation 1 explains 80 percent and Equation 4 explains 61 percent of the variation in area cultivated to maize and sesame during the ten-year period between 1977 and 1986, respectively.

With the exception of the rainfall variable, all of the coefficients have the right signs and are all significant at least at the five percent level. Furthermore, the Durbin-Watson test for both equations, which tests for first-order serial auto-correlation of the error terms, does not reject the null hypothesis of no first-order auto-correlation. This test, however, does not detect the presence of serial auto-correlation of higher orders. Therefore, if higher order serial correlation was present, it would make the OLS estimates inefficient but still unbiased.

The equations were also checked for the possible presence of imperfect multi-collinearity among the independent variables.

Table 3.10
Maize and Sesame Supply Response

Equation No.	Independent Variables					Adj. R ² .	DW
	Constant	At-1	Dpt-1	Rnt	DV		
<u>Maize</u>							
1)	1.95x10 ⁵ ** (7.60x10 ⁴)		62.75** (27.08)	- 321.09 * (162.68)	1.05x10 ⁵ ** (3.33x10 ⁴)	0.80	2.20
2)	2.03x10 ⁵ * (9.07x10 ⁴)	- 0.08 (0.34)	67.37 (35.50)	- 329.26 (183.59)	1.17x10 ⁵ (5.88x10 ⁴)	0.76	-
<u>Sesame</u>							
3)	7.29x10 ⁴ *** (4.90x10 ³)		0.57 ** (0.21)	0.03 (24.29)	7.05x10 ³ ** (2.69x10 ³)	0.61	1.70
4)	7.38x10 ⁴ (7.72x10 ⁴)	- 0.01 (1.02)	0.58 (0.35)	- 0.08 (29.00)	7.19x10 ³ (1.32x10 ⁴)	0.51	-

Notes: 1) The numbers in parenthesis are standard errors;

2) Significance levels:

*** = 1 %
** = 5 %
* = 10 %

The presence of multi-collinearity in the regression equations is indicated by a large coefficient of determination (R^2) accompanied by statistically insignificant estimates of the explanatory variables (Kelejian & Oates, 1981). This results from large variances of the estimated coefficients which reduce the confidence of possible policy prescriptions based on those estimates. The selected equations do not have these salient features of the possible presence of multi-collinearity.

Equations 1 and 3 indicate positive supply response of maize and sesame cultivated areas to crop prices deflated with the CPI. Table 3.11 shows the magnitudes of the estimated short-run elasticities for each crop. Because the lagged dependent variable was not statistically different from zero, the long-run supply elasticities was not calculated. Nevertheless, the model results indicate that both maize and sesame are price responsive, and that maize is more price responsive than sesame. In other words, farmer incentives are affected more by the real crop prices.

Recent policy reforms appear to have had positive effect on planted area to maize and sesame. The dummy variable for policy reforms in Equations 1 and 3 indicates significant statistically area response to the policy reforms. Rainfall appears to have had a negative on maize area cultivated, but no significant effect on planted area to sesame.

Table 3.11

Estimated Own Price Elasticities of Maize and Sesame

Crop	Price Deflator	Own Price Elasticity ^a	Absolute T-Ratio Value
Maize	CPI	0.40	2.3
Sesame	CPI	0.10	2.8

a/ Elasticities were computed at the mean.

3.4.3. Summary of the Results of the Supply Response Analysis

The estimation of the supply response analysis has provided the following information:

- 1) The own price elasticities of both maize and sesame are both positive. Maize appears to be more responsive than sesame as indicated by the magnitude of their price elasticities.
- 2) Farmer incentives are affected by the general level of prices in the economy.
- 3) Both maize and sesame cultivated areas have positively responded to recent policy reforms.

There are no previous supply response studies in Somalia with which to compare the significance of our estimated elasticities. However, evidence abounds from empirical studies in other parts of the world. Askari and Cummings (1976) and Scandizzo and Bruce (1980) compiled a large body of evidence of the supply elasticities around the world. Scandizzo and Bruce reported that acreage response typically falls in the range of 0.1 to 0.8 in the short run. In Africa, Bond (1983) reported that short-run supply elasticities for several cash crops in the range of 0.02-0.87.

The present study's estimated short-run elasticities, which fall in the range of 0.1-0.40 compare favorably with previous empirical experience. The available empirical studies of supply response in other parts of the world, which can only be compared to a limited extent to our results, substantiate that the estimated maize and sesame elasticities are within the range of observed experience. The short length of time for which data was available on which to base the analysis, however, calls for caution in interpreting these results.

3.5. Chapter Summary and Policy Implications

This chapter examines the dramatic turnaround in maize area cultivated and output that Somalia has experienced in the 1980s. The cereal market liberalization, increases in the official producer prices and other macro-economic reforms appear to have improved farmers incentives to expand maize output. Sesame marketing, which was not previously monopolized by public parastatals, suffered less from the depressed official producer prices. However, sesame oil prices continue to be negatively affected by the large quantities of food aid edible oils that are sold at below import parity prices.

Therefore, the improved farmer incentives in recent years (stemming from the combined effect of market liberalization, devaluation of the currency and the increased encouragement of the private sector) have contributed to the increase in domestic maize output. The somewhat rigorous state monopoly on cereals trade, low producer prices, overvalued exchange rate and the dumping of imported cheap food onto the domestic market previously reduced farmer incentives. Unfortunately, these recent changes appear to have had little effect on sesame output. A likely reason for this lack of sesame response is the large quantities of edible oils food aid that are imported each year and sold at extremely low prices.

The supply response analysis provides firm support that prices do matter in any attempt to expand domestic maize and sesame production. The government's ability to induce desired increases in food crop production are confirmed, if they successively improve real producer prices. The fairly large magnitude of price response of cultivated maize area in the past perhaps indicates that there was a significant quantity of suitable land that could easily be brought into maize production if prices changed. However, the magnitude of these price increases could not, obviously, be continued indefinitely to induce required increases in area cultivated to accompany current population growth rates. Sooner or later, land constraints for suitable irrigated maize would set in and force the abandoning of such a strategy. Furthermore, the political feasibility of such large continued annual increases in food prices is doubtful, under current and foreseeable economic circumstances in Somalia.

Considering the limited supply of suitable agricultural land for maize and sesame cultivation along the river valleys, continued land expansion is certainly impossible over the long run. There are already signs that no new suitable land for maize production is left unclaimed, even though there may be some newly registered farms that have not been completely cultivated. Therefore, future growth in the output of maize and other food crops will have to come mainly from increased

productivity rather area expansion. The need to examine improvements in productivity appears particularly relevant to Somalia now, where almost all of the post-liberalization growth in maize output has come from expansion in cultivated area, rather than from improved yields. Fortunately, there is some evidence that improved maize technology is available in the country. It is hoped this technology has the potential for doubling maize yields within the short- to medium-term.

The government represents the largest urban employer, and salaries cannot be adjusted to the cost of living without the emergence of new sources of substantial government revenue. Annual cereal price hikes of more than 30 percent would put tremendous pressure on government revenue and anger urban dwellers, the most vocal political group. Already there signs of urban discontent over increased food prices, as shown by the government's sudden imposition of food price controls in early 1988.

In the Chapter Five, we will look at the available evidence on current maize technology in the country, the effects recent policy reforms appear to have had on the profitability of adopting these hypothesized maize practices, and the rate of farmer adoption of this technology. The following chapter will also examine the question of which farmers - on the basis of resource levels, technology and access to services - have likely responded most to the new economic incentives.

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CHAPTER FOUR

THE EFFECT OF FARMERS' RESOURCE BASE AND INSTITUTIONAL ENVIRONMENT ON HOUSEHOLD OUTPUT AND FOOD SECURITY

Maize and sesame are the two major food crops in the cropping system of the Lower and Middle Shabelle regions. In addition to these two crops, farmers devote their land, labor and available capital to the production of vegetables, fruits and other minor crops and off-farm activities. Part of the farm household labor, particularly that of children, is also used in tending the few milking cows and small ruminants that are kept on the homestead while other family members may graze household livestock herds outside the river valley. In addition to meeting farm expenditures, the cash income derived from the sale of farm products and off-farm activities is used for food and other consumption goods from the market.

Differences in resource endowments among these farmers are principal factors explaining the differences in household crop and livestock production, family income and food security. Furthermore, farmers' access to institutional services (e.g. credit, extension services, access to markets and security of land tenure) that particularly affect input delivery and technology adoption also play a major role in the farm household's capacity to produce for home consumption as well as for the market. Access to product and input markets are also thought to significantly affect farm output. The

technology with which crops are produced influences how much farmers obtain from their effort and, consequently, the amount of food available for home consumption as well as the quantity of food and cash crop sold by the household.

This chapter describes what are thought to be the major determinants of maize and sesame production systems in the Lower and Middle Shabelle regions. These hypothesized determinants are grouped into resource endowment and institutional support services including market access, while the farmer crop technology is discussed in Chapter Five. The purpose of this chapter is to examine the relative importance of various factors in farm production and household food security, and the potential effect of changes in policy towards these factors on the welfare of different categories of farmers and on overall domestic food production.

4.1. Resource Endowments

4.1.1. Farm Size

The sample farmers reported their estimated landholding in either standard hectares or in the local measures (i.e., Jibaal or Darab) during the interviews, and the reported local measures were later converted into hectares¹. Table 4.1 shows the farm size of the sample of farmers not participating in the credit program.

¹. A Darab is equal to 4 Jibaals, and 1 Jibaal is equivalent to 625 square meters or 1/16 of a hectare.

Table 4.1
Mean Farm Size of the Control Sample of Farmers

District & Village	No. of Farms	Mean Farm Size (Ha.)	Maximum (Ha.)	Standard Deviation
<u>Lower Shabelle</u>	152	9.5	302.0	30.2
Afgoi				
Barire	21	25.0	302.0	65.0
Awdhegle	12	15.5	80.0	24.0
Darasalam	24	7.6	35.0	9.7
Merca				
Ugunji	25	12.8	188.0	37.5
Sigale	25	4.3	34.0	8.6
Samey Samey	20	3.0	11.0	3.3
Qorioley				
Bulo Sheikh	25	2.7	22.6	4.4
<u>Middle Shabelle</u>	73	3.1	10.0	2.3
Jowhar				
Kallundi	25	3.8	9.0	2.6
Bananey	24	3.1	10.0	2.1
Barrei	24	2.2	7.5	1.8

Source: FSP Surveys, computed from the control sample.

Even though farm sizes were not measured but were estimated, it is believed that these estimates of farm size are reasonably reliable given the fact that land is a valuable asset that is sold and rented by the unit. Hired labor at weeding is also generally contracted by area units. These reported farm sizes were generally divided into smaller plots, with an average of 2.5 separate plots per household. As the information in the table indicates, there is a great deal of variability of average farm size between the various districts and villages of the two regions. The three villages in Afgoi (i.e., Barire, Awdhegle and Darasalam) and one in Merca (i.e., Ugunji) have mean farm sizes exceeding eight hectares, while all of the rest are villages with average farm size below five hectares. The largest farms are found in Afgoi and Merca districts. Consequently, landholding are on average larger in the Lower Shabelle. Afgoi district has the highest mean farm size, 15.7 hectares, followed by Merca with average farm size of 7.0 hectares. Qorioley and Jowhar have the lowest farm sizes with average landholding of 3.1 and 2.7 hectares, respectively. These two latter districts are also characterized by a relatively more uniform landholding, consisting mostly of small farmers.

The proximity of Afgoi and Merca districts to the Mogadishu market and their good transportation networks have attracted a large number of urban elites to establish sizable farms after the policy liberalization in the early 1980s.

Conze and Labahn (1986) reported that a large number of former and current state officials and urban businessmen have established large farms in Afgoi. Similarly, Muzinger as reported by the above two authors previously indicated that the number of absentee farmers had increased dramatically in these areas of the Lower Shabelle in recent years.

As discussed in Chapter Two, it is more appropriate to characterize farmers according to farm size than simply on the basis of location because of the great variability of farm size in the study area. For analytical purposes, therefore, the sample farmers were divided into the following four categories according to the size of farms: "small", "medium small", "medium large" and "large" farms².

Table 4.2 shows the distribution of mean farm size in the study area. More than half of the farmers own two or fewer hectares. Farms of five or fewer hectares make up more than three-quarters of the farms. Even in Afgoi district, where the highest percentage of large farms are found, about 60 percent of the farmers cultivate five or fewer hectares. Merca and Qorioley districts have the highest concentration of farms with two or fewer hectares while Jowhar farmers consisted exclusively of farms with 10 or fewer hectares.

². The definition of who is a small, medium or large farmer is relative to the particular situation. The Ministry of Agriculture of Somalia defines small farmers as those cultivating five or less hectares, i.e. categories 1 and 2 in Table 3.2.

Table 4.2

Control Sample Distribution of Size of Farms
in Selected Villages in the Lower and Middle Shabelle

Farm Size Categories	Districts				Total	Cum. Percent
	Afgoi	Merca	Qorioley	Jowhar		
	- - - - Percent of Farms - - - -					
<u>1. Small</u> 0 - 2.0 Ha.	33.3	64.3	68.0	57.5	54.7	54.7
<u>2. Medium Small</u> 2.1 - 5.0 Ha.	26.3	17.1	24.0	24.7	22.7	77.3
<u>3. Medium Large</u> 5.1 - 10.0 Ha.	14.1	5.7	4.0	17.8	11.6	88.9
<u>4. Large</u> > 10 Ha.	26.3	12.9	4.0	0	11.1	100.0

Note: The figures refer to own farm land and, thus, do not include rented land.

Source: FSP Surveys, computed from the control sample.

Given existing technology and crop mix, there is generally a minimum threshold of farm land necessary to feed an average sized farm family. Farm households without sufficient land are able to rent additional land from other farmers in their village through the active system of tenancy known as "Doonfuul" that functions throughout the country³. Table 4.3 shows the incidence of tenancy in the study area, mean rented area and land rents during Der 1987.

³. The Somali word "Doonfuul" literally means 'tenant'.

Table 4.3

Percent of Farms Renting Land, Mean Rented Area
and Land Rents in the Study Area During Der 1987

Region & District	Farm Size Categories ^{1/}				Mean Rented Area (Ha.)	Rent/ Hectare (So.Sh.)
	1	2	3	4		
- Percent of Farms Renting -						
Lower Shabelle						
Afgoi	5	13	0	0	1.1	500
Merca	44	17	25	0	1.0	1,140
Qorioley	59	33	0	0	0.8	1,400
Middle Shabelle						
Jowhar	14	0	15	-	1.1	1,645
AVERAGE	30	12	11	0	1.0	1,290

1/ Farm size categories: 1=2 or fewer Ha.; 2=2.1 - 5.0 Ha.;
3=5.1 - 10.0 Ha.; 4=more than 10 Ha.
Source: FSP Surveys, computed from the control sample.

Tenancy is clearly more widespread among the smaller farms. Approximately 30 percent of the farms with 2 or fewer hectares (i.e., category 1) rented land while none of the farms with more than 10 hectares (i.e., category 4) did so during the season. In contrast, all reports in the survey of leasing out of land came from farms with more than 10 hectares. Qorioley and Merca farmers reported the highest incidence of tenancy, while Afgoi and Jowhar farmers reported the largest per household rented land during the Der season. Almost half of the Qorioley farms said they have rented in land while only five percent of the Afgoi farmers indicated having rented in land.

Land rents were highest in Qorioley and Jowhar, where average landholding per household are the lowest in the four study districts. Land rents ranged from a low of So.Sh. 500 in Afgoi to more than So.Sh 1,600 in Jowhar. As a result of the abundance of land in certain districts, land rents are lowest in these areas. In addition to this tenancy arrangement, there are a few share-cropping cases where the landowner shares in the harvest by receiving a fixed percent of the total harvested quantity.

4.1.2. Household Labor Availability

In addition to land, labor is a second major resource in the production of maize and sesame in the Lower and Middle Shabelle. The sample farmers were asked about their household size, where household is defined as those family members living together in the same house and who were eating from the same pot. Average family size for the control sample was found to be 7.5 members per household. This compares well with results of the TAMS 1986 study, where family size ranged between 6.8 to 7.3 persons per household from data collected in several villages located in the Merca and Qorioley districts. Table 4.4 shows the size of households and labor availability of the sample farmers.

Table 4.4
Households Size and Labor
Availability of the Sample Farmers

	Lower Shabelle	Middle Shabelle	Total
No. of Households	152	73	225
Mean family Size	7.0	8.7	7.5
Standard Deviation	4.1	4.9	4.4
Average Available No. of Adult Family Laborers ^{a/}	3.3	4.1	3.6

a/ Adult family labor was determined by excluding children under 15 and people over 60 years based upon reported age distribution of rural population (MNP, 1986)

Source: FSP Surveys, computed from the control sample.

Results in Table 4.4 also indicate that household size was on average larger in the Middle Shabelle (8.7) than in the Lower Shabelle region (7.0). This observed difference in the size of households between the two regions is likely a result of relatively greater land abundance offered by the smaller population density in the Lower Shabelle. The relative land abundance in the Lower Shabelle may allow adult children to move out and establish their own individual farms more easily than would be the case in the Middle Shabelle.

After deducting the number of minor children and older family members from total household size, the sample farm households reported an average of 3.6 able-bodied adults available for the farm enterprise. Again, the average available number of adults per farm household remains higher for the Middle Shabelle region, where average household size was larger. Farmers with smaller land holdings reported having the smallest family sizes. This fact is probably related to the household food security issue because smaller farms are simply unable to support a large family on their small piece of farm land. There may be several alternative hypothesis of the observed correlation between family size and landholding. Families on smaller farms may either tend to have fewer children or some of the family members may be forced to emigrate from the village to find livelihood elsewhere, thus, reducing the number of family members the farm has to support. The latter hypothesis seems to be the most likely given the

general lack of family planning in the country, particularly among the rural population in the country. Conversely, larger farmers need more labor to till the fields, thus, requiring them either to have larger families of their own and to retain more adult family labor on the farm, or to bring in relatives who live with them. The observed association between family and farm sizes could also be, to some extent, a life cycle phenomenon with younger, smaller families having smaller farms but expanding to larger farms as their family size increases.

4.1.3. Farm Machinery and Draught Power

Draught power for land preparation in Somalia comes exclusively from motorized tractors. Tractor use for land preparation is a common practice among farmers in both irrigated and rainfed areas of the country. Despite the general use of tractors for ploughing, only a handful of farmers in the study area owned tractors. The overwhelming majority of farmers rent tractor services from either private farmers or the public tractor hire agency (ONAT). Of the total 225 randomly selected farmers, only six (or less than three percent) owned tractors. Tractor owners were mainly the relatively large farmers found mainly in the Afgoi and Merca districts. Tractors are rented by the hour from private or public tractor hire services, and mainly used for land preparation. Mechanized cultivation, weeding, spraying and harvesting are very rare in the study area.

Some farmers prepare land with simple hand tools due to lack of access to either private or public farm machinery rental services. The hand tools that are used by farmers include the yambo, kawawa, garweyn, and faas. The yambo is a small hoe with a short handle used for seed-bed preparation and weeding. The kawawa is used for light land leveling, ridging and bunding. The garweyn is a digging tool while the faas is used for felling trees and bush clearing.

Animal traction is not used in the Shabelle valley. Although there are no available studies on the constraints to animal traction use, several reasons may explain the lack of animal traction tradition in the Somalia. These include tsetse fly infestation in some areas, the Somali nomadic culture which opposes the idea of putting animals to burdensome farm work, and the heavy clay soils, which justify the use of medium to heavy farm machinery.

4.1.4. Livestock Ownership

Farmers in the Lower and Middle Shabelle regions supplement their crop production with a limited livestock enterprise. In addition to milk and meat provision, livestock ownership serves farmers as a food security hedge against crop failures. During droughts, farmers sell livestock to gain access to purchased household food requirements. Also farmers sell animals for a variety of cash needs including seasonal

farm expenditures and various social events. A few animals, mainly cattle and goats, are generally kept within the homestead and their care relegated to children or a village herdsman, while the rest of the animals are grazed outside the village for most of the year. Livestock herds, other than those kept for milk, are grazed in the grasslands outside the river valley during the rainy seasons and brought closer to the village during the dry season. A majority of the farmers also keep a number of chickens for eggs and poultry meat. Very few farmers were found to own either camels or donkeys.

Table 4.5 shows the livestock ownership pattern of the sample farmers. Forty-one percent of the sample farmers in the Lower and Middle Shabelle reported owning cattle, with a sample-wide average of three head of cattle per household. However, some farmers reported having as many as 100 cattle. Only 18 percent of the sample farmers owned sheep and goats, with a sample average of one sheep or goat per farm. More than 80 percent of the sample possessed chicken, with a sample average of 9 chickens per household.

Table 4.5

Livestock Ownership Among FSP Sample Farmers

Animal Type/ District	# of Farms Owning	% of Farms Owning	Sample Mean # Animals	Stand. Deviation	Maximum # Animals Farm	Total # of Animals
<u>Cattle</u>						
Afgoi	36	63	5	14	100	267
Merca	34	49	4	10	50	280
Qorioley	9	36	2	5	20	49
Jowhar	13	18	2	4	30	113
TOTAL (N=225)	92	41	3	9	100	709
<u>Sheep & Goats</u>						
Afgoi	11	19	1	2	10	40
Merca	22	31	2	5	20	164
Qorioley	5	20	1	1	5	14
Jowhar	3	4	0	1	10	15
TOTAL (N=225)	41	18	1	3	20	233
<u>Poultry</u>						
Afgoi	43	75	9	11	60	492
Merca	62	89	12	24	200	863
Qorioley	20	80	9	11	40	215
Jowhar	57	78	7	7	40	506
TOTAL (N=225)	182	81	9	16	200	2,076

a/Only 4 and 5 farmers owned donkeys and camels, respectively.
Source: FSP Surveys, computed from the control sample.

4.2. Off-farm Activities and Income

Farm households in the Lower and Middle Shabelle grow several different crops on the farm, raise livestock, and engage in variety of off-farm activities. Off-farm income earning activities include wage labor on other farms, salaried employment in the villages or nearby towns, the production and sale of handicrafts, petty trade, fishing and remittances from family members working outside the village. Renting out tractors or land provide additional sources of cash income to households owning tractors or surplus land.

Off-farm income-earning activities are crucial for the livelihood of a significant part of the rural population. Despite their importance in rural welfare, off-farm employment and income sources are often overlooked in government development plans that look at ways of improving rural incomes. Table 4.6 shows the importance of the various alternative cash income sources in the study area.

Table 4.6

Percent of Households Reporting
Income From Various Farm and Non-Farm Sources

Income Source	Afgoi	Merca	Qorioley	Jowhar	Average
	- - - -	Percent of Households			- - - -
<u>Crop Sales</u>	79	83	88	89	84
<u>Livestock Sales</u>	7	19	24	14	15
<u>Off-Farm Activities</u>					
a. Labor Sales	47	74	92	84	72
b. Petty Trade	18	14	40	11	17
c. Handicrafts	18	21	12	10	16
d. Fishing	0	0	4	3	1
e. Remittances	12	17	20	5	12

Note: The figures represent the percent of households reporting gaining cash income from the various sources.

Source: FSP Surveys, computed from the control sample.

In spite of the importance of off-farm income, it appears that the sale of crops still remains the most common source of cash income for the sample farmers. (The absolute amount of the various income sources will be examined later.) More than 80 percent of the farmers reported earning cash from the sale of grains, fruits and vegetables. The sale of crop residues represents a major source of cash income after the Der harvest during which grazing materials become scarce.

Of the various off-farm activities in which farmers engage, sales of labor are the most frequent off-farm activity and second only to crops in potential importance as an income source. Almost three-fourths of the farmers reported having sold labor during 1987. The labor market is more active in those areas with a high concentration of plantation farms such as Jowhar and Qorioley.

Other sources of income include the sale of livestock, petty trade, handicrafts, fishing and remittances. Only 4 percent of the farmers in Qorioley and 3 percent of those in Jowhar reported river fishing as an income strategy. This is probably due to the widespread nomadic tradition that resists the consumption of fish across the country. On the other hand, livestock sales represents an important household food security strategy as a source of cash income in the event of crop failure. During normal seasons, farmers with surplus milk sometimes sell dairy products at the village market. The handicrafts sold by the Lower Shabelle farmers are mainly mats

and baskets, while stools made of wood and hide are the main products in the Jowhar district. Being a country where 100 percent of the population is Muslim, Somali farmers do not brew beer as is found among the small-scale rural industry in some other African countries.

As shown in Table 4.7 estimated yearly off-farm cash income is more important to the smaller farmers than it is to the larger farmers. Total cash income was calculated as the sum of the cash income from crop sales, livestock sales, and off-farm activities. Off-farm cash refers to income derived from sales of labor, handcrafts, river fish, and income received from petty trade and remittances. It is necessary to note that these figures do not refer to net income since production costs were not deducted, and the home consumed portion of own farm produced crop and livestock products were not included as part of income.

Farmers cultivating fewer than five hectares, which represent about 75 percent of the sample, derived over 40 percent of their total cash income from off-farm sources. In contrast, farmers with over 50 hectares derive less than 15 percent of the total cash income from off-farm sources. For the sample as a whole, off-farm cash income contributed about one third of farmers' total cash income.

Table 4.7

**The Importance of Estimated Annual Farm
and Off-Farm Cash Income By Farms Size, 1987**

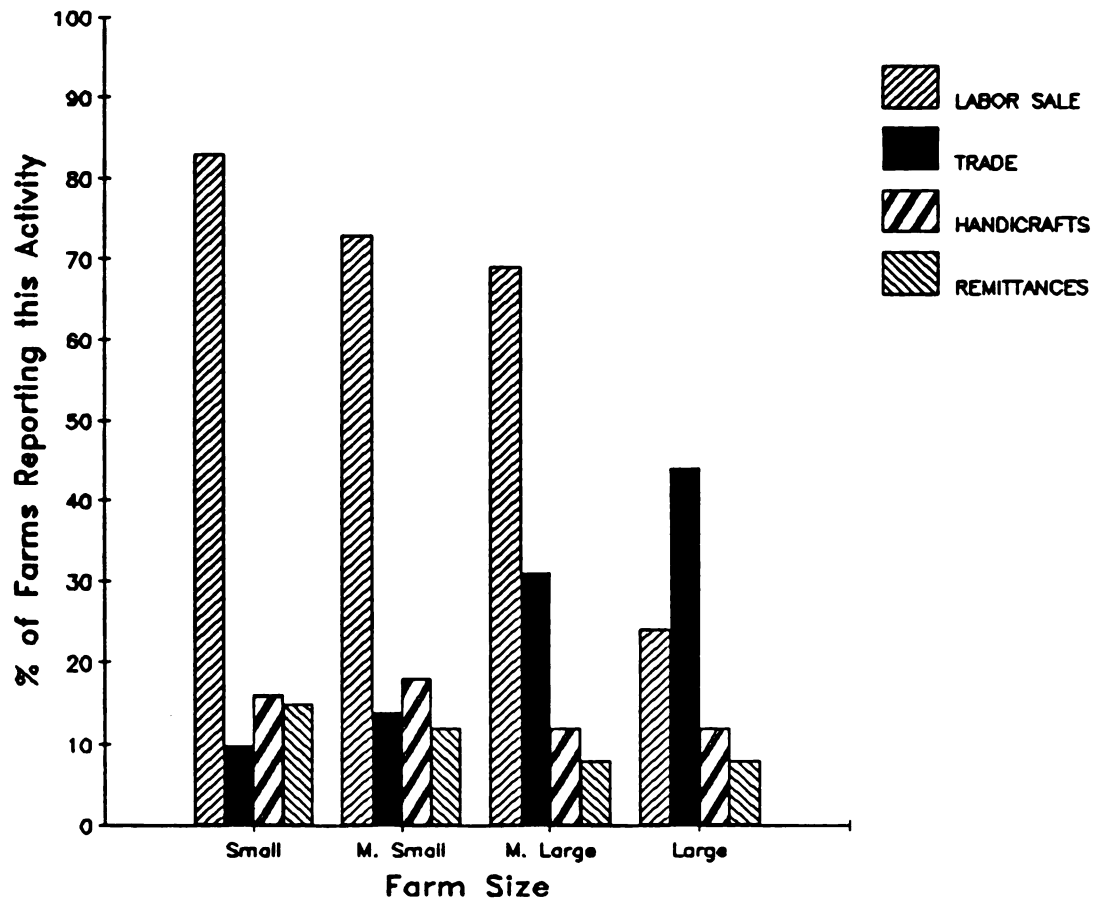
Distribution of Farm Sizes		No. of Farms	Total Cash Income (So.Sh.)	Income From Crop Sale (So.Sh.)	% Off-farm of Total Cash Income
< 2	Ha.	87	34,285	13,805	58
2 - 4.9	Ha.	80	53,440	29,940	41
5 - 9.9	Ha.	30	82,865	47,835	39
10-19.9	Ha.	10	140,655	113,715	19
20-49.9	Ha.	14	153,235	114,130	19
=> 50	Ha.	4	334,250	291,250	13
Total		225	65,035	39,695	36

Source: FSP Surveys, computed from the control sample.

Different sized farms have different requirements for alternative off-farm activities. Smaller farmers depend more on off-farm income than do larger farmers. Most of the smaller farms off-farm income is derived from the labor market (See Figure 4.1). About 83 percent of the small farmers participate in the local labor market, while only 24 percent of the larger farmers mentioned this.

Figure 4.1

**The Importance of Labor Sale, Rural
Trade and Remittance for Different Sized Farms**



Note: Small= 0 - 2.0 Ha.; M. Small= 2.1 - 5.0 Ha; M. Large= 5.1 - 10 Ha.; Large= more than 10 Ha.

Source: FSP Surveys, computed from the control sample.

Labor sale and remittances are relatively more important to small farmers while large farmers reported trading activities as their major off-farm activity. In fact, none of the farm households with over 20 hectares reported remittances from households members working elsewhere. Twelve to 18 percent of all farm size categories mentioned handicrafts as a source of off-farm income.

These observations indicate the importance of alternative income strategies of the farmers in the Lower and Middle Shabelle regions. Obviously, off-farm income-earning opportunities and their importance to different size of farms have significant policy implications. Off-farm activities are crucial for many households' income and household food security. They offer alternative income sources for gaining access to the available food in the market.

4.3. Maize and Sesame Production

Table 4.8 shows the geographic distribution of maize production in the study area and among different farm size categories. Ninety-two percent of the sample farmers produced a total of 566 metric tons maize in 1987. About 83 percent of the maize output was produced in the Gu season and the remaining 17 percent during the Der season. Afgoi farmers produced the largest part of the sample's maize production.

Table 4.8

The Distribution of Maize Output by
the Sample Farmers in the Study Area, 1987

Village	Total No. of Farms	% Farms Producing	Output Per Farm Farm Size Categories ^{1/}				Total Output
			1	2	3	4	
- Quintals Per Farm - -Quintals-							
<u>Afgoi</u>	57	87.7	12.3	25.4	69.8	140.2	3,266.5
1. Barire	21	85.7	17.7	25.0	90.8	285.2	2,298.0
2. Awdhegle	12	75.0	9.9	19.5	--	30.0	237.5
3. Darasalam	24	95.8	7.8	28.9	48.8	54.4	731.0
<u>Merca</u>	70	94.3	13.3	20.3	19.0	34.0	1,221.8
4. Ugunji	25	92.0	10.7	14.3	22.0	42.0	457.5
5. Sigale	25	100.0	17.6	27.5	25.0	36.0	510.5
6. Samey	20	90.0	9.5	25.8	4.0	11.5	253.8
Samey							
<u>Qorioley</u>	25	100.0	10.4	16.0	37.5	5.0	314.5
7. Bulo	25	100.0	10.4	16.0	37.5	5.0	314.5
Sheikh							
<u>Jowhar</u>	73	91.8	11.1	12.4	13.1	--	857.5
8. Kallundi	25	88.0	15.8	13.0	12.9	--	352.0
9. Bananey	24	95.8	11.4	14.3	16.0	--	312.5
10.Barrei	24	91.7	8.3	6.3	8.0	--	193.0
Total Sample	225	92.4	11.9	18.5	32.4	96.6	5,660.3

1/ Farm size categories: 1=2 or fewer Ha.; 2=2.1 - 5.0 Ha.;
3=5.1 - 10.0 Ha.; 4=more than 10 Ha.

Source: FSP Surveys, computed from the control sample.

About 58 percent of the sample's output was produced by Afgoi farmers out of which 70 percent of it came from Barire village alone. Barire is the closest village to Mogadishu and also has the highest concentration of large farms.

Not surprisingly, table 4.8 also shows the high degree of correlation between average maize output per farm and farm size. Farm Size Category 1 (i.e., those with two or fewer hectares) has the least mean output per farm (11.9 Qts.), while Farm Size Category 4 (i.e., those with more than 10 hectares) has the highest production of maize (96.6 Qts.).

About 48 percent of the sample farmers produced 121 metric tons of sesame in 1987. In contrast to maize, which is mostly produced in the Gu season, almost 91 percent of the sesame was produced during the Der season. Farmers with 10 or fewer hectares produced on average less than two Quintals of sesame. In contrast, farmers with 10 or more hectares (i.e., Category 4) produced on average more than 38 Quintals. Similar to the maize output pattern, Afgoi farmers again accounted for about 72 percent of the total sesame output produced by the sample, and Barire village alone contributed to more than 85 percent of it. Table 4.9 shows the geographic distribution of sesame production among the four different farm size categories in the study area. The results again show that large farmers produce most of the sesame in the study area.

Table 4.9

The Distribution of Sesame Output by
the Sample Farmers in the Study Area, 1987

Village	Total No. of Farms	% Farms Producing	Output Per Farm Farm Size Categories ^{1/}				Total Output
			1	2	3	4	
- Quintals Per Farm - -Quintals-							
<u>Afgoi</u>	57	49.1	1.0	1.5	2.1	55.1	884.6
1. Barire	21	52.3	0.7	0.5	1.0	124.3	756.9
2. Awdhegle	12	16.7	0.1	0.8	--	--	3.2
3. Darasalam	24	62.5	1.6	2.8	3.3	16.2	124.5
<u>Merca</u>	70	62.9	1.4	2.3	3.5	15.7	245.9
4. Ugunji	25	64.0	0.9	1.1	--	25.6	145.8
5. Sigale	25	52.0	1.5	5.5	7.0	2.3	58.5
6. Samey Samey	20	75.0	1.7	2.6	--	4.5	41.6
<u>Oorioley</u>	25	56.0	0.7	1.1	0.5	1.0	20.0
7. Bulu Sheikh	25	56.0	0.7	1.1	0.5	1.0	20.0
<u>Jowhar</u>	73	28.8	0.7	1.0	1.2	--	65.0
8. Kallundi	25	80.0	0.6	1.1	0.1	--	16.0
9. Bananey	24	37.5	0.7	1.1	2.3	--	26.0
10.Barrei	24	29.2	0.8	0.3	3.0	--	23.0
Total Sample	225	47.6	1.0	1.5	1.8	38.8	1,215.5

1/ Farm size categories: 1=2 or fewer Ha.; 2=2.1 - 5.0 Ha.;
3=5.1 - 10.0 Ha.; 4=more than 10 Ha.

Source: FSP Surveys, computed from the control sample.

4.4. Maize and Sesame Sales

The survey data show that not all maize and sesame growing farmers in the Lower and Middle Shabelle regions sell a marketable surplus. Reported sales, based on eight months of collected data, show that 49 percent of maize growing farmers, and 90 percent of those producing sesame, reported selling these crops in 1987.

Sales data are unavailable for the months of July, August, November and December. These missing months make both the number of farmers selling maize and sesame, and the quantities sold throughout the year, potentially incomplete. However, the available sales data and other information collected in the survey indicate that the critical two-month periods after the Gu and Der harvest are when most farmers tend to make the majority of their sales. It is, therefore, assumed that data from the critical months included in the survey cover over 90 percent of the marketed surplus. Table 4.10 shows the percent of farmers selling maize and sesame, and the average sales of those selling the products by district and farm size categories.

Table 4.10

Percent of Farms and the Average
Quintals of Maize and Sesame Sold Per
Farm by District and Farm Size Category, 1987

District	Maize Sales				Sesame Sales			
	Farm Size Categories ^{1/}				Farm Size Categories ^{1/}			
<u>Afgoi</u>								
% of Farms								
Selling	47.4	66.7	100.0	66.7	31.4	20.0	50.0	60.0
Average Sales ^{2/}	9.0	15.3	37.6	77.9	2.3	5.0	7.0	20.4
<u>Merca</u>								
% of Farms								
Selling	57.8	50.0	25.0	33.3	44.4	83.3	50.0	100.0
Average Sales	2.7	4.8	6.0	11.3	3.0	2.8	7.0	15.5
<u>Oorioley</u>								
% of Farms								
Selling	58.8	66.7	100.0	100.0	47.1	66.7	100.0	100.0
Average Sales	4.4	3.9	10.0	2.0	1.5	1.3	0.5	1.0
<u>Jowhar</u>								
% of Farms								
Selling	28.6	44.4	7.7	--	23.8	33.3	23.1	--
Average Sales	3.2	2.8	5.0	--	2.2	2.7	4.0	--
<u>Sample</u>								
% of Farms								
Selling	46.3	54.9	42.3	56.0	35.8	45.1	38.5	76.0
Average Sales	4.1	7.8	29.2	58.2	2.4	2.8	5.5	17.1
Sales as % of Output	10.1	23.2	38.3	33.7	90.0	86.7	100.0	33.5

1/ Farm size categories: 1=2 or fewer Ha.; 2=2.1 - 5.0 Ha.;
3=5.1 - 10.0 Ha.; 4=more than 10 Ha.

2/ Sales quantities are expressed in Quintals.

Source: FSP Surveys, computed from the control sample.

Among those selling products, Table 4.10 shows that farmers with two or fewer hectares reported gross sales of 4.1 Quintals of maize and 2.4 Quintals of sesame. This groups of farms are the most likely category of households that would buy maize from the market later on during the year. In contrast, farms of over 10 hectares sold an average of 58.2 Quintals of maize and 17.1 Quintals of sesame. In addition to higher per farm commodity sales, larger farmers also had a higher sales-to-output ratio. Most of the sales -both in terms of quantities sold and the percent of output sold- were made, therefore, by the larger farmers.

The higher sales to output ratio of sesame reflects the fact that sesame is produced primarily as a cash crop. With the exception of large farms, the sample farmers sold more than 86 percent of their sesame output. In contrast, the large farms that produce the bulk of the sesame reported selling only about a third of their 1987 sesame output. Note that most of this group of farms are situated in Afgoi and Merca districts. This high retention perhaps indicates that farmers in these districts sell sesame in processed sesame oil. By processing sesame into sesame oil and selling the oil, these farmers are able to capture the benefits of value added.

Overall, the sample farmers reported maize gross sales of 159 metric tons (or 28 percent of total output), and gross sesame sales of about 55 metric tons (or 45 percent of output), during the eight months for which data were

available. Extrapolated to a 12-month period, the sample farmers marketed approximately 31 percent of their maize output and 50 percent of their sesame output.⁴ Based on population and per capita grain consumption, a 1984 grain marketing study estimated that perhaps 40 percent of production is marketed (Asser et al., 1984). Therefore, the reported gross marketed portion of maize from the present study appears quite plausible.

4.5. Maize Purchases and Stocks During the Hungry and Harvest Periods of the Year

Available farm household food supplies fluctuate as a result of the seasonal nature of agricultural production. This fluctuation of output and stocks brings with it times of plentiful food supplies and times of food shortages. At harvest, the overwhelming majority of households have some maize on hand to satisfy family consumption needs. However, farmer-held maize stocks decline as the season progresses and stock levels reach their lowest levels just before the next harvest is due. To understand the seasonality of transitory household food insecurity, information on household maize stocks and purchases was gathered in June and October of 1987. Table 4.11 shows the pattern of monthly maize purchases during the pre-and post-harvest periods by district.

⁴. This extrapolation is calculated on the assumption that these eight months for which sales data is available account for 90 percent of annual sales.

Table 4.11

**Household Monthly Maize Purchases
During Harvest and Hungry Periods, 1987^{1/}**

Period & Farm Size Categories	Percent of the Farms Purchasing	Average Purchases Per Farm			
		Afgoi	Merca	Qorioley	Jowhar
- - Kgs. Purchased Monthly - -					
<u>Pre-Harvest (June)</u>					
Farm Size Categories:					
1) 0 - 2.0 Ha.	54.5	94.7	38.7	100.9	56.3
2) 2.1 - 5.0 Ha.	41.2	101.9	55.2	144.0	43.2
3) 5.1 -10.0 Ha.	38.5	179.3	0	100.0	37.5
4) > 10 Ha.	20.0	184.0	57.3	0	--
Average	45.8	114.0	42.7	110.8	50.1
<u>Post-Harvest (Oct.)</u>					
Farm Size Categories					
1) 0 - 2.0 Ha.	8.1	86.7	48.0	106.0	37.5
2) 2.1 - 5.0 Ha.	7.8	0	4.0	0	58.3
3) 5.1 -10.0 Ha.	3.8	0	0	0	144.0
4) > 10 Ha.	4.0	0	0	120.0	--
Average	7.1	86.7	26.0	110.7	58.6

1/ Only households with reported purchases are included.

Note: The two periods refer to the months of June and October, 1987.

Source: FSP Surveys, computed from the control sample.

A significant change is observed in the number of farmers purchasing grain from the market at the hungry season in June and at the harvest period in October. Forty-five percent of the entire sample reported purchasing maize from the market during the pre-harvest period while only seven percent bought maize after the harvest. More of the relatively smaller farmers purchase maize both during the hungry and harvest periods than do the relatively larger farmers.

During the hungry season, about 54 percent of those with two or fewer hectares purchased while only 20 percent of the farms with 10 or more hectares reported maize purchases at the time. Average maize purchases per farm both at the hungry and harvest season appear to be relatively higher in Afgoi and Qorioley than in the other two districts. The results also show that some small farmers in all four district continued to buy maize right after the harvest. The medium large and large farmers in Jowhar and Qorioley purchasing maize at harvest do so either to augment to their stocks or perhaps buy it to sell later during the year. With the exception of the medium large and large farmers, mean quantities purchased decline at harvest.

Maize stocks held by farmers in the Middle and Lower Shabelle regions generally follow a seasonal pattern, with peaks at harvest times in the Gu and troughs at the pre-harvest period. Maize is stored in large underground pits

known in Somali as 'bakaar'. Table 4.12 shows the stock position of farmers in the four districts by farm size category at both the hungry and harvest seasons.

Only about 20 percent of the farmers reported holding maize stocks during the hungry period, with district-wide means per farm ranging from as low as 1.4 Quintals in Merca to as high as approximately 10.6 Quintals in Afgoi. Virtually all maize-producing farmers in the sample had some maize stocks after the 1987 Gu harvest in October, with average quantities per farm ranging from a low of 2.7 Quintals in Jowhar to a high of 15.7 Quintals in Afgoi.

Since farm and/or off-farm income allows farmers to purchase maize and other grains from the market, low levels of maize stocks do not necessarily imply lower household food security. One of the benefits of the liberalization of the grain trade has been the increased availability of grain in the market during the hungry season. During the era of state monopoly of the grain trade, farmers were not allowed to store any grain beyond household grain requirements, and ADC did not sell back its stocks in the rural areas. Before the policy reforms, farmers who ran out of their household grain supplies could not easily purchase maize from the markets while those with extra stocks were unable to sell their maize openly in the market and to benefit from the seasonal price increases.

Table 4.12
Household Monthly Maize Stocks
During Harvest and Hungry Periods, 1987^{1/}

Period & Farm Size Categories	Percent of Farms with Stocks	Average Stocks Per Farm			
		Afgoi	Merca	Qorioley	Jowhar
- - Quintals in Stock - -					
<u>Pre-Harvest (June)</u>					
Farm Size Categories:					
1) 0 - 2.0 Ha.	13.0	13.3	1.3	0.5	1.5
2) 2.1 - 5.0 Ha.	15.6	3.5	1.0	0	2.0
3) 5.1 -10.0 Ha.	26.9	2.5	1.8	0	4.5
4) > 10 Ha.	52.0	13.8	1.7	3.0	--
Average	19.6	10.6	1.4	1.8	2.8
<u>Post-Harvest (Oct.)</u>					
Farm Size Categories:					
1) 0 - 2.0 Ha.	89.4	3.5	4.5	2.2	2.1
2) 2.1 - 5.0 Ha.	90.2	5.8	6.7	4.4	3.0
3) 5.1 -10.0 Ha.	88.5	11.0	7.7	10.8	4.6
4) > 10 Ha.	88.0	40.4	11.4	0	--
Average	89.3	15.7	5.8	3.2	2.7

1/ Only households with reported stocks are included.

Note: Again, the two periods refer to the months of June and October, 1987.

Source: FSP Surveys, computed from the control sample.

4.6. Maize Output Levels and Some Selected Household Characteristics

This section examines the characteristics of the farms producing different levels of maize. On the basis of total household maize output, farmers were grouped into four quartiles. Table 4.13 displays the four output classes and their relevant resource levels and other characteristics.

The results clearly show that the bulk of the maize output in the sample is produced by farmers with the highest output per person, the largest maize cultivated area, farm size, yields, cash income, household size, and number of cattle. The mean area allocated to maize in all four quartiles shows a sharp increase as farm size increases. In addition to the larger output levels of the relatively better endowed farmers, the upper quartiles also have higher maize yields which suggests that larger farmers perhaps employ more improved practices than smaller farms. Technology adoption among different size of farms will be analyzed in the next chapter.

Table 4.13

**Farm Household Characteristics
by Maize Output Categories**

Farm Household Characteristics	Household Maize Output Classes			
	Bottom 25 %	Lower Middle 25 %	Upper Middle 25 %	Top 25 %
Average Output Per Farm (Qt)	4.4	10.7	18.6	73.8
Output/Person (Qt)	1.0	1.9	3.6	10.9
Cultivated Area (Ha)	0.8	1.8	2.2	7.6
Farm Size (Ha)	2.2	2.3	3.6	17.7
Yield (Qt/Ha)	6.8	9.4	11.1	14.1
Total Cash Income Per Farm (000 So.Sh)	30.9	44.4	57.9	129.1
Off-Farm Cash Income Per Farm (000 So.Sh)	16.0	22.4	24.3	29.8
Household Size (No)	5.7	7.7	8.0	8.6
Cattle Owned (No)	1.0	2.0	3.0	7.0
% of Household Purchasing Maize at:				
Hungry Period (%)	58.0	47.0	44.4	25.0
Harvest Period (%)	20.0	9.0	0	0
Per Capita Maize Purchases Per Month at:				
Hungry Period (Kg)	9.3	12.0	21.1	13.4
Harvest Period (Kg)	11.4	16.7	0	0

Source: FSP Surveys, computed from the control sample.

The results also show that more than half of the bottom quartile reported buying maize from the market during the pre-harvest hungry season while only one quarter of the upper quartile indicated purchases during this period. At harvest, the need for market maize purchases declined sharply for all output classes. None of the upper two quartiles purchased maize at all during the harvest season, while 20 percent of the bottom quartile still continued to buy maize during the harvest season.

The percent of household purchasing maize in the two periods apparently reflects the stocks position of the households. Households in the upper quartiles are relatively more able to store their annual maize requirement for home consumption. Among those purchasing maize at the hungry period, the two upper quartiles are able to make higher per capita purchases than do the two lower one. This is mainly an income effect in which the better off farmers are able to buy more maize in times of need than the relatively poorer households. Per capita household maize purchases increase during the harvest period when maize prices reach their seasonal low.

4.7. The Potentially Food Insecure Households

What proportion of the farmers are food insecure, and what are the characteristics of the relatively more vulnerable farmers? These are extremely important policy relevant

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questions, particularly in the design of poverty alleviation programs targeted to the most needy groups. The sample farmers reported an average per capita maize requirement of 157 Kg. per year. Taking this estimate into account, net household per capita maize availabilities were calculated for the sample farmers. Households with less than this per capita requirement were grouped as deficit, and those with above it as surplus.

Net maize availability was computed as the sum of 1987 maize output, purchases, and maize gifts received minus gifts given out and sales. Estimates for the annual sales were extrapolated from the available 8-month sales data and 2-month purchases data. First, the purchased quantities in July and May were assumed to be the same as the reported purchases in the month of June, while September and November purchases were assumed to be similar to October purchases. Second, the yearly purchases were estimated by assuming that purchases in these estimated 6-month period constitute 80 percent of the year. In this way, net annual per capita household maize availability was calculated, and then this estimate was compared with the per capita maize requirements. The analysis is expected to roughly indicate the magnitude of the group of potentially vulnerable farmers. Table 4.14 presents estimates of the household average per capita net maize availability, and the percent of households falling into either potentially deficit or surplus positions during 1987.

Table 4.14

1987 Maize Deficit and Surplus
Farm Households in the FSP Sample

Farm Size Category	Household Average Per Capita Net Available Maize (Kg)			
	Deficit Households		Surplus Households	
	% of Farms	Available Maize -Kg/person-	% of Farms	Available Maize -Kg/person-
1) 0 - 2.0 Ha.	49.6	99.1	50.4	401.0
2) 2.1- 5.0 Ha.	51.0	93.2	49.0	374.2
3) 5.1-10.0 Ha.	57.7	72.8	42.3	356.1
4) > 10 Ha.	28.0	43.1	72.0	1,065.7
All Farms	48.4	90.5	51.6	494.1

Source: FSP Surveys, computed from the control sample.

About half of the farmers are estimated to have net deficits in maize. Strikingly, more than 50 percent of the farms with 2.1 to 10 hectares are deficit in maize. Twenty-eight percent of the farmers with more than 10 hectares were also estimated to be deficit in annual maize requirements. These are more likely farms that did not grow maize in 1987, or have grown very little relative to their available land. Overall, the deficit households had available on average about 57 percent of their total annual per capita maize requirement.

Deficit farmers with the available income supplement their stocks with market purchased food, while the households who cannot afford to buy food absorb the deficit through reduced consumption. Surplus farmers keep more maize than they need for a year partly as a food security reserve in the case the next season's harvest fails.

Table 4.15 shows several characteristics of the surplus and deficit households broken down into four categories based upon per capita net maize availability. In addition to farm size, other distinguishing characteristics of the surplus farmers, compared to deficit ones, include being slightly more educated, having a greater percentage of land registration, owning more livestock, participating more proportionally in formal credit, extension service and cooperatives, and having a higher adoption rate of Somtux maize variety.

Table 4.15

Selected Characteristics of the
Maize Deficit and Surplus Households

Household Characteristics	<u>Deficit Households</u>		<u>Surplus Households</u>	
	Lower 50 %	Upper 50 %	Lower 50 %	Upper 50 %
Mean Per Capita Availability (Kg.)	49.8	118.2	199.9	838.8
Farm Size (Ha.)	3.6	3.1	4.4	14.7
Number of Cattle	1.6	2.6	2.3	5.4
% of Farms Using Somtux Variety	19.1	21.0	28.0	44.3
% of Farms with Formal Credit	9.4	19.8	13.5	22.6
% of Farms with Formal Education	45.3	40.0	34.6	54.7
% of Farms with Extension Contact	20.8	27.7	21.2	26.4
% of Farms with Land Registration	38.5	40.0	38.5	64.2

Source: FSP Surveys, computed from the control sample.

4.8. Government Services and Infrastructure

4.8.1. Formal Credit Services

The role of both the Somali Development Bank (SDB) and the Somali Commercial and Savings Bank (SCSB) in extending farm credit has been discussed in Chapter Two. The special UNCDF fund managed by the SCSB represents the only formal credit source where small farmers in the two regions obtain seasonal credit. Credit is provided to a small number of project beneficiaries in the form of improved maize seed, fertilizer and insecticides. About 90 percent of the credit is given during the Gu season when rainfall is more reliable and returns from investment in modern inputs are more assured. A total of 3,953 farmers have obtained credit from this project between 1984, when the project began, and 1987. The project provided input needs for an average of 2.4 hectares per farm household. Out of the 1,521 farmers who received credit in 1987 from the project, 76 farmers (or roughly 5 percent) were interviewed during the course of this study.

The UNCDF credit program represents a pilot initiative with very limited coverage. On average a little less than a thousand farmers per year have received credit from the project, yet the program has been able to transfer significant income to the small number of project beneficiaries in the form of the subsidized inputs and subsequent improved yields. The interest rate charged on the UNCDF loans is only 10 percent per year while annual inflation in the country has

been running at an average rate of around 30-50 percent. This yields a negative real interest rate of 20-40 percent. This income transfer is even larger when considering the project's monetary overhead costs.

Table 4.16 presents information about the sample of 1986 and 1987 UNCDF credit recipients and their mean farm sizes. The number of sample farmers in each district that dropped and entered the credit program in 1987 are also shown. The 83 credit receiving farmers in 1986 had an average of 12.5 hectares. As the mean farm sizes of the 1986 and 1987 credit samples show, the adjustment that took place between the two years was that many smaller farmers in Jowhar stop receiving credit through the program, while larger farmers in Afgoi were added. The number of Jowhar credit recipients in the sample declined sharply from 28 in 1986 to 9 farmers in 1987. On the other hand, the number of credit receiving farmers in Afgoi increased while the number of participants in Merca and Qorioley remained virtually unchanged.

Table 4.16

Mean Farm Size for the Sample of 1986
and 1987 UNCDF Credit Receiving Farmers

District	1986 Credit Sample		Adjustments in 1987 to the 1986 Credit Sample				1987 Credit Sample	
	# of Farms	Farm Size	# of Drops	Farm Size	# of Adds	Farm Size	# of Farms	Farm Size
		-Ha.-		-Ha.-		-Ha.-		-Ha.-
Afgoi	25	28.3	6	16.5	17	33.6	36	32.8
Merca	21	7.3	8	14.8	9	10.0	22	5.7
Qorioley	9	10.7	0	--	0	--	9	10.7
Jowhar	28	2.9	25	2.9	6	2.5	9	2.7
<u>TOTAL</u>	83	12.5	39	7.4	32	21.1	76	18.8

Source: FSP Surveys, computed from the 1986 and 1987 credit samples.

The target group that the UNCDF credit project was intended to benefit in 1986 consisted of those farmers cultivating five or fewer hectares, and in 1987 this target was revised to allow a 12 hectares limit. Yet, the Afgoi project beneficiaries in both 1986 and 1987 display a mean landholding that is more than twice the revised ceiling. In fact, most of the credit receiving farmers in Afgoi and some in Merca actually had much larger farms than the 12 hectare size ceiling for the intended project beneficiaries.

Thus, the relatively larger farmers appear to have enjoyed a preferential transfer of additional productive resources not shared by the rest of the farm population through the 'soft' loans provided under the UNCDF seasonal credit program. Access to the formal loans appears to be largely influenced by farm size and location, and this fact is crucial in terms of the distributive effect of the project.

The t-test is used in this analysis to examine the association between participation in the credit program and maize output and yields. To reduce the confounding effect of farm size, farmers are grouped into four similar farm size categories. Table 4.17 displays results of a test of the association between participation in the formal input credit program and maize output and yields.

Farms in size categories 2 and 4 show that higher maize output is significantly associated with participation in the credit program. Credit receiving farmers in these categories produced more maize per farm than the non-credit receiving farmers. Furthermore, the credit participants also had higher per capita maize output than non-participants. The results show that higher yields are the basic reasons behind the differences in output among the two groups of farmers. Because credit is given in the form of inputs which affect productivity, formal credit was a likely factor in maize yields. Credit recipients in farm size categories 2 and 4 obtained significantly higher maize yields.

Table 4.17

The Association Between Formal
Credit Participation and Maize Production,
Per Capita Output and Yields, Gu 1987

Credit Program Participation	No. of Farms	Output/ Farm (Qts.)	Output/ Person (Qts.)	Mean Yield (Qts/Ha.)
<u>1) 0 - 2.0 Ha.</u>				
With Credit	22	11.4	3.4	10.0
Without Credit	112	9.8	2.3	10.6
T-test significance ^{a/}		ns	ns	ns
<u>2) 2.0 - 5.0 Ha.</u>				
With Credit	20	21.4	2.7	13.5
Without Credit	42	14.5	2.6	9.8
T-test significance ^{a/}		*	ns	***
<u>3) 5.1 - 10 Ha.</u>				
With Credit	7	34.9	8.6	13.5
Without Credit	24	25.5	2.7	9.8
T-test significance ^{a/}		ns	*	ns
<u>4) > 10 Ha.</u>				
With Credit	27	114.4	14.1	14.7
Without Credit	15	52.2	8.9	9.8
T-test significance ^{a/}		*	ns	**

a/ T-test significance levels refer to the observed significance level of the difference of means test:

- *** = significant at the 1 % level,
- ** = significant at the 5 % level,
- * = significant at the 10 % level,
- ns = not significant.

Source: FSP Surveys, computed from the 1987 control and credit samples, i.e. N=269.

Differential access to inputs made available through the seasonal farm credit program are, therefore, likely to be important determinants of farmers' production, yields, and farm incomes. Further analysis of the effect of inputs through the credit program on farm yields is investigated in Chapter Five.

4.8.2. Land Tenure and Title Registration

As discussed in Chapter Two, the land registration process involves a lengthy sequence of formal application, inspection and visit to the site by the district officer of the DLWR. While registration has been under way for more than a decade, the majority of farmers in the country have not registered their land due to bureaucratic difficulties involved in the process. Farmers with unregistered farm land continue to cultivate these lands under the traditional land tenure system of tribal ownership which recognizes use rights of farm households for the land cleared by members of the family. However, this traditional rule of legitimacy inherent in enjoying the use rights of one's own labor is increasingly coming under fire.⁵

⁵. The traditional tenure system allowed for inheritance and transfers of land between two willing parties either through trade or other agreed-upon terms including gift.

Without reference to who has previously invested in the land, the new rules of the game as dictated by the current land law recognize legitimacy only of the person holding the official certificate of registration. The DLWR officer and other local government officials are expected to ascertain whether registration applicants have a legitimate claim to the piece of land before the title certificate is issued, but the underdeveloped institutional and legal system coupled with the abysmally low salaries paid to government employees at all levels give ample opportunities for corruption and improper inspection of new registration applications. Land disputes have become an almost everyday occurrence as a result of improperly registered land that gave the legal use privileges to someone else other than the family which for years (and possibly for several generations) had tilled that land. These disputes are more prevalent in the irrigated areas, especially in the better-located districts with fertile, easily irrigable land that is close to major market towns.

Table 4.18 presents the association between maize output and land registration. The t-test confirms a statistically significant relationship between maize yields and land registration only for farms with over five hectares.

Table 4.18

The Association Between Land
Registration and Maize Production,
Per Capita Output and Yields, Gu 1987

Land Registration	No. of Farms	Output/ Farm (Qts.)	Output/ Person (Qts.)	Mean Yield (Qts./Ha.)
<u>1) 0 - 2.0 Ha.</u>				
With Title	52	10.0	2.7	10.8
Without Title	59	8.6	1.9	10.5
T-test significance ^{a/}		ns	ns	ns
<u>2) 2.0 - 5.0 Ha.</u>				
With Title	17	16.4	4.3	10.6
Without Title	25	13.2	1.5	9.2
T-test significance ^{a/}		ns	**	ns
<u>3) 5.1 - 10 Ha.</u>				
With Title	10	36.4	3.5	16.3
Without Title	14	17.7	2.1	8.9
T-test significance ^{a/}		ns	ns	***
<u>4) > 10 Ha.</u>				
With Title	11	65.3	11.4	15.1
Without Title	4	16.3	2.3	8.3
T-test significance ^{a/}		ns	ns	**

a/ T-test significance levels refer to the observed significance level of the difference of means test:

- *** = significant at the 1 % level,
- ** = significant at the 5 % level,
- * = significant at the 10 % level,
- ns = not significant.

Source: FSP Surveys, computed from the 1987 control sample, i.e., N=193.

Security of tenure provides the relatively larger farmers the incentives to invest in land improvements, such as better land leveling, drainage and other measures which notably enhance land productivity. Nevertheless, the t-statistic indicates no significant differences in total maize output between the two groups of farmers.

4.8.3. Access to Markets

Access to product and input markets plays a significant role in farm production. Farmers need reliable markets to sell their output and to purchase from the market the necessary inputs used in the production process. Marketing services, thus, affect farmers' cropping pattern, sales and storage behavior by inducing farmers without easy market access to become more subsistence oriented than if they had easier access.

The ten sample villages in the four study districts all lie on feeder roads that connect them to the major all-weather roads, and none of these villages lies more than 100 Km. from Mogadishu (See Map 2.2). In addition to being the largest metropolitan consumption center in the country, Mogadishu serves as the main distributive center for both domestic and imported food in the country. Supplies of domestically produced foodstuffs are brought into Mogadishu by a variety of marketing agents. Some of the goods are consumed within the

city but a significant portion are purchased by traders who transport these commodities for distribution around the country.

Taking the distance of the various villages from Mogadishu as a proxy for market access, each sample village was classified as "close" or "far". The three villages in the Afgoi and two in the Merca district were classified as "close" while the village Samey Samey in Merca, which lies off the main feeder road, and those located in Qorioley and Jowhar were grouped as "far" from the city. The 'close' villages lie within a radius of less than 60 km. from the capital city, while the 'far' villages are more distant than that. Obviously, the cost of transporting goods from the various villages to the city varies with their respective distance from Mogadishu. In addition to lower transportation cost, the traffic of villagers to and from Mogadishu is higher in the closer villages. The heavier traffic of travelers to and from the city facilitates the flow of the informal word-by-mouth market information that farmers mainly depend on for information about supply and demand conditions in the market.

Table 4.19 shows the association between distance from Mogadishu and maize output and yields. With the exception of category 4 which did not include sufficient number of farms for the t-test, the table gives the results of the t-test showing that the differences of means of virtually all variables are statistically significant.

Table 4.19

The Association Between Market
Access and Maize Production, Per
Capita Output and Yields, Gu 1987

Market Access	No. of Farms	Output/ Farm (Qts.)	Output/ Person (Qts.)	Mean Yield (Qts/Ha.)
<u>1) 0 - 2.0 Ha.</u>				
Close	43	11.9	3.0	12.3
Far	69	7.5	1.8	9.6
T-test significance ^{a/}		***	**	**
<u>2) 2.0 - 5.0 Ha.</u>				
Close	19	19.8	4.2	10.7
Far	23	10.1	1.3	9.1
T-test significance ^{a/}		**	**	ns
<u>3) 5.1 - 10 Ha.</u>				
Close	9	48.6	5.7	16.2
Far	15	11.6	0.9	8.4
T-test significance ^{a/}		***	***	***
<u>4) > 10 Ha.</u>				
Close	14	59.1	10.2	--
Far	1	7.5	0.4	--
T-test significance ^{a/}		na	na	--

a/ T-test significance levels refer to the observed significance level of the difference of means test:

*** = significant at the 1 % level,

** = significant at the 5 % level,

* = significant at the 10 % level,

ns = not significant

na = not applicable.

Source: FSP Surveys, computed from the 1987 control sample,
i.e. N=193.

Therefore, the evidence indicates a close association between maize yields and access to a major market town. But since distance to market may be correlated with other important variables, such as farm size and land registration, the independent effect of distance on production and yields cannot be sorted out in this kind of crosstabulation. A multivariate analysis later in this chapter is used to examine further the effect of market access on household production.

4.8.4. Extension Services

The extension service is a crucial public institution that bridges the gap between the generation and the diffusion of technology. As technology is generated and tested for appropriateness by the ARI, the AFMET project in Somalia is entrusted with the responsibility of national crop extension activities. The AFMET project employs the widely used Training and Visit (T & V) system in which a number of "progressive" farmers are selected as extension contacts. The village field extension agents (FEAs) periodically visit these contact farmers and train them in the use of improved technologies and about the corresponding recommended applications of inputs and cultural practices.⁶

⁶. In the Lower and Middle Shabelle regions, each FEA had 48 contact farmers with whom he constantly worked.

Therefore, contact farmers are expected to be the first adopters of new technology, and consequently to achieve improved productivity and incomes. Fifty-six of the 225 randomly chosen control sample of farmers reported being contact farmers. Table 4.20 shows the association between access to extension training and maize output and yields.

The results indicate that the "progressive" farmers selected to become contacts for the extension service do not necessarily have any better yields than the rest of the farmers. Differences of the maize yields of the two groups were statistically insignificant. Thus, access to extension services without the accompanying yield-increasing inputs may have little effect in increasing yields.

Table 4.20

The Effect of Access to Extension Services on Total
Maize Production, Per Capita Output and Yield, Gu 1987

Extension Participation	No. of Farms	Output/ Farm (Qts.)	Output/ Person (Qts.)	Mean Yield (Qts./Ha.)
<u>1) 0 - 2.0 Ha.</u>				
Contact	14	8.0	1.5	7.9
Non-contact	98	9.4	2.4	11.0
T-test significance ^{a/}		ns	ns	*
<u>2) 2.0 - 5.0 Ha.</u>				
Contact	9	16.0	2.1	8.7
Non-contact	33	14.1	2.8	10.1
T-test significance ^{a/}		ns	ns	ns
<u>3) 5.1 - 10 Ha.</u>				
Contact	7	32.7	3.1	13.4
Non-contact	17	22.5	2.6	10.9
T-test significance ^{a/}		ns	ns	ns
<u>4) > 10 Ha.</u>				
Contact	12	51.9	8.9	8.7
Non-contact	3	53.3	8.9	13.4
T-test significance ^{a/}		ns	ns	ns

a/ T-test significance levels refer to the observed significance level of the difference of means test:

- *** = significant at the 1 % level,
- ** = significant at the 5 % level,
- * = significant at the 10 % level,
- ns = not significant.

Source: FSP Surveys, computed from the 1987 control sample,
i.e. N=193.

4.9. Determinants of Household Grain Production

The magnitude of total household farm output is a good measure for assessing household income. On the other hand, per capita output measures how large the share is for each individual family member once the pie is divided up among the household members. To combat poverty and household food insecurity effectively among the farmers living in the Lower and Middle Shabelle regions as well as in other parts of the country, policy-makers require an understanding of the basic factors that affect household production and rural incomes.

Farm production is affected by the physical, institutional and socio-economic environments in which farmers operate. These factors, through their effects on cultivated crop area and yields, affect the quantities produced. The physical environment includes weather, soil fertility, pests and diseases. Access to input credit, extension services, and input and output markets are some examples of the institutional factors that are relevant to farm production. The socio-economic environment includes household resource endowments and such demographic characteristics as family size, education, and farmers' age. Resources include farm land, family labor, and capital.

To evaluate the importance of the various factors in influencing output, simple models of per capita household maize and sesame production were estimated using ordinary least squares (OLS) regression analysis. Per capita maize

production during Gu 1987 and per capita sesame production during Der 1987 were used as dependent variables in the regression equations. The models relate per capita maize and sesame production to the physical, institutional, and socio-economic factors that are believed to influence per capita area cropped, yields or both. One equation has been estimated for each crop.

The variable district was included as proxy for the potential agro-climatic and other natural variation within the study area. Dummy variables were entered for each district, using Jowhar as the base district. Per capita endowments of land, and livestock and per capita off-farm cash income were included as independent variables. Off-farm cash income was included in the equation because households with more cash income from off-farm activities are believed to be better able to meet farm expenditures than others. Since improved technology exists only for maize, a technology variable was included in the maize equation. Fertilizer use was taken as a proxy for technology, and applied fertilizer quantities were entered. Market access was defined as a dummy variable, with the 'close' to the capital city given 1 and 0 for the others. Land registration and extension contact were also defined as dummies, with the value of 1 for the households with land registration certificate and who participate in extension training. The regression results of the two equation are given in Table 4.21.

Table 4.21

Estimated Equations of Per Capita Maize Production
in Gu 1987 and Per Capita Sesame Production in Der 1987

Variable:		Per Capita Maize Output		Per Capita Sesame Output	
Variables	Coefficient	T-Statistic	Coefficient	T-Statistic	
Intercept	0.2	0.6	0.2	0.3	
P.c. available land	1.8	10.5	0.6	3.9	
P.c. cattle	1.3	4.6	0.5	1.5	
P.c. off-farm income	4.9×10^5	0.7	$- 5.1 \times 10^5$	- 0.9	
Fertilizer use	5.1×10^3	1.6			
Market access	- 0.8	- 0.6	- 0.6	- 0.6	
Land Registration	1.6	2.2	1.3	2.0	
Extension contact	- 0.3	- 0.4	0.4	0.6	
District:					
DV1 (Afgoi)	3.5	2.1	1.7	1.3	
DV2 (Merca)	- 0.2	0.2	- 1.0	- 0.9	
DV3 (Qorioley)	0.8	0.7	- 0.5	- 0.5	
Adjusted R ²	0.54		0.36		
F Ratio	34.08		9.84		
Number of observations	281		142		

Source: FSP Surveys, computed from all maize and sesame growing farmers.

The regression coefficients of the two equations (0.54 and 0.36 for the per capita maize and sesame equations, respectively) indicate that the models were able to explain only a portion of the observed variability of per capita output among the farm households. The above two equations confirm the crucial importance of land availability per person in explaining per capita maize and sesame output. The models show that differences in per capita cultivated area for each crop is strongly affected by the availability of land.

In the case of maize, farm households with larger herds of cattle appear to have higher per capita maize output while cattle ownership was not found to significantly affect sesame output per person. One possible explanation for this might be that households with larger cattle herds produce surplus milk that is sold in the market. As a result, these households have relatively better cash flow position which enables them to better meet maize crop expenditures for hiring tractors, labor and purchasing other essential inputs. And since sesame cultivation requires less out-of-pocket cash expenses than maize, the cash income from milk sales might not have the strong influence it has on sesame output despite the pronounced effect of off-farm per capita cash income on both crops.

In addition to per capita land availability and cattle ownership, maize output per person was found to be significantly affected by technology as indicated by fertilizer use, land registration and the locational effect of Afgoi district. With regards to location effects on per capita output, maize production was found to be higher in Afgoi with respect to any of the other districts. In contrast, per capita sesame output is positively correlated with per capita land availability and land registration. Per capita off-farm income, market access, and extension contact were found to have insignificant effect on maize and sesame output per person.

4.10. Chapter Summary and Policy Implications

The analysis of the farm survey data in this chapter indicates that there is a great disparity of household resource patterns among the farmers living in the four study districts of the Lower and Middle Shabelle regions. Farm sizes range from landless peasants to farms with over 300 hectares. Afgoi and Merca have the greatest concentration of large farms while Jowhar farms uniformly consist of farms of fewer than 10 hectares. Nevertheless, across the study areas more than three-quarters of the households are small farmers who own five or fewer hectares of land.

Farm family size is about 7.5 persons. Average household size was higher in the Middle Shabelle (8.7) than in the Lower Shabelle (7.0). In addition to land and household labor, farmers own an average of three head of cattle, one small ruminant, and nine chickens. Very few farmers own tractors and, consequently, almost all farmers depend on privately or publicly rented ones.

Off-farm income was found to be a significant source of income for most small farmers. For small farmers, income received from off-farm activities appears, therefore, to be as important as own farm production in household food security and access to purchased food. Off-farm cash income, therefore, plays a significant role on the household's ability to sustain food consumption levels during the hungry season and its ability to purchase inputs used in the production process.

Smaller farmers depend on off-farm income sources for a greater part of their total cash income earnings than do larger farmers. Labor sales to other farms represent the main source of off-farm income to the small farmers, while petty trade appears to be more relevant to the larger farmers engaged in off-farm activities. Cash income from either farm or off-farm activities is used for household purchases of food, other consumption goods and services not produced by the household, and for meeting farm cash expenses. In view of its great importance to the livelihood of the poorest segments of the rural population, future studies on rural labor markets

and small-scale industries will be required to provide answers to possibilities for improving the off-farm income sources, which are often neglected in agricultural development plans and projects.

The bulk of the maize and sesame in the study area is produced and marketed by the relatively larger farmers. On the other hand, a majority of the smaller farmers depend more on purchased maize for their consumption needs during the hungry period. More than half of the farms with two or fewer hectares reported maize purchases in June while only one-fifth of those above 10 hectares bought maize at this period. At harvest, fewer than 10 percent of all farmers reported purchasing maize from the market. These purchases reflect the maize stock position of farm households. Very few small farmers had maize stocks at the hungry season while a majority of those with more than 10 hectares had some maize stored in their bakaars. About half of the sample farm households were found, therefore, to be net deficit in maize.

In addition to the significant close relationship between farm output and household resource levels, available evidence also indicates that smaller farmers get less government support in the form of formal credit and extension service training. The farm size distribution of farmers participating in the UNCDF project in both 1986 and 1987 indicates that credit receiving farmers had on average larger farms than their counterparts who received no credit. Furthermore, the

larger farmers were found to be concentrated in the villages with the best access to the Mogadishu market.

It appears that current government support services favor the larger farmers over the poorer farm households. The provision of formal credit, extension services and land registration all tend to be more accessible to the larger farmers. Furthermore, the recent increases in commodity prices appear to have benefitted more of the larger farmers who produce and sell the bulk of the marketed maize and sesame.

The various factors which affect either cultivated area or yields play a significant role on the welfare of farmers. These include access to production resources, technology, inputs, markets, credit and other support services. Because Somalia's national objectives call for reducing rural poverty and food insecurity, the present findings call for the need to look into the current land ownership distribution and possible ways of achieving a more equitable distribution of land. The land registration process also need to be examined with the goal of reducing costs involved in obtaining registration titles for smaller farmers. Government support services programs are currently being captured mostly by the larger farmers. This fact obviously contradicts with the stated equity objectives of rural development. Therefore, current and future rural public programs and projects need to be carefully examined on their effect on different size of farms.

CHAPTER FIVE

TECHNOLOGY AND YIELD DIFFERENCES

This chapter will examine whether there is a potential to significantly increase maize and sesame yields and productivity. Future growth of food production in Somalia will in the long-run depend mainly on increased crop yields. First, the chapter will examine the available maize and sesame technologies in the country. Second, the yield gap between researcher-managed field trial yields and those achieved by the average farmer is investigated to understand the potential level to which current yields could be increased in the future. Third, the chapter investigates technology and yield differences among the sample farmers. Fourth, the economic and non-economic factors affecting adoption of improved technologies will also be discussed.

The analysis is expected to provide information on the constraints to improved productivity, incomes and food security both at the national and household levels. Information about present crop yields associated with different levels of technology use provide policy planning tools for raising national output and productivity to the current maximum potential. Furthermore, the geographical pattern of technology utilization in the two regions is useful in informing policy-makers about the need for effective targeting of public institutional support services.

5.1. A Brief Description of Available Technologies

There is an available improved maize technology in Somalia. This technology consists of an allegedly improved maize variety called Somtux; fertilizer; insecticide; irrigation and several cultural practices including early planting, row planting, and weeding. The Somtux maize variety, an open-pollinated composite variety obtained from the cross-breeding between a local variety with the Tuxpeno variety from CIMMYT, was released in 1983. At the time of its release in 1983, Somtux was found to have a higher yield than the local variety both at experiment station trials and at farmers' field trials. Except for Somtux, the ARI has not released improved varieties for any other crop including sesame.

Sesame, despite being the most important oilseed crop in the country, seems to have been relatively neglected crop by the agricultural research system. Breeding work on sesame has not yet begun in the country, and the CARS agricultural experiment station in Afgoi has done very few agronomic studies on sesame response to various input levels, leading to few conclusive results. During the field data collection, none of the sesame-producing farmers among the surveyed farmers mentioned using fertilizer or insecticide on sesame.

As a result, farmers' methods of sesame production have changed very little over the years. Virtually all farmers continue to use the same traditional cultivation practices,

using the local variety with very few purchased inputs. Perhaps the only difference of cultivation practices among sesame-producing farmers consists of the intensity of labor input applied per unit of land. For this reason, our discussion on technology is limited to maize. .

Most of the maize farmers surveyed employ tractors for land preparation. Farmers generally give one or two supplemental irrigations to their Gu season maize crop and also weed the fields twice by hand. The use of herbicides for controlling weeds in maize is virtually unknown in the study area. Only a handful of maize farmers use some fertilizer, while pesticide use other than insecticides is also limited. Urea represents the main fertilizer used for maize, while Diazinon insecticide is the main insecticide used by maize growers against the stalk-borer. Maize stalk-borer (*Chilo partellus*) damage is thought to be one of the principal causes of low maize yields in Somalia. Conventional estimates of the annual loss of maize output to stalk-borer damage range from 30 to 50 percent of domestic production.

5.2. Technology Use Patterns

The FSP sample farmers were asked about their use of different maize technologies. Improved and unimproved maize technologies were classified according to the use or nonuse of Somtux maize seed, fertilizer, and insecticide.

5.2.1. The Adoption Pattern of Somtux Maize Seed

In the Gu 1987 cultivation period, sample farmers were asked about the type and source of maize seed planted during the season. It was difficult for the study team to ascertain whether seeds from the previous harvest (obtained from farmers' own farm or purchased from the market) were in fact Somtux. For this reason, only those farmers who have explicitly reported planting Somtux were considered as adopters.

Table 5.1 gives the adoption rate of the Somtux maize variety by the credit and control samples in the Lower and Middle Shabelle regions. The adoption of the Somtux maize variety appears to be geographically limited to the Lower Shabelle region.

Table 5.1

Types and Source of Maize Seed Used by
Region and Credit Program Participation, Gu 1987

Seed Type and Source	<u>Lower Shabelle</u>		<u>Middle Shabelle</u>	
	Control Sample (N=120)	Credit Sample (N=66)	Control Sample (N=63)	Credit Sample (N=7)
- - - - Percent of Farmers ^{a/} - - - -				
<u>Somtux Variety</u>				
Through Credit	0	50.0	0	0
Direct Purchase ^{b/}	4.2	12.1	0	0
Both Sources	0	1.5	0	0
Own Farm	29.2	0	4.8	0
Sub-total	33.4	63.6	4.8	0
<u>Local Variety</u>				
Own Farm	39.2	22.7	74.6	85.7
From Market	25.8	10.6	20.6	14.3
Sub-total	65.0	33.3	95.2	100.0

a/ The total does not add up to 100 due to exclusion from the calculations of four farmers in Merca who reported cultivating a mixture of both varieties.

b/ Purchased Somtux from the Seed Multiplication Farm located near Afgoi town.

Source: Computed from the 1987 control and credit samples farmers who planted maize in Gu 1987.

About two-thirds of the farmers participating in the credit program in the Lower Shabelle employed Somtux maize seed in the Gu season of 1987, compared with only one-third of the farmers who did not participate in the credit program. Farmers in the credit program mentioned the project as their main source of Somtux seed. The sources of Somtux seed most often mentioned by the control sample included seed from their own farm, from neighbors, and direct purchases from the Seed Multiplication Farm in Afgoi. The fact that the control sample mostly get their seed from their own farm may lead to variety degradation over time. In contrast, those in the credit program mostly get their Somtux seed from the UNCDF or the seed farm. Hence they may have more true Somtux variety that has not genetically degenerated. Less than five percent of the Jowhar farmers reported cultivating Somtux.

Table 5.2 shows the distribution of Somtux and local maize variety adoption in the study districts. The highest adoption of Somtux variety was encountered in Merca, where more than 46 percent of the control sample farmers used Somtux variety in Gu 1987. This is followed by Afgoi district, with almost 30 percent of the control sample farmers using Somtux.

Table 5.2
The Distribution of Somtux and Local
Maize Variety Use in the Study Districts, Gu 1987

Districts	Control Sample			Credit Sample		
	No. of	Local	Somtux	No. of	Local	Somtux
	Farms	Variety	Variety	Farms	Variety	Variety
	-No.-	-- % of Farms --		-No.-	-- % of Farms --	
1. Afgoi	38	71.1	28.9	35	25.7	74.3
2. Merca	58	53.4	46.6	22	40.9	50.0
3. Qorioley	23	91.3	8.7	9	66.7	33.3
4. Jowhar	63	95.2	4.8	7	100.0	0

Source: FSP Surveys, computed from the 1987 control and credit sample who reported growing maize and the type of seed grown.

Qorioley and Jowhar districts reported the lowest adoption of Somtux both among credit and non-credit receiving households, while Afgoi and Merca districts again had the highest adoption of Somtux. The adoption rate of Somtux maize variety within these districts, however, refers only to the more accessible villages that have a relatively better access to extension and credit services and, therefore, cannot be generalized to the whole farm population in the districts.

Several reasons may contribute to this diffusion pattern. First, the seed multiplication farm, which often sells Somtux seed directly to farmers, is located in Afgoi. And, most

villages in Afgoi and Merca are located within a relatively short distance of the seed farm. Due to this favorable location, farmers in the two districts have relatively better access to Somtux. Second, the greater concentration of larger farmers in these two districts may provide a fertile ground for the diffusion and early adoption of new improved technologies due partially to their greater capacity to absorb potential losses from innovation. Third, the testing of technologies on farmers' fields has generally been conducted in these two districts by the extension service and the research station. As a result, the demonstration effect of these trials may have helped spread the adoption of Somtux maize technology in the two districts.

5.2.2. The Adoption of Associated Maize Technology

In addition to the believed genetic yield superiority of Somtux, other associated improved technology components are hypothesized to include the application of both physical inputs and improved cultural practices. According to Mokhtarzadeh (1985), the Somtux variety displays its yield full potential only with relatively higher applications of inputs (i.e., fertilizer, insecticide, and irrigation) and improved husbandry practices discussed below.

Discussions with the field extension agents revealed that farmers do not grow Somtux as a completely new crop requiring new techniques of production. The majority of the farmers

planting Somtux grow it under similar physical input and husbandry practices as the local variety. The recommended rates per hectare for Somtux variety of 100 kg. of urea and 5 kg. of Diazinon insecticide against the maize stalk-borer are also suggested for the local variety. Furthermore, two supplemental irrigations and two weeding are recommended for both varieties during normal rainfall seasons with average weed infestation. Other recommended practices include early planting and planting the crop in rows. Farmers are encouraged to plant maize early at the end of March and/or during April before the rains begin, which allows the crop to benefit from the full course of the rainy season. Row plating is suggested because it makes weeding easier.

Somtux users were expected to apply irrigation, fertilizer, and insecticide and improved cultural practices. Data were collected in the FSP survey to examine maize input use. Utilizing this data, the relationship between variety type and use of various inputs and cultural practices is first analyzed with a chi-square test.

Table 5.3 shows the relationship between variety and improved practices by district.

Table 5.3

The Use of Various Recommended Maize
Technology Practices by Type of Seed, Gu 1987

Practice	Somtux Variety (n=85)	Local Variety (n=171)	Chi-Square Value
- Percent of Farmers -			
1. Physical Inputs			
a. Fertilizer	22.4	8.2	8.9 ***
b. Insecticide	64.7	20.5	46.8 ***
c. Irrigation	87.1	71.8	7.6 ***
2. Cultural Practices			
d. Tractor ploughing	95.2	91.2	0.7
d. Early Planting ^{a/}	58.3	67.6	1.7
e. Row Planting	82.4	81.2	0.0
f. Weeding more than once	89.4	90.0	0.0

a/ Early planting refers to seedlings in March or April.

Note: Significance levels = *** at the 1 percent level.

Source: FSP Surveys, computed from the 1987 control and credit sample farmers who reported growing maize in the Gu.

The chi-square test investigates the hypothesis that a particular practice and variety are independent of each other. The independence hypothesis between the practice and the type of variety is either accepted or rejected depending on the magnitude of the chi-square value. For example, if the practice and Somtux variety were related, the probability that a random sample would result in a chi-square value of at least that magnitude would be small and the independence hypothesis between the practice and the type of variety would be refuted.

About 22 percent of Somtux users and only 8 percent of local variety users used fertilizer during Gu 1987. The frequency of fertilizer use was, therefore, more than two times higher among the Somtux maize adopters than farmers planting the local variety. The chi-square test rejects the independence hypothesis between maize variety and fertilizer use. Nevertheless, the incidence of chemical fertilizer use in the two regions is extremely low given the lack of systematic rotation and use of animal manure in the cropping system. This low incidence of fertilizer use during the season may be partly due to the unavailability of fertilizer in the country during the Gu of 1987, and more generally in other years as well. Almost all of the observed fertilizer using farmers were from Afgoi and Merca districts.

Similarly, about 65 percent of the farmers who planted Somtux applied Diazinon insecticide against the stalk-borer, in contrast to less than 21 percent in the other group.¹ Overall, about a third of the maize farmers in the two regions were found to use (mainly granular and/or powder) Diazinon for the control of the stalk-borer in Gu 1987. Again, most of the sample farmers using insecticide were from Afgoi and Merca districts. Nevertheless, the available evidence indicates that stalk-borer problems are widespread throughout the country, and any observed differences in the adoption rate of insecticide are mainly due to geographical differences in technology adoption and availability of the input.

The survey results in Table 5.3 also show that Somtux adopters use irrigation more often than farmers using the local variety. Maize is mostly grown with supplemental irrigation in the two regions. Despite the general perception that all farmers irrigate maize during the Gu season,² it was found out that only about three out of four farmers on average gave supplemental irrigation to maize in Gu 1987. Merca farmers had the greatest percentage of irrigated maize. Despite a willingness to irrigate their maize crop, lack of diesel fuel was the main reason mentioned by those who did not irrigate during the cropping season.

¹. Basudin is a commercial name for Diazinon insecticide.

². Boetang et al. (1986 and 1987) reported that 100 percent of the farmers in the two region used irrigation in both season.

The values of all the three physical inputs show a clear and highly significant relationship between the input applications and Somtux adoption. In contrast, there were no statistically significant relationship between the various cultural practices (i.e., tractor ploughing, early planting, row planting, and weeding more than once) and maize variety. These findings are in harmony with the experience of the introduction of improved high yielding varieties (HYVs) in other parts of the world. HYVs perform better under relatively higher levels of input applications. On the other hand, the values for the cultural practice variables show very little association between variety type and husbandry practices (See Table 5.3). Furthermore, the analysis reveals that very few farmers have combined all of the four major physical inputs (improved seeds, fertilizer, insecticide, and irrigation) together into a complete technology package.

5.3. The Gap Between Actual and Potential Maize Yields

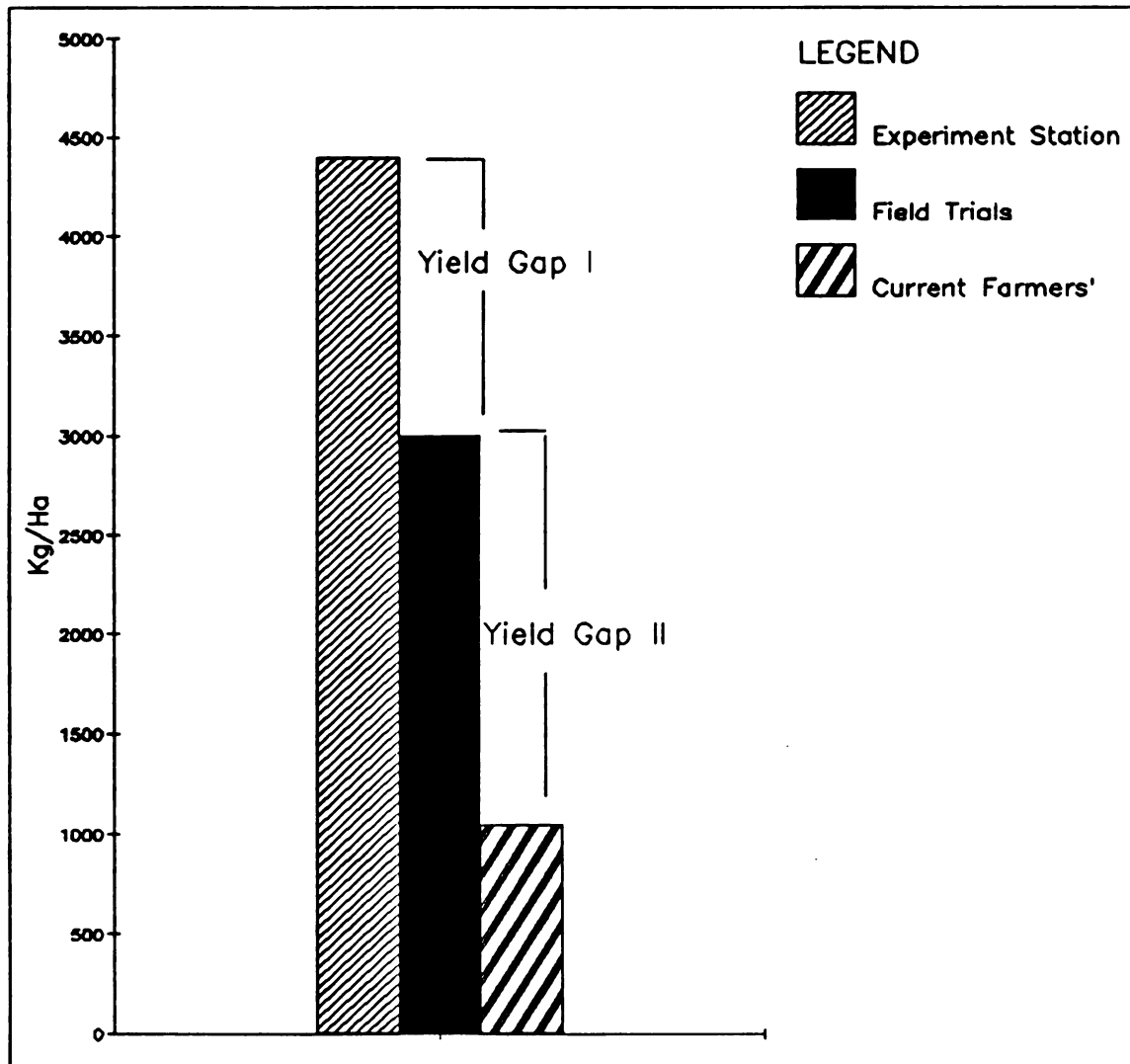
Discussion has so far revolved around the analysis of the differences in Somtux maize variety adoption and likely association between variety and other practices among farmers in the Lower and Middle Shabelle regions. The study results also show that current average maize yields are much lower than the potential achievable yields, as indicated by experimental test results under farmers' field conditions. The difference between yields achieved by researchers in on-

station trials and those achieved by researchers under on-farm trial conditions are due to various technology factors that are often not easily transferrable to the farm level. The yield gap between experimental on-station trial yields and those achieved under farmers' field trials represents what researchers at IRRI termed the 'Yield Gap I'. The gap in yields between that achieved under farmers' field trials and actual farmers yields has been termed as 'Yield Gap II' (Bernsten and Herdt, 1980), and is mainly due to various bio-physical and socio-economic constraints that are possible to remove. Figure 5.1 shows the current maize Yield Gaps I and II in Somalia.

In Gu 1983, Somtux on-station trials with fertilizer and insecticide application yielded 44 Quintals/Ha. (Mokhtarzadeh, 1985). However, tests of the improved maize variety conducted by the extension service under farmers' field trials, with 46 kg. of Nitrogen (i.e., 100 kg. urea) and 5 kg. of Diazinon insecticide per hectare revealed that the improved variety was able to yield about 30 Quintals/Ha (Abukar and Jain, 1986).

Figure 5.1

The Yield Gaps Between Experiment Station, Farmers' Field Trials and Currently Observed Farmers Yields^{a/}



 a/ Currently observed maize yields refers to the average yields achieved by the control sample farmers.

Source: Experiment station yields from Mokhtarzadeh (1985), field trial yields from Abukar and Jain (1986), and current farmers' yields from FSP surveys.

These results in a Yield Gap I of 1,400 Kg. between experiment station and researcher managed farmers' field trials. This gap is perhaps due to non-transferable technology factors found in the experiment station. These factors include inherent soil fertility, better land-leveling, excellent irrigation water control, and wire fences to remove theft losses in the experiment station. The Yield Gap II between current average yields (i.e., for the control sample) and these achieved under farmers' field conditions indicates that maize yield could be increased 300 percent.

Thus, researcher-managed farmers' field trial results might be duplicated under farmers' management, and are, therefore, more likely to be within achievable range by farmers using similar technology and input levels. In fact, one farmer among the study sample reported achieving a yield of 37.5 Quintals per hectare, or more than three times the sample average yields. In addition to supplemental irrigation, this particular farmer employed the Somtux variety, fertilizer and insecticide. If farmers using improved technology achieve two to three times the current average farmers' maize yields, what are the constraints that impede such dramatic productivity achievement in overall maize yield in the country?

5.4. Analysis of Yield Variability Among the Sample Farmers

Farmers employing improved maize technology in the two regions obtained higher maize yields than those using traditional low-input practices. Table 5.4 illustrates the various technology levels farmers used during Gu 1987 and associated maize yields.

Technology levels here refer to the use of physical inputs such as supplemental irrigation water, Somtux maize seed, fertilizer and insecticide. About 22 percent of the control sample farmers and 11.8 percent of the credit sample did not use any of these four physical inputs. Another 44 percent of the control sample farmers and 13 percent of the credit-participating sample indicated using supplemental irrigation but no Somtux, fertilizer or insecticide. Overall, about 63 percent of the control sample farmers and 25 percent of the credit sample did not use either Somtux, fertilizer or insecticide during the season.

The remainder of each sample, or about 75 percent of the credit sample and 34 percent of the control sample, used in combination with supplemental irrigation either one, a combination of two or all of the three purchased inputs (i.e., Somtux, fertilizer, insecticide). Most of the irrigation plus single input users among both samples used either Somtux or fertilizer. On the other hand, the majority of the irrigation plus two-input users employed a Somtux plus insecticide combination.

Table 5.4
The Relationship Between
Technology and Maize Yield, Gu 1987

Technology Level	<u>Control</u> % Farms	<u>Sample</u> Yield	<u>Credit</u> % Farms	<u>Sample</u> Yield	Average Yield
	- Qts -		----- Qts -----		
<u>No Purchased Inputs</u> ^{a/}					
1. No inputs	21.8	10.0	11.8	11.8	10.3
2. Irrigation only	44.3	9.5	13.2	7.9	9.3
<u>Single Input With Irrigation</u>					
3. Somtux seed	8.0	9.5	16.2	10.7	10.0
4. Fertilizer	1.1	13.0	0	--	13.0
5. Insecticide	8.6	11.0	11.8	12.6	11.5
<u>Two-Inputs With Irrigation</u> ^{b/}					
6. Somtux + Insecticide	11.5	13.7	14.7	12.1	13.2
7. Fertilizer + Insecticide	2.9	13.2	8.8	15.6	14.4
<u>Three-Inputs With Irrigation</u>					
8. All three purchased inputs	1.7	14.9	23.5	18.5	17.9
TOTAL	100.0	10.5	100.0	13.2	11.2

a/ The UNCDF project, in a few cases, during Gu 1987 gave tractor services for credit. Therefore, control and credit sample farmers in Lines 1 and 2 used no purchased inputs other than tractor services.

b/ No two-input combination of Somtux + Fertilizer was encountered in the surveys, probably because little fertilizer was available.

Source: FSP Surveys, computed from 1987 control and credit samples who reported growing maize in Gu 1987.

About 25 percent of the credit program participants, and less than 2 percent of the control sample, combined all three purchased inputs together with supplemental irrigation during the Gu season of 1987.

Table 5.4 shows the pattern of relationship between input use and achieved maize yields. The highest maize yields were obtained by farmers who, using supplemental irrigation, combined all of the three purchased inputs. These farmers obtained an average yield of about 18 Quintals of maize per hectare, or nearly twice the yield achieved by those who used supplemental irrigation with no purchased inputs.

The second highest level of maize yield was achieved by the two-input combination users with supplemental irrigation. The group of farmers who planted the local variety and applied fertilizer + insecticide achieved the second highest overall yields, followed by the Somtux + insecticide users. These farmers obtained an average of 14.4 and 13.2 Quintals per hectare, respectively. The lowest yields were achieved by the farmers who used no purchased inputs or applied supplemental irrigation only.

The proportions of the two samples using various technology levels shows that the use of improved technology is highly associated with credit participation. Credit-participating farmers were almost 14 times more likely to combine fertilizer, insecticide and Somtux variety with supplemental irrigation than non-credit participating farmers.

5.4.1. Analysis of the Yield Factors

Yield is, however, not simply a function of the use or non-use of yield-increasing inputs such as Somtux variety seeds, fertilizer and insecticide but rather the combined outcome of the agro-climatic conditions, applied inputs rates, proper cultural practices and the skills of the farmer in the correct and timely application of the inputs. To assess the effects of these various factors on maize yields, a yield regression analysis is performed using the various factors as explanatory variables.

An OLS yield model was estimated for determining the yield response to input application rates, various husbandry practices, and location effects on yield. The model treats maize yield as the dependent variable and inputs rates, cultural practices and location as the independent variables. The independent variables included in the model are: farm sizes; variety; an interaction variable between Somtux and participation in the credit program; application rates of fertilizer, insecticide, and seeds; number of irrigations; number of weedings; planting date; land registration; contact and district. Since weeding is the most labor-intensive operation, labor was not included because it is mostly captured by the inclusion of the frequency of weedings. Farm size was included to examine the possible effect of resource endowment on maize yields. Land registration was included as proxy for possible yield-increasing investments in land, while

extension contact was used as an explanatory variable for farmers' knowledge of proper use of inputs.

The interaction variable was entered to examine whether the Somtux seed obtained from the credit program was of better quality than the Somtux seed farmers obtained from their own farm or from other sources. Dummy variables were used for defining row planting, number of weedings, date of planting and district.

The estimated model has the following general form:

$$Y = f(V, VC, F, IN, S, IR, RP, WD, EP, D)$$

- where Y = maize yield, expressed in kgs/hectare;
 V = maize variety (1 for Somtux and 0 for the local variety);
 VC = an interaction variable between Somtux and participation in the credit program;
 FS = farm size, expressed in hectares.
 F = fertilizer application rate, expressed in kgs/hectare;
 IN = insecticide application rate, expressed in kgs/hectare;
 S = seeding rate, expressed in kgs/hectare;
 IR = number of supplemental irrigations;
 RP = dummy for row planting (1 if yes, 0 if no);
 C = extension contact, (1 if yes, 0 if no);
 LR = land registration, (1 if yes, 0 if no);
- Weeding:
 WDV1 = dummy variable for weeding once (1=yes, 0=no),
 WDV2 = dummy variable for weeding twice (1=yes, 0=no),
 WDV3 = dummy variable for weeding three times or more (1=yes, 0=no);
- Early Planting:
 PDV1 = dummy variable for March planting (1=yes, 0=no),
 PDV2 = dummy variable for April planting (1=yes, 0=no),
- District:
 DV1 = dummy for Afgoi (1=yes, 0=no),
 DV2 = dummy for Merca (1=yes, 0=no),
 DV3 = dummy for Qorioley (1=yes, 0=no);

Both a linear and a logarithmic specification were tried, but the linear specification had a slightly better explanatory power. Thus, the linear specification was chosen in reporting the results. The estimation and discussion of the model are reported in the following section.

5.4.2. Estimation and Discussion of the Yield Model

Table 5.5 shows the results of the final yield regression model. The strength of the model in explaining the determinants of yield variability was limited; the adjusted R^2 of 0.25 indicates that the regression model was able to account only a quarter of the observed yield differences among farmers. This suggests that other nonincluded variables explain most of observed differences of maize yields among the farm households.

In 1987, farmers used both urea; with an NPK composition of (46-0-0) and TSP with an NPK content of (0-45-0), as the main fertilizer types. Maize yields respond differently to these two types of fertilizers. Because no information is available about the type of fertilizer used by farmers, the dissimilar effects of urea and TSP on sample farmers' yields cannot be distinguished. Similarly, farmers use granular or powder Diazinon against the maize stalk-borer. The number of supplemental irrigations during the season ranged from zero to two irrigations. Planting dates extended from early March to late May. Seeds were either broadcast or planted in rows.

Table 5.5

Maize Yield Regression Results, Gu 1987

Variable	Coefficient	Standard Error	Significance Level
Constant	591.5	539.0	.27
Farm size (FS)	- 2.3	1.3	.09
Variety (V)	- 8.9	103.5	.93
Somtux-credit (VC)	43.7	123.6	.72
Fertilizer (F)	5.3	1.6	.01
Insecticide (I)	47.5	24.2	.05
Seeding (S)	4.8	3.2	.13
Irrigation (IR)	- 40.5	61.3	.51
Row Planting (RP)	166.9	95.3	.04
Weeding (WD):			
WDV1 (1 weeding)	127.2	530.9	.81
WDV2 (2 weedings)	- 9.0	519.6	.98
WDV3 (3 or more)	34.5	526.4	.81
Early Planting (EP):			
PDV1 (March)	458.5	218.3	.03
PDV2 (April)	55.2	86.3	.52
District (D):			
DV1 (Afgoi)	445.5	112.8	.01
DV2 (Merca)	208.9	128.8	.10
DV3 (Qorioley)	129.1	120.1	.28
Land Regist. (LR)	31.8	77.5	.68
Extens. Cont. (C) -	137.9	83.6	.10
Significance F = < 0.01			
Adj. R ² = 0.25			
Number of cases = 239			

Source: FSP Surveys, computed from the combined 1987 control and credit samples growing maize during the Gu.

The model indicates that a major part of the explained yield differences are due to differences in application rates of fertilizer and insecticide, and to locational differences, early planting in March, and planting in rows. An extra kilogram of insecticide increased current maize yields on average by 47 kg., while increased fertilizer raised yields on average by about 5 kgs. The regression results indicates that farm size has a negative effect on yields. In other words, when all other inputs are held constant, smaller farms have higher yields than larger ones. Land registration does not appear to affect maize yields, while extension contact surprisingly shows to have a negative effect on yields. This latter findings is in direct contrast to the alleged positive benefits of extension training on farm yields.

Interestingly, the regression results do not support the view that the Somtux maize variety is superior to the local variety in terms of raising yields. No significant yield differences were found between farmers using the local variety and those using the allegedly improved Somtux variety, holding other things constant. This brings into question the alleged superiority of Somtux with respect to the local variety under similar input applications. Furthermore, the results fail to show any yield differences between farmers using Somtux seeds obtained from the credit program and from other sources. This suggests that the Somtux seed produced by the seed

multiplication farm, and distributed by the UNCDF credit project, is not better in terms of variety potential than either the Somtux seeds farmers get from their own farms or the local variety.

Discussions with ARI research staff have raised the possibility that the existing Somtux foundation seeds may have undergone a severe genetic contamination as a result of lack of proper storage and multiplication practices. Cross-pollination with the local variety from nearby farms during multiplication may have caused the loss of the original yield potential of Somtux. It appears the research program may have to reconstruct the foundation seeds of Somtux variety again.

Other things being equal, the results also indicate that farmers in Afgoi and Merca have significantly higher maize yields than those in Jowhar. This may perhaps result from agro-climatic differences during the season or from differences in soil fertility.

Among the cultural practices, early planting and planting in rows appear to positively influence yields. In addition to benefiting from the early rains of the Gu season, which generally begin in the middle of April, early planting during March helps farmers to obtain tractor services and hired labor in time before the peak demand season for these inputs begins. On the other hand, row planting perhaps facilitates weeding. The number of irrigations and weedings were found to be insignificant in explaining yield differences among farmers.

5.5. Factors Affecting Adoption of New Technology

Farmers are believed to adopt a new technology if: 1) it yields more than the prevailing practices, 2) it is profitable, and 3) it is compatible with the farmers' production system (MacDonald, 1976; Sanders and Roth, 1985). Agronomists and plant breeders often test for yield effects of new technologies with some form of analysis of variance. However, farmers' technology decision are not simply based on maximizing yields. A new technology has to also be profitable and, thus, this brings the need to analyze some form of financial budgeting to examine profitability of the innovation.³

Even if a technology is judged superior, from the farmers' private viewpoint, in terms of yield and profitability, it may still be unfeasible from the social point of view when the associated social costs and benefits are taken into consideration. A new technology may require the use of various subsidized imported inputs. When these imports are shadow priced, the social profitability of the technology might be different from the private farmers' profitability. The following sections of this chapter, after a brief review

³. Many other objectives besides profits are important decision factors for farmers in developing countries. Household food security, risk avoidance, and various other constraints enter into the farmers' decision making process. However, it is assumed here that some farmers will be concerned about the relative profitability of the innovation rather than describe all of the factors that affect farmers decisions.

of the literature on technology adoption, will investigate the financial and economic profitability of selected maize technologies.

5.5.1. Review of Literature on Technology Adoption

Agricultural technology adoption, and the factors that affect it, has for a long time been an issue of great interest to economists, anthropologists, sociologists, communication specialists, and others. Many researchers from various disciplines have written about the likely factors that explain the success (or lack of success) with which new and improved agricultural technologies have been formulated, disseminated to, accepted and used by farmers. Rogers and Shoemaker (1971) provide an excellent summary of the literature on technology adoption.

It is believed that the process of technology adoption consists of several sequential events which include: awareness, interest formation, evaluation, trial, adoption, and discontinuance. Through formal or informal communication channels, farmers first become aware about the existence of a new technology. Only after a farmer gets to know about the existence of the alternative technology would he/she be able to form a positive or a negative attitude about it. If the new technology instills a favorable impression, the individual farmers would then evaluate the decision to give it a try. The farmer may first try the innovation on a small scale to

validate its appropriateness to his/her own socio-economic conditions. If the trial results are good, the farmer would then commit to adopt the new technology on a large scale and continue to use it as long as the proper incentive environment exists. If these incentives change, then the farmer may decide to revert back to the traditional methods.

The adoption process takes time, and not all farmers adopt an innovation at the same time. Only after all members of a social unit have accepted and utilized an innovation is the adoption process over (MacDonald, 1976). According to the time frame it takes for a farmer to adoption a new technology, many authors including Rogers, MacDonald and Lionberger classified farmers into innovators, early adopters, the average majority, and laggards. Innovators, according to Rogers (1962) as cited by Coulibaly (1987), are adventurous risk takers who like to try innovations. These may be the larger and wealthier farmers who may be able to absorb possible losses from allegedly attractive but ultimately unsuccessful and uneconomical innovations, and who may comprehend and apply complicated information. In contrast, the laggards are latest adopters of a technology and are more risk averse than the others. But Rogers (1983) cites the need to look at the events occurring previous to the adoption process itself, namely at the political process through which the recognition of the problem, research, development through diffusion and adoption take place.

It is hypothesized that several personal and socio-economic factors condition or influence adoption attitudes. Adoption was found to be highly correlated with farm size and ownership of other productive resources among Indian farmers (Hodgdon, 1974). Gerhart's study of the diffusion of hybrid maize in Kenya in 1975 found significant correlation between adoption and farmers' formal education, knowledge about credit, input availability, farm income and extension contacts.

Formal credit, extension, availability of inputs and assured output markets are some of the institutional factors that are believed to be essential to farmers' adoption of new improved technology. Tesfai (1975) found out that land ownership, availability of inputs and access to credit and extension services were important in the adoption of new technology among Ethiopian farmers. Even if the complementary inputs to an innovation are readily available, financial constraints may impede farmers from purchasing them. To solve both the farmers' financial constraints and lack of inputs, many credit projects in the developing countries provide credit-in-kind in the form of inputs. The following section will examine the profitability of three alternative maize technologies currently used by the farmers in the Shabelle river valley.

5.5.2. The Profitability of Alternative Technologies

Maize yields are affected by input rates, location, and cultural practices. The following section uses partial budgeting to analyze the economic constraints that restrict farmers from adopting yield-increasing technology.

5.5.3. Partial Maize Budgets for Three Alternative Technologies

The relative profitability of three different levels of technology are compared in terms of cost and returns, utilizing partial budgets for the three technology levels. These three technology levels, here referred to as traditional, intermediate, and advanced, represent the three most widely used technology levels among sample farmers⁴. Farmers using the traditional technology employ land, labor, tractor services, the local variety seed either obtained from their own farm or purchased, and one or more supplemental irrigations. In the case of the intermediate technology, farmers also use Somtux seed and insecticide, while the advanced farmers employ fertilizer in addition to the above. These three technology levels are the most popular technology types found in among the sample farmers. Table 5.6 displays the partial budgets for the three different levels of technology.

⁴. These technology level are equivalent to items 2, 6 and 8 in Table 5.4.

The gross revenue for each technology level in the table is computed from the relevant survey group mean yield multiplied by the official floor price at harvest. Gross revenue is computed on the basis of the net floor price. This is 1,700 So.Sh. per Quintal paid by ADC in Gu 1987, from which is deducted all sales taxes and the transportation cost. The various sales and local taxes came to about So. Sh. 120, while transportation cost to the ADC buying station and the cost of the burlap bags came to another So Sh. 80. The effective floor maize price, therefore, for one Quintal of maize was So. Sh. 1,500 or 15 Shillings/Kg. Private trader prices at harvest were about the same as the official price (after deduction of taxes and transportation cost).

The variable cost components for planting, weeding, irrigation and harvest represent mainly hired labor cost. Land preparation costs are exclusively for tractor rental for ploughing, harrowing, and bunding. All three technology levels used an average of 3 hours of tractor services per hectare of maize, rented at a rate of 550 Shillings per hour. Agro-chemical input costs and their application costs are shown separately. Both advanced and intermediate technology farmers used the same average amounts of insecticide per hectare of 4.3 kg. of Diazinon at So. Sh. 100 per kg. The higher incremental expenses for the advanced farmers come from the application of 100 Kg of urea fertilizer to the crop at a cost of So. Sh. 21.2 per kg.

Table 5.6

Partial Maize Budget for Three Alternative
Technologies Found in the Lower Shabelle Region
(So.Sh. per Ha.)

Budget Elements	Traditional Technology (No Inputs)	Intermediate Technology (HYV + Insect)	Advanced Technology (All Inputs)
% of Farms in region	35	12	8
A. Average Yield (Kg/Ha.)	930	1,320	1,790
B. Price (Sh/Kg)	15	15	15
C. Variable Cost: (Sh/Ha)			
1. Land preparation	1,650	1,650	1,650
2. Planting	300	300	300
3. Weeding	2,200	2,200	2,200
4. Irrigation	580	580	580
5. Inputs:			
a. Seed			
i. Seed ^{a/}	500	600	600
b. Fertilizer			
i. Fertilizer (100 Kg. of urea)	--	--	2,120
ii. Application cost	--	--	390
c. Insecticide			
i. Insecticide	--	430	430
ii. Application cost	--	240	240
6. Harvest ^{b/}	2,377	3,374	4,575
7. Threshing ^{b/}	791	1,122	1,522
8. Total variable cost	8,398	10,496	14,607
D. Gross Revenue (Sh/Ha)	13,950	19,800	26,850
E. Returns to land and family labor	5,552	9,304	12,243
F. Incremental gross revenue		5,850	12,900
G. Incremental cost ^{c/}		2,098	6,209
H. Benefit/Cost ratio of improved technology ^{c/}		2.8	2.1
I. Marginal Benefit/Cost Between Inter. & Adv.			1.7

a/ In all three technology levels, a seeding rate of 20 Kg. per hectare is assumed. Somtux seed cost So.Sh 30 /Kg while local variety sold at So.Sh. 25 at planting time.

b/ Harvest costs are estimated at 255.6 So.Sh. per Quintal; threshing costs are 85 So.Sh. per Quintal.

c/ Relative to traditional technology.

Source: FSP Surveys, computed all farmers growing maize in Gu 1987.

Harvest and threshing costs are based on harvested and threshed quantities. Weeding cost are assumed to be the same for all three technologies.

The three levels of maize technologies give average yields of 9.3, 13.2 and 17.9 Qts/hectare. The extra monetary gains and costs involved in adopting intermediate and advanced technologies are shown by items F and G in the table. The advanced technology package has the highest incremental cost and returns relative to the traditional technology, but it also has the highest total returns to household labor and fixed assets. The intermediate technology gives a return to land and household labor of about So.Sh. 9,300 (or 75 percent of the advanced technology), but at a fraction of the cost of the advanced technology.

Line H in Table 5.6 displays the benefit-cost ratio of the two improved technology levels relative to the traditional technology. Under the current input costs and output price, investment in intermediate technology factors such as Somtux seed with insecticide gives the highest return with respect to the added cost. The intermediate technology yields a benefit-cost ratio of 2.8 compared to 2.1 for the advanced technology. The traditional technology has the lowest return to land and labor, and the highest cost per kg., relative to the two other levels of technology.

Although the advanced technology involves higher variable costs for inputs per hectare, its recommendation on the basis

of the high returns to land and labor alone would seem to provide the justification for recommending its diffusion to all farmers in the regions. However, looking at the magnitude of the net positive benefits alone is misleading, and does not provide sufficient grounds for recommending the improved package. Both the intermediated and advanced technology levels provide the conventional minimum return criterion of at least 200 percent return (relative to traditional technology) to capital invested in new technology. Considering the capital scarcity of farmers, the intermediate technology requires less cash expenditure than the complete advanced technology package.

Line I shows the marginal benefit-cost ratio of going from the intermediate to the advanced technology. The 1.7 estimate of this ratio indicates that incentives are lower to switch from the intermediate to the advanced technology level than to go from the traditional to the intermediated technology. This is perhaps the reason why more farmers have adopted the intermediate technology package.

5.5.4. Risks Associated With the Alternative Technologies

In an uncertain and risky agricultural environment, maize farmers make decisions to try to control and reduce risks. The three alternative maize technologies have associated with them different levels of risk. As shown below, the intermediate and advanced technologies, using relatively more purchased inputs,

imply more risk. In case of crop failure, the losses incurred would be higher in the input-intensive technology levels. Variability in yield and prices are the two major sources of risk for maize farmers in the Lower and Middle Shabelle regions. In addition to yield differences caused by different farmers' management skills, variability in yield occurs across time (from season to season and year to year) and across space (among villages, districts, and regions) due to various natural factors. The government's floor price system is a mechanism for reducing variability in farm prices during the harvest period. However, the variability of yields among farmers and across time and space is more difficult to control and influence with policy. Yield variability, therefore, remains the major source of uncertainty to farmers in the two regions. In addition to the financial losses involved, maize crop failures due to drought or pests have devastating effects on farmers' household food security. For this reason, farmers try new technologies only if they have a proven record that does not pose an unacceptable level of risk compared to the traditional methods of production.

There have been two popular definitions of risk: 1) the chance that random event will fall below a certain critical level, and 2) measures of the dispersion of outcomes such as variance or standard deviation of output or income (Young et al., 1979). Using both of these definitions, the risks involved for the three different technology levels were

estimated. Table 5.7 shows the mean and break-even yields, the cumulative distribution for the cases falling below the break-even yield, and the standard deviation of the group yields about their group means. Note that the break-even yields are computed at the effective official support price of So. Sh. 1500. The break-even yield will increase or decrease as the actual price received lies below or above that level.

Table 5.7
Risks Associated with the
Three Maize Technologies

Technology	Mean Yield	Break-even Yield	Cum. % Below Break-even	Standard Deviation
	-- Quintals ---			-Quintals-
Traditional	9.3	5.6	14.5	4.6
Intermediate	13.2	7.0	25.9	6.0
Advanced	17.9	9.7	45.7	8.4

Source: FSP Surveys, computed from all farmers growing maize in Gu 1987.

The traditional technology has the lowest risk as measured both by the lower break-even yield and its standard deviation. Farmers using traditional technology of maize production need to produce about 5.6 Quintals of maize to equate gross revenue with variable cost. On the other hand, farmers using either intermediate or advanced technology levels would have to produce more maize just to be able to recover their variable cost. The advanced farmers would need about four more Quintals per hectare to achieve break-even status. Therefore, the highest risk is observed for farmers using the complete improved package, which has the highest break-even yield and the highest standard deviation. Relative risk, as measured by the coefficient of variation, is fairly stable, but for semi-subsistence farmers, absolute risk may be more important.

The higher risk associated with the improved technology package, as measured by the higher standard deviation and break-even yield, may reduce its appeal to the relatively more risk-averse farmers and, thus, its adoption rate. To the extent that yield and price uncertainty can be reduced, incentives can be increased for adopting more improved technologies.

5.5.5. Sensitivity Analysis of Prices and the Effect of Policy Reforms on Technology Adoption

Farmers' technology choices are made under currently existing yields, input prices and product prices. Since prices and yields are unlikely to remain at their observed levels in the future, the choice of technology may change as these circumstances change over time. Changes in the availability of inputs would also make particular technology levels suitable over certain ranges of input and product prices. That is to say, even if a technology was profitable, farmers would not be able to employ that technology unless its associated inputs were also readily available at the village level.

To assess the evolution of technology use under different price scenarios, sensitivity analyses of the three technology levels before and after market price liberalization in Somalia are performed here. Recent liberalization policies regarding cereal prices and trade have significantly changed the profitability of growing maize in the country. The Somali government has raised the official ADC farm purchase prices of maize several times since the liberalization began. Official prices, now used as floor prices rather than forced-sales prices, were raised significantly. To assess whether increased producer prices affected the choice of technology, the profitability of the three alternative technologies under two price scenarios was analyzed. The analysis is made using the 1980 and 1987 real effective official producer prices.

Table 5.8 presents the changes in the benefit-cost ratios of the three technology levels using 1980 and 1987 prices. At 1980 official prices, the original ranking of the technology alternatives is not affected. The advanced technology, however, had a very low benefit-cost ratio. Thus, the only maize technology that was both available and economically feasible for farmers in the Lower and Middle Shabelle region before 1985 may have been the traditional technology alternative. The 1987 producer prices have significantly increased the benefit-cost ratio for both the intermediate and advanced technology. But they have done so more for the intermediate than for the advanced technology level.

Thus, recent policy reforms in the country have affected the profitability of employing yield-increasing technologies. The higher returns of investing in improved seed, fertilizer and insecticide have allowed farmers to adopt the use of these inputs. Currently, the pilot seasonal credit project has assured a limited supply of modern farm inputs to a small number of farmers participating in the credit scheme. However, the majority of the farmers are still unable to purchase a bag of fertilizer or insecticide in their village market.

Table 5.8

Effect of Price Policy Reforms on
Maize Technology Adoption and Productivity

	1980= So. Sh. 1,200 ^{a/}			1987= So. Sh. 1,500		
Cost and Return	Trad- ional	Inter- mediate	Adv- anced	Trad- ional	Inter- mediate	Adv- anced
Gross Revenue	11,160	15,840	21,480	13,950	19,800	26,850
Total variable cost	8,398	10,496	14,607	8,398	10,496	14,607
Returns to land and family labor	2,762	5,344	6,873	5,552	9,304	12,243
Incremental gross Revenue	2,582	1,529		3,752	2,939	
Incremental cost	2,098	4,111		2,098	4,111	
Benefit/Cost Ratio of improved technology		1.23	0.4		1.79	0.71

a/ Real official maize prices reflatel using Mogadishu CPI.
Source: Yield and cost data are from Table 5.6.

5.5.6. Analysis of the Social Profitability of the Improved Maize Technologies

As previously discussed, private and social profitability of a new technology might be different due to differences between the private and social costs and benefits of the technology. The social profitability of the three alternative technologies are computed by modifying some of the line items in Table 5.6 where the market prices were believed to not reflect social opportunity costs.

First, in the economic analysis maize is priced at the import parity price. Maize import parity prices were computed from FAO price data for No.2 U.S. yellow maize, using a freight rate of U.S. \$50 per metric ton and a foreign exchange premium. The farm gate maize import parity price was found to be about So.S. 17 per kg. Using IMF figures for market and official exchange rates of So.Sh. 142 and 136 per one U.S. dollar, the official rate fails to account for a premium of about four percent (IMF, 1988). The overvaluation of the domestic currency in 1987 was much lower than it has been previously in the past. Table 5.9 shows the partial budget for the three alternative technologies using economic prices.

Social Profitability Analysis for the
Three Alternative Maize Technologies
(So.Sh. per Ha.)

Budget Elements	Traditional Technology (No Inputs)	Intermediate Technology (HYV + Insect)	Advanced Technology (All Inputs)
% of Farms in region	35	12	8
A. Average Yield (Kg/Ha.)	930	1,320	1,790
B. Price (Sh/Kg)	17	17	17
C. Variable Cost: (Sh/Ha)			
1. Land preparation	1,716	1,716	1,716
2. Planting	300	300	300
3. Weeding	2,200	2,200	2,200
4. Irrigation	586	586	586
5. Inputs:			
a. Seed			
i. Seed ^{a/}	500	600	600
b. Fertilizer			
i. Fertilizer (100 Kg. of urea)	--	--	2,204
ii. Application cost	--	--	390
c. Insecticide			
i. Insecticide	--	447	447
ii. Application cost	--	240	240
6. Harvest ^{b/}	2,377	3,374	4,575
7. Threshing ^{b/}	791	1,122	1,522
8. Total variable cost	8,470	10,585	14,780
D. Gross Revenue (Sh/Ha)	15,810	22,440	30,430
E. Returns to land and family labor	7,340	11,855	15,650
F. Incremental gross revenue		6,630	14,620
G. Incremental cost ^{c/}		2,115	6,310
H. Benefit/Cost ratio of improved technology		3.1	2.3
I. Marginal Benefit/Cost Between Inter. & Adv.			1.9

a/ In all three technology levels, a seeding rate of 20 Kg. per hectare is assumed. Somtux seed cost So.Sh 30 /Kg while local variety sold at So.Sh. 25 at planting time.

b/ Harvest costs are estimated at 255.6 So.Sh. per Quintal; threshing costs are 85 So.Sh. per Quintal.

c/ Relative to traditional technology.

Source: FSP Surveys, computed all farmers growing maize in Gu 1987.

Assuming that land and labor markets are competitive, only imported input prices were modified using the shadow exchange rate to account for the foreign exchange premium. Inputs used in maize production that have a heavy import content are tractors, fuel, fertilizer, and insecticide. It was assumed that 90 percent of the land preparation cost, fertilizer, and insecticide input cost consist of imported component. Since the majority of the farmers employ gravity irrigation, it was assumed that 25 percent of the irrigation cost also consists of imports due to the small number of farmers who use irrigation pumps.

The results in Table 5.9 indicate that the social profitability for the intermediate and advanced maize technology levels are in fact higher than private accounts. The benefit-cost ratios for both intermediate and advanced technology levels are higher from the social point of view than they are from the private farmers' perspective. This is mainly due to the underpricing of domestic maize output below its opportunity cost. Even though both imported input and output prices rise after the shadow pricing, the extent of the increase of cost is relatively small compared to the increase in maize prices. These results show that society, as well as producers, will benefit from increased productivity.

5.6. Factors Affecting Adoption of Maize Variety

What characterizes adopters of technology from those continuing to use traditional practices? In the following section, the analysis focuses on some of the farmer characteristics that may influence adoption of maize technologies. The purpose of the analysis is to understand what factors, in addition to profitability of the technology, influence adoption in order to guide research and extension support services to more effectively reach the non-adopters.

As previously discussed in Section 5.5 of this chapter, not all farmers adopt a new technologies at the same time. Several personal and socio-economic factors influence farmers' disposition to adopt innovations in agricultural production practices. Demographic factors such as gender of the head of the household and age may condition technology adoption. Furthermore, socio-economic factors, including resource ownership and access to public agricultural services, are also important in influencing technology adoption.

Table 5.10 shows the relationship between selected demographic and socio-economic factors and the use of insecticide. To sort out the confounding effect of input credit on insecticide adoption, only control sample farmers who had not received input are included in the analysis. Such demographic factors as gender of the household head and age, and access to various public services and farm sizes are analyzed.

Table 5.10

**Demographic Factors and Access to Services
Which May Influence Farmers' Insecticide Adoption^{1/}**

Factor	Total No. of Farms	No. of Farms using Insecticide	% of Farms using Insecticide	Chi-Square Value & Significance
<u>Demographic</u>				
Gender:				10.6 ***
Male	174	35	20.1	
Female	19	11	57.9	
Age:				2.1
< 26 yrs	20	6	30.0	
26-40 yrs	74	19	25.7	
41-60 yrs	70	18	25.7	
> 60 yrs	29	3	10.3	
<u>Access to Services</u>				
Formal Education:				0.1
With	81	20	24.7	
Without	112	26	23.2	
Land Registration:				18.8 ***
With	90	35	38.9	
Without	103	11	10.7	
Extension Contact:				0.3
With	42	12	28.6	
Without	151	34	22.5	
Farm Size:				1.8
2 or fewer Ha.	112	28	25.0	
2.1 - 5.0 Ha.	42	6	14.3	
5.1 -10.0 Ha.	24	5	20.8	
> 10 Ha.	15	7	46.7	

Notes: Significance levels = *** at the 1 percent level.

1/ Technology adoption here refers to insecticide use in Gu 1987.

Source: FSP Surveys, computed from the 1987 control sample farmers who reported growing maize during the Gu.

5.6.1. Adoption and Demographic Characteristics

A. Gender of the Head of the Household

There were a total of 19 female-headed households in the control sample. Comparing the insecticide adoption pattern between male- and female-headed household, Table 5.10 shows that a greater proportion of female farmers have used insecticide than their male counterparts. The chi-square test suggests that there is a relationship between insecticide use and the gender of farmers. This finding is a novel outcome, certainly as far as current experience of agricultural development in developing countries is concerned.

A number of empirical studies on the effect of agricultural development on women farmers have showed that women in Africa and other developing countries have generally suffered from the male-biases of agricultural development projects in most third world countries. The adoption rate of female farmers in the Middle and Lower Shabelle, at least as far as insecticide technology levels are concerned, does not support this proposition. This finding would also certainly accord with the fact that Somali women are generally one of the most emancipated and fairly treated women in the African continent as well as in the Islamic world in terms of education, employment, and economic opportunities.

B. Age of the Farmer

In general, older farmers are assumed to be more conservative and less disposed to try out new methods of farm production. This assumption is basically derived from the conventional wisdom that old methods of doing things die hard and, thus, are more difficult to change the older the person. To see the influence of age on insecticide use, sample farmers' were grouped into four age categories. The results in Table 5.10 show that despite a greater insecticide use by the relatively younger farmers, the chi-square test fails to indicate the interdependence between age and insecticide technology. Therefore, it does not appear that older farmers adopt insecticide less frequently than younger farmers.

5.6.2. Adoption and Socio-Economic Factors

A. Formal Education

The sample farmers were asked whether they had received any formal education. Because most farmers have some Koranic education during childhood, formal education in this study refers to adult formal schooling including childhood education and participation in the 1974-75 Somali language literacy campaign. The test results in Table 5.10, though with slightly higher adoption of insecticide by the educated farmers, fails to show significant relationship between the level of farmers' education and technology adoption.

B. Land Tenure

Security of tenure was also analyzed for its effect on insecticide adoption. The results in Table 5.10 indicate that farmers with land registration had more than three times the insecticide adoption rate of non-adopters. However, other factors such as the difference of farm sizes between adopter and non-adopters might confound these results. Thus, despite the suggested significant relationship between land registration and insecticide use, the results of the yield regression analysis do not suggest land registration to have significant effect on productivity.

C. Extension Contact

As Table 5.10 shows, farmers with extension contact appear to have higher, but statistically insignificant, adoption rate of insecticide. Extension contact may perhaps make farmers more aware of the potential benefits of using insecticide and other alternative improved technologies. But the results fail to show any statistically significant difference of the insecticide use between farmers with and those without extension contact.

D. Farm Sizes

The effect of farm size on technology adoption during the Green Revolution in Asia has been debated for a long time in the agricultural development literature. The radical political

economists have argued that the relatively larger farmers have captured most of the benefits of the Green Revolution technology because they were financially more capable of purchasing the necessary complementary inputs that go with high yielding varieties (HYVs). Others hold the view that HYV technology is scale-neutral, and that both small and large farmers have equally benefited from it. Among this latter group is Hayami who argued that the empirical evidence refutes the proposition that Green Revolution adversely affected income distribution in Asia. Hayami (1981) wrote on this subject the following:

"The empirical evidence fails to identify the modern varieties technology (in combination with irrigation and fertilizer) as a factor in promoting more unequal income distribution. In general, both small and large farmers adopted MV at more or less equal rates and achieved efficiency gains of the same order."

In the present study, Table 5.10 does indicate that the farms with 10 or more hectares had the highest adoption rate of insecticide compared with the other farm size categories. The lowest adoption rate of insecticide were found to be among those with 2.1 to 5 hectares. In general, however, the chi-square test fails to show significant relationship between insecticide use and farm size.

E. Participation in Formal Credit

During the study design phase, it was hypothesized farmers receiving credit in the form of inputs from the UNCDF seasonal credit project would have a higher adoption rate. The reason for this hypothesis was that the credit project represented the only existing input distribution system at the village level in the two regions. Since one of the major research objectives was to explain some of the purported significant yield gap among maize and sesame farmers in the Lower and Middle Shabelle regions, credit availability was included in the final research design as a stratification criterion. A sample of farmers who received credit from the project in Gu 1986 were included in the selected sample of farmers⁵.

Technology use and yields were hypothesized to be different between the credit receiving farmers and those who did not receive. Obviously, the credit program gave participating farmers access to yield-increasing input which otherwise is generally unavailable to most farmers. Consequently, farmers who participated in 1987 in the credit program had about three times higher adoption rate of insecticide than those who did not participate in the credit program.

⁵. Because the list of credit recipients changed between 1986 and 1987, the data in the analysis refers to the 1987 credit sample for which technology use information was available.

5.7. Chapter Summary and Policy Implications

This chapter has sought to look closely at the question of whether there is a potential to significantly increase maize yields and productivity in Somalia. The chapter examined the available maize technology in the country and the yield gap between current farmer yields and the potentially achievable maximum yields. The analysis investigated the differences of yields across the sample farmers and the major factors that explain these differences. Both economic and non-economic factors affecting adoption of technologies were examined on their influence of adoption.

Because improved technologies are currently available for maize only, the discussion on technology was limited to maize. The major findings of the analysis are reviewed in this section, and brief comments made on some of the policy implications of these findings.

In the present study, it was found that there is an existing maize technology package in the country that has the potential of substantially increasing farm productivity and national maize output. Already, a small number of farmers have adopted this technology package and achieve yields of up to triple the current average farm yields. On the other hand, no improved sesame technology package has yet been developed in the country.

The improved maize technology package consists of an allegedly improved composite maize variety known as Somtux, the application of fertilizer and insecticide, and various cultural practices. About 24 percent of control sample farmers in the Lower Shabelle and Middle Shabelle regions have adopted Somtux maize variety. In contrast, 52 percent of the credit-participating sample also used Somtux maize seed in Gu 1987. Most of the credit participating farmers obtained Somtux seeds from the UNCDF project, while the non-credit receiving farmers mostly obtained it from their own farms.

The study found significant relationship between input applications (fertilizer, insecticide and irrigation) and Somtux variety. There is about 2,000 kg. yield gap between researcher-managed field trial yields and average farmers' yields. This yield gap, which is mainly due to biological and socio-economic constraints, can be theoretically narrowed by lifting these constraints through increased diffusion of technology and appropriate economic incentives. This fact is underlined by the study finding that farmers using improved technologies obtained up to three times the average maize yields. Farmers using a combination of Somtux seeds, fertilizer and insecticide with supplemental irrigation were found to achieve 70 percent higher yields than those using none of these inputs.

A multivariate analysis of the yield factors was carried to sort out the individual effects of various inputs, cultural practices and agro-climatic variables. The analysis found out that differences in farmer yields are explained by differences in the use of fertilizer, insecticide, row planting, early planting in March, and the locational effects of Afgoi and Merca. Despite the alleged genetic superiority of Somtux over the local variety, the regression analysis did not find any evidence that currently available Somtux variety, under similar input levels, yields better than the local variety. Severe degeneration of the Somtux foundation seed may be responsible for the variety's loss of its genetic yield potential.

Even though technical possibilities exist for very large increased in yield, the economic analysis indicates that improved technology is associated with higher levels of expenditure and risk. The improved maize technologies were found to be superior both from the farmers' financial view point, and also from society's perspective. Investigating the costs and benefits of the traditional and two alternative improved maize technologies indicated that the advanced technology had the highest returns to land and household labor. However, the intermediate technology required less cash expenditure and obtained a higher rate of return to invested capital and was less risky than the advanced technology. Recent policy reforms have significantly improved the

profitability of using improved maize technologies. As a result of the increased farm price of maize since the reforms began in 1983, technology adoption and purchased input use has become increasingly more profitable, but more so for the intermediate than the advanced technology.

So far, adoption of Somtux, fertilizer and insecticide has been closely linked with the access to credit. The UNCDF credit project, through its seasonal input loans, has played a major role in the diffusion of improved technology among farmers in the two regions. Notwithstanding its limited coverage, the demonstration effect of technology appears to have further spread adoption even among non-participants in the credit program.

Nevertheless, the results also show that there was not gender discrimination in using insecticide. A greater proportion of female-headed farmers adopted insecticide technology than male-headed households. Together with gender, a secure land tenure as indicated by having land registration certificate was also found to significantly influence adoption of technology. Thus, it can be concluded that adoption of new technology appears to be more associated with both farmers' demographic and socio-economic characteristics.

The policy implications of the demonstrated relationship between technology use and input availability is clear enough; an expanded private market for inputs coupled with a credit system, or alternatively an in-kind credit scheme, are likely

system, or alternatively an in-kind credit scheme, are likely to increase technology adoption rates, productivity, and rural income. The increased productivity would have positive effect on both household and national food security.

Increased maize productivity coming from new technology in Somalia increases the aggregate domestic produced maize available in the market place. Who benefits from the increased productivity and domestic maize supply is a major policy issue. Analyzing the distributive aspect of the new maize technology on income distribution is, however, a complex matter requiring consideration of the share of the benefits going to farmers with different farm sizes, and producers versus consumers, including farmers with different food security status. As previously discussed in Chapter Four, about 50 percent of the farmers were potentially net deficit in maize. Thus, the extent to which increased aggregate maize output would lower market prices, there would be important benefits for the deficit farmers as well as urban consumers. An indepth analysis of income distribution effects of technology change was beyond the scope of this study.

In conclusion, the findings indicate that a limited public investment in maize breeding research, extension, input distribution together with seasonal farm credit have the potential to benefit the government and the people of Somalia in terms of increased yields, productivity, rural incomes and improved food security both at the national and farm household

levels. This potential, however, can only be realized if available technology is widely adopted by farmers. If the technology components are made available and there are the economic incentives to adopt, Somali farmers are not "conservative" and tied to the age-old traditional methods of cultivation. Therefore, improved technologies under favorable economic incentives offer powerful means of increasing domestic food output and improving food security in Somalia.

CHAPTER SIX

MAIZE AND SESAME PRICE SEASONALITY AND THE PRIVATE MARKETING SYSTEM

Many of the farmers in the Shabelle regions rely on the market for selling their maize and sesame output. Furthermore, almost every farmer purchases sugar, tea and other consumption goods that are not produced on the farm. In addition to the sales and purchases of food products, farmers also rely on the market for inputs other than family labor. Therefore, the marketing system for food products and inputs has important political and economic implications of important relevance to policy-makers. Concerns about urban consumer food price levels in the 1970s were a compelling reason for the government's ban on private grain trade and low producer prices. The policy reforms of the early 1980s have fundamentally transformed the grain marketing system in Somalia from mainly an intended state monopoly to one in which the private sector plays a legitimate and increasingly important role.

In this chapter, a few selected elements of the marketing system for maize and sesame are reviewed. The main purpose of the analysis is to identify opportunities for improving performance of the marketing system. First, the chapter examines farmer market outlets, and the related seasonal behavior of maize and sesame prices. The nature and magnitude of price seasonality, how it affects the timing of farmer

sales, returns to storage, and its implications for government price stabilization schemes are also discussed in the chapter. Second, a brief description of the private trade sector and trade margins are presented, and some elements of market efficiency and market failure are reviewed. Third, the government's role in improving the performance of the marketing system is addressed. The currently used system of chaotic weights and measures in the market, and its need for reform to a more standardized system is also discussed. Finally, major findings in the chapter are summarized and the potential policy implications of these findings are discussed.

6.1. Market Outlets and Maize Sales Prices

About two-thirds of the farmers sold maize to ADC in Gu 1986, while the majority of the farmers were unable to sell maize to ADC in Gu 1987. In Gu 1986, the agency was relatively more able to purchase grain in all of its buying stations network. But financial constraints forced ADC to reduce its operations in 1987. Consequently, open market prices for maize fell below the ADC support prices in Gu 1987 harvest period. Table 6.1 shows market outlets and the characteristics of farms selling maize to the various market outlets.

Table 6.1
Characteristics of Farms Selling to
Various Maize Buyers, Gu 1986 and 1987

Buyer	Gu 1987				Gu 1986	
	% Farms Selling	Sales/ Farm	Maize Prices	Average Farm Size	% Farms Selling	Average Farm Size
		-Qts-	-So.Sh.-	-Ha.-		-Ha.-
ADC ^{a/}	7.5	40.2	1,700	25.9	34.7	15.0
Trader	29.3	7.1	1,520	4.3	4.0	5.3
Other	3.1	16.4	1,480	7.7	13.8	3.8
Total	39.9	14.1	1,550	8.6	52.5	11.5

a/ ADC deducted sales tax totaling So.Sh. 120 from the its support price. Transportation cost to the ADC buying station are estimated to be So.Sh. 80 per Quintal on average.

Source: FSP Surveys, computed from the control sample farmers.

The table shows that a significant number of farmers do not sell maize at all. In Gu 1986, about half of the control sample farmers reported selling maize at harvest. But less than 40 percent of the farmers reported selling maize at harvest time in Gu 1987. Part of this is due to the shorter length of time that has elapsed between the harvest period and the time the interview was carried out in 1987. Among those

who sold maize to ADC, the So.Sh. 1,700 nominal support price they received includes various sales taxes and transportation cost to the ADC buying station. In contrast, reported private market prices represent actual effective prices that farmers received. Deducting ADC's hidden taxes and transportation costs, farmers received comparable prices from ADC and private market agents during Gu harvest of 1987. The larger farmers who had more grain to sell, were relatively better able to sell it to ADC in both 1986 and 1987. Therefore, whatever direct benefits ADC's floor price accorded went disproportionately to larger farmers in both 1986 and 1987 Gu harvests. Farm size of those selling maize to ADC were on average more than three times that of those selling to private buyers. It should be mentioned that there are indirect benefits from a floor price if it affects the open market price that private traders pay. These indirect benefits potentially accrue to all farmers selling maize. In fact, both the market price for maize and ADC's effective floor price were in reality very close to each other in 1987. Therefore, it is quite possible that without ADC's presence in the market in 1987, the private market maize prices would have been lower.

Unlike maize, sesame is exclusively traded in the private sector. ADC does not currently purchase any sesame. Private sesame traders usually purchase sesame directly from farmers. Sometimes farmers themselves transport their sesame to the

major market towns and sell it to town-based wholesaler, owners of the small presses located in the towns, or sell to other farmers who do likewise.

Ninety seven percent of the sesame producing farmers in the sample sold sesame to private traders coming to the villages and the remaining three percent sold to other farmers who either inturn sold to traders or sold in the market towns. The average received farm price of sesame was So.Sh. 6500 per quintal.

6.2. Maize and Sesame Price Seasonality and Farmer Sales Behavior

6.2.1. Price Seasonality

To assess the seasonal pattern of maize prices, a seasonal index of maize prices was constructed using the Mogadishu retail maize price data between 1979 and 1986. The computed seasonal index, known as the Grand Seasonal Index (GSI), shows the seasonal price behavior over that period. Using a 12-month moving average, the GSI is computed by finding the average seasonal index for each month, and then adjusting those averages to sum to 1200. Table 6.2 shows the monthly index of retail maize prices.

Table 6.2
Seasonal Indices for Mogadishu
Retail Maize Prices, 1979-1986

Month	Grand Seasonal Index	Month	Grand Seasonal Index
January	84.76	July	123.01
February	93.12	August	94.33
March	104.25	September	79.34
April	118.83	October	80.10
May	128.92	November	77.57
June	129.85	December	85.90

Source: Wehelie, Y., 1987.

An index value above 100 means that monthly retail maize price over the period of analysis is seasonally higher than average, while an index value below 100 indicates a seasonally lower than average price¹. In an average year, maize prices reach their lowest point during the Gu harvest period of September-November and their peak during the hungry period of April-June, approximately two to three months before the next Gu harvest. The GSI shows that maize prices are seasonally highest in the March-July period, reaching their peak in the

¹. For an in-depth description of seasonal price analysis techniques, see Goetz and Weber, 1986.

two months period of May and June. Even though the Gu harvest does not begin until mid September, the GSI indicates that maize prices start to fall by July, which confirms some of the observed farmer behavior of selling stored maize to make room for the upcoming harvest. Usually, farmers are aware of the size of the upcoming Gu harvest by late June.

Figures 6.1 and 6.2 show the marked seasonal pattern of maize and sesame prices. Retail and wholesale maize prices are shown for the period between September 1986 through December 1987, while sesame prices refer to January-December 1987. Farm prices refer to the weighted average price in the sample villages, while wholesale and retail prices are for Mogadishu. Maize Prices were low during the months of September through October in 1986, and rise after that until the next harvest period. As expected, maize prices dip at the Gu harvest months in September and October. Prices in different stages in the same market channel move in a similar fashion, suggesting that prices in one stage represent a good predictor for price levels in other market stages.

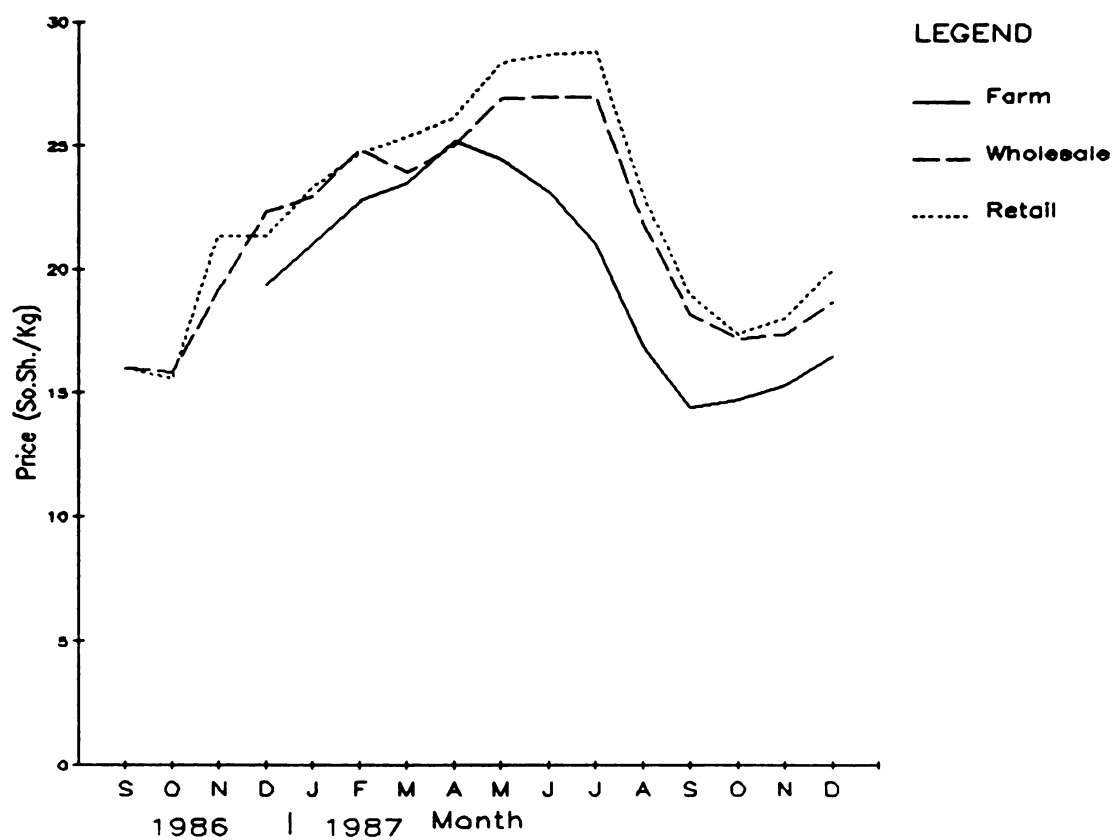
Maize prices rose more sharply than normal (as suggested by the seasonal index) in early 1987 as a result of the Der season drought. The minor Der season maize harvest usually has a moderating effect on the rise of prices between January and March of each year except when the Der rains fail. Normally, about 20 percent of the annual maize output in the country is produced during the Der season. Der 1986/87 season

maize output contributed only 10 percent of the annual production due to the drought that hit many areas of the country. Consequently, maize prices rose sharply during the first six months of 1987.

Sesame prices also appear to follow a seasonal pattern similar to maize. Sesame prices reach their bottom right after the Der harvest in March and April. Therefore, both sesame seed and sesame oil prices rise and fall as a result of within year market supply and demand conditions, that is prices increase during the off-season months and decline during the harvest. Unfortunately, lack of sufficient time series on sesame prices prevent computing a seasonal price index for sesame. If we assume that 1987 sesame seed and sesame oil price patterns are typical, we can deduce that sesame prices dip during the Der harvest months of February and March, reaching their lowest level in April, and then rise afterwards until the next Der harvest.

Figure 6.1

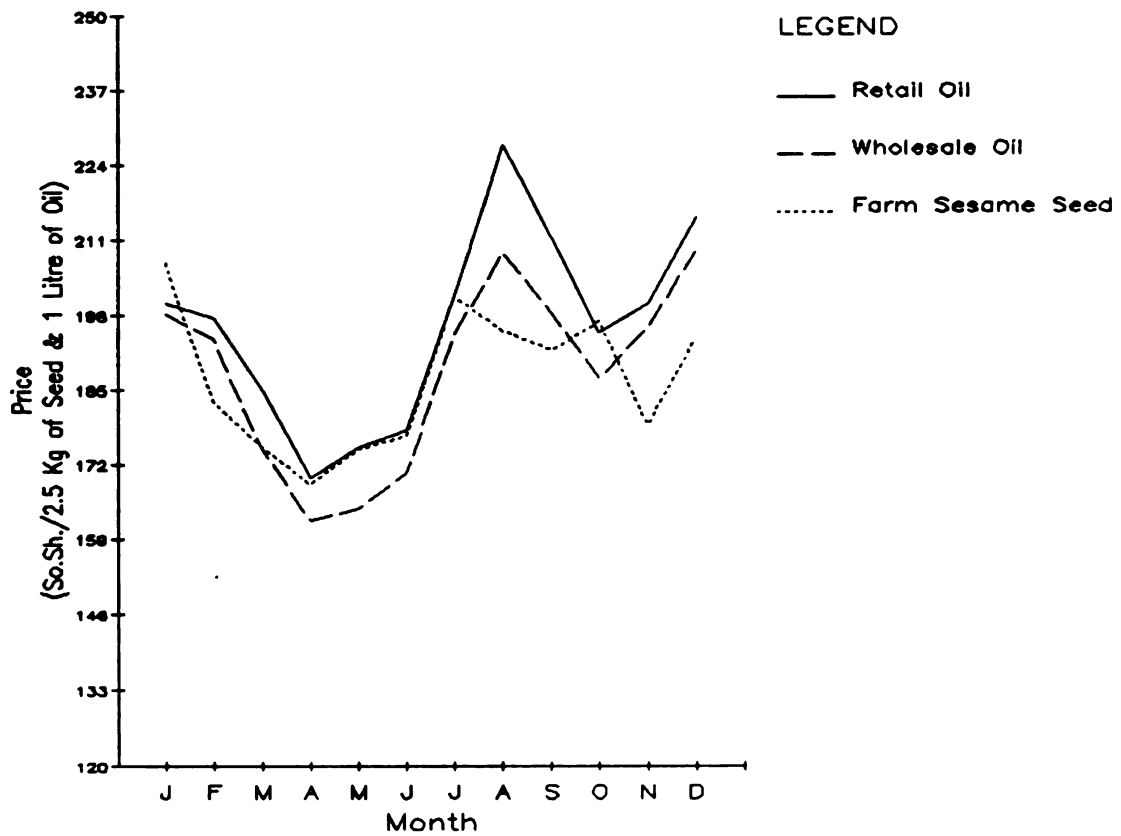
**Seasonal Pattern of Farm, Wholesale and Retail
Maize Prices in the Study Area, Sept. 1986-Dec. 1987**



Source: FSP Surveys.

Figure 6.2

Sesame Seed and Sesame Oil Wholesale
and Retail Price Pattern in Mogadishu, 1987



Source: FSP Surveys.

6.2.2. Price Seasonality and the Timing of Farmer Sales

An important question about price seasonality and farmer sales behavior concerns whether farmers take advantage of the observed seasonal price changes or whether they are forced to sell their marketable surplus during the low-price harvest period and buy during the high-price period. A frequent characterization of the alleged 'irrationality' of African farmers has been that they sell their staple foods during the immediate post-harvest season when prices are at their lowest point and are forced to purchase the same staple foods later on in the year at the time when farm stocks get low and market prices reach their highest levels (Ellsworth & Shapiro, 1985). The alleged reason for this type of farmer sales behavior has been that farmers have 'pent-up' demand for cash at harvest periods to pay taxes, loans, and other expenditures. Thus, the hypothesis is that poorly functioning capital markets impose cash-flow constraints on farmers, forcing them to sell output during the harvest time when prices are at their lowest levels.

Household maize transaction information available for the FSP control sample helps inform this issue. Recall that farm households were asked about their principal maize sales and purchases after the Gu harvest and during the preceding hungry season. These responses were cross-tabulated and merged with other available information about household maize production

in the 1986 Gu season. Table 6.3 shows selected characteristics about the sample households, according to the household's position of quantity of maize sold at harvest and purchased during the succeeding hungry season.

This analysis shows clearly that a majority (60 percent) of the farm households did not sell maize during the Gu 1987 harvest season. And of this group of households, approximately one half did not purchase maize during the hungry season in June. The other one half purchased various quantities as shown in the table. The characteristics of the households falling into these categories indicate that these are simply those who produce insufficient quantities of maize to meet household consumption needs during the entire season, rather than being forced by a cash constraint to sell at harvest and buy back later in the season at a higher price. And the internal logic in the data is quite consistent, in that the households producing the least output during the Gu season, are those purchasing the largest quantities during the following hungry season.

Table 6.3

Maize Purchases and Sales During
the Hungry and Harvest Periods, 1987

Household Maize Purchases at the Hungry Season (June '87)	Household Maize Sales at Harvest (Oct. '87)			
	None	75-499 kg	500-1400 kg	>1400 kg
<u>None</u>				
% of farms	29.8	10.7	4.4	6.7
Gu output (Kg)	1,783	1,085	3,315	12,510
June stocks (Kg)	116	34	220	522
Sales at harvest as % of output	0	20.9	28.3	51.4
% of sales to ADC	0	2.3	12.5	64.4
<u>1 - 49 kg</u>				
% of farms	14.7	4.9	1.3	0.4
Gu output (Kg)	824	1,068	1,700	500
June stocks (Kg)	21	0	0	0
Sales at harvest as % of output	0	25.3	44.9	30.0
% of sales to ADC	0	0	47.6	0
<u>50 - 99 kg</u>				
% of farms	8.0	1.8	1.3	0.9
Gu output (Kg)	497	1,625	2,100	4,250
June stocks (Kg)	0	0	0	0
Sales at harvest as % of output	0	14.5	48.2	65.8
% of sales to ADC	0	0	0	72.7
<u>> 99 kg</u>				
% of farms	7.6	4.4	2.7	0.4
Gu output (Kg)	365	1,700	2,017	4,500
June stocks (Kg)	27	10	0	0
Sales at harvest as % of output	0	15.6	47.2	48.9
% of sales to ADC	0	5.1	81.1	0
<u>Total</u>				
% of farms	60.0	21.8	9.8	8.4
Gu output (Kg)	1,199	1,251	2,575	10,590
June stocks (Kg)	66	19	100	412
Sales at harvest as % of output	0	20.3	38.4	51.6
% of sales to ADC	0	2.1	34.2	63.4

Source: FSP Surveys, computed from the control sample.

Note also that a majority of the households in the category of those not found to purchase maize later in the season (row 1 of Table 6.3) likewise did not sell maize at harvest. Hence they had the potential to sell maize later in the season as prices increased. Those who did sell maize at harvest, in row 1 of the table, also had kept significant stocks to enable them to sell later during the year and to take advantage of the seasonal price increase.

Approximately 20 percent of the entire sample did sell maize at harvest, and these consist of the largest producers in the sample, who even after selling 20 to 51 percent of Gu output at harvest, still held significant stocks for home consumption and for taking advantage of the seasonal price changes later in the marketing year. Note also that the percentage of households found to sell directly to ADC at the official floor price increases with the quantity of maize sold. In fact the group of producers with the single largest output sold the most to ADC, and made these sales at harvest. This is a bit difficult to understand, since they would seem to have the greatest potential to hold maize inventories for sale later in the marketing year when prices are more favorable. It would appear that these larger farmers prefer (for at least 50 percent of their inventory) the certainty of the ADC floor price over the possibility of higher prices later in the season.

Overall less than 20 percent of the sample households behave as suggested by the conventional hypothesis-- that is selling at harvest and having to buy-back maize for consumption later in the season at higher prices. And the other information available for these households suggests that they may have misjudged their total household consumption needs as they sold between 15 and 65 percent of their Gu output, which in most cases was large enough to permit some sales and still come close to meeting household consumption needs for the rest of the year.

Thus, the available evidence shows clearly that all sample farmers are not "irrational" and suffer from the alleged forced-sales of maize when prices are low and the need to purchase later in the year when prices are much higher. In fact, less than one-fifth of the farms were found to sell any maize at harvest and then repurchase during the high-price hungry season.

In any case, improved commodity and capital markets (including increased access to formal credit) could, potentially reduce the need to sell at relatively low prices during harvest. This would allow those farmers selling at harvest to take full advantage of price seasonality. On the other hand, the ADC price support system (when effective) potentially reduces the magnitude of farmers' loss of income stemming from the sale of output during the low-price harvest season.

6.3. The Private Sector Marketing System

As restrictions on private grain trade were lifted beginning in the early 1980s, the bulk of the marketed surplus of domestic produced grain began to move through the private sector. From available aggregate ADC purchases information, it is evident that parastatal grain purchases declined from an average of three-quarters of the marketed surplus of maize during the 1970s to less than 10 percent in the early 1980s. The private sector currently handles more than 90 percent of the maize marketed, and all of the marketed sesame. Despite the reversal of the quantities marketed by the private and public sector in recent years, the grain marketing system in Somalia remains dual in nature with both private traders and ADC purchasing grain from farmers.

The private marketing system, however, remains fragmented, with individual traders being small and unspecialized in specific commodities. The dividing line of specialization between maize and sesame assemblers, wholesalers, and retailers is often not drawn clearly. Farmers, for example, sometimes transport maize and sesame to the market towns and sell directly to consumers, thus acting as retailers. Town-based retailers sometimes by-pass wholesalers and purchase goods directly from farmers. Wholesalers travel to the rural areas, assemble the commodities themselves, then sell their stocks from rented small stores located in market towns.

In addition to lack of specialization, trader resources are very limited and their operations are primarily self-financed or receive limited credit from informal sources. Thus, financial constraints and risks of government policy changes appear to be the major reasons why traders handle small amounts of maize or sesame and turn them over quickly. The lack of profitability in grain marketing perhaps prevents traders to attract capital into their line of business. More than half of the traders interviewed reported lack of financial resources as a major constraint to their capacity to handle larger quantities of the commodities, and pointed out that they would have increased their trading volume and scale of operation if they could have obtained more capital. Many traders are, therefore, unable to attain any economies of scale that would result from greater specialization and trade in larger quantities.

Informal credit is prevalent, with traders generally borrowing from other traders. No interest payment is charged on the loan, as dictated by the Islamic law which forbids interest charges. Borrowers may repay the loan in kind when the lender himself/herself would one day need assistance. No profit-sharing arrangements were reported by the interviewed traders.

6.3.1 Private Trade Maize Margins

Trader returns, as indicated by gross margins between farm and retail prices, appear to be extremely modest. The available evidence refutes the general previous perception by government officials that Somali traders make excessive profits. One of the objectives ADC was established in 1971 and private grain trade banned was to "...eradicate the deplorable system of exploitation..." (Law No. 51, 1971). Private traders were assumed to make windfall profits by exploiting both farmers and consumers.

Table 6.4 shows the farm, wholesale and retail maize prices in four different markets during the 1987 market year, and associated price spreads. Farm-retail price spreads are generally small and range between a low of 4 percent to a high of 24 percent of the final product value. Deducting the trader cost of assembly, transportation, and sales tax from the gross margins would provide traders only a modest return on their invested capital, storage, risks, and returns to their labor input. Conversely, farmers received an average share of 87 cents of every shilling of the final consumer expenditure.

Table 6.4

**Maize Marketing Margins in Four
Urban Centers, December 1986-November 1987**

Period	Town	Farm ^{1/}	Wholesale	Retail	Gross Margin	Farm as a % of Retail
- Somali Shillings per Kilogram -						
Dec-Feb	Mogadishu	21.0	23.4	24.0	3.0	88
	Jowhar	22.0	22.1	23.0	0.5	96
	Bulo Burte	22.0	21.7	23.0	2.0	96
	Baidoa	na	na	na	--	--
Mar-May	Mogadishu	24.4	25.3	27.0	2.6	92
	Jowhar	23.8	24.8	26.0	2.2	93
	Bulo Burte	23.8	24.9	27.0	3.2	88
	Baidoa	24.4	24.4	26.0	1.6	94
Jun-Aug	Mogadishu	20.3	25.3	27.0	6.7	76
	Jowhar	19.7	23.0	25.0	5.3	81
	Bulo Burte	19.7	20.5	23.0	3.3	86
	Baidoa	20.3	24.3	25.0	4.7	81
Sep-Nov	Mogadishu	14.8	17.5	18.0	3.2	82
	Jowhar	15.6	16.4	18.0	2.4	87
	Bulo Burte	15.6	18.2	20.0	1.2	78
	Baidoa	14.8	16.7	18.0	3.2	82

1/ Farm prices for Mogadishu and Baidoa are the average farm prices observed in seven villages of the Lower Shabelle and Jowhar farmers' market in the Middle Shabelle. Jowhar and Bulo Burte farm prices represent only Middle Shabelle farm prices.

Source: FSP Surveys.

Furthermore, representative maize and sesame trader budgets based on trader survey data for a Mogadishu-based traders confirm the fact that maize and sesame trading is anything but a highly profitable business. Table 6.5 shows the net margin for one quintal of maize and sesame for a Mogadishu-based wholesaler, purchasing directly from farmers and transporting and selling the products in Mogadishu. The budgets display that net margins per quintal are higher for sesame than for maize. During each transaction period, the representative trader captured a modest five and one percent return to his labor of the final sesame and maize selling price, respectively².

The estimated net margins per quintal are not a measure of net profitability of the trade of either commodity, but are rather the returns to the trader's labor and storage function in that particular period. On the average, each of the maize assembler/ wholesalers purchased 48 quintals while sesame traders handled 12 quintals during every two weeks. Based on these volumes, a maize traders would make an estimated monthly income of So.Sh. 1,440 compared to approximately So.Sh. 4,000 for a sesame trader (in 1987 nominal Shilling value). Compared to the So.Sh. 5,000/month a truck driver makes, the returns to private maize and sesame traders are in fact low low.

². Transaction period is meant by the length of time it takes the trader to purchase maize and sesame, transport them to market, and sell the products.

Table 6.5

**Representative Maize and Sesame
Trader Net Margin Budgets, April 1987**

Budget Items	Maize Budget	Sesame Budget
Sale Price (in Mogadishu)	2318	7300
Variable Marketing cost ^b :		
1. Acquisition price	2067	6575
2. Purchase tax	30	65
3. Handling charges	30	40
4. Transportation	90	105
5. Storage charges	14	23
6. Sales tax	10	16
7. Sales Commission	10	25
8. Miscellaneous ^b	25	68
7. Opportunity cost of capital ^c		
	12	43
Total cost	2288	6960
Net margin/Quintal	30	340

Notes: 1) The cost of the empty sack is not included because traders often require the return of the empty sack.

2) Miscellaneous includes trader traveling cost to and from the point of purchase.

3) Opportunity cost of capital of the incurred cost is calculated at 15 % per year for the number of days between acquisition and sales (about 2 weeks).

Source: FSP Surveys, computed from sample traders.

These estimated incomes refer to the trading business alone without any other side occupations or sources of income. Compared to pay scales for equivalent skills, these income figures suggest modest livelihood for those engaged in the maize and sesame trade.

6.3.2. Returns to Private Storage

Grain storage in Somalia is performed by a host of public and private institutions including ADC, ENC, private traders and farmers. Sesame, in contrast, is exclusively stored by the private sector. Public-sector storage capacity is estimated at 300,000 metric tons, of which 180,000 metric tons is owned by ADC at thirty-seven locations around the country (FAO, 1986). Commercial and concessional food imports are often stored at Mogadishu, Kismayo, and Berbera port warehouses on a transitory basis. The liberalization of private grain trade clearly brought greater participation on the part of the private sector in the storage business for domestic and imported food products, but there are no statistics available on private sector storage capacity.

Private traders use above-ground warehouses mostly located around major markets for storing maize and sesame. Survey results show that trader storage consists mainly of working stocks that are kept for very short periods rather than long-term inventories. Storage periods for both maize and sesame

were in general less than two weeks on average. Farmers and public institutions store commodities for more significant lengths of time. Farmers generally store maize in underground pits (known as bakaar), while sesame is usually stored in above ground space. Bakaar sizes range from a few quintals to over a hundred quintals. Most farmers store maize in their bakaar for food security reasons. However, it is the larger producers that retain significant maize stocks during the high-price season, and are, thus, most likely to benefit from the seasonal price pattern.

Is private storage of maize and sesame profitable? Obviously, private market participants need positive returns for their investment in storing commodities over time. The observed seasonality of maize and sesame prices seems to be conducive for temporal arbitrage. The incentives for farmers and traders to store maize and sesame for relatively long periods of time is an important food-security policy issue. Furthermore, private food storage may have the social benefit of transferring part of the burden of holding the necessary food security reserves from public concerns to private entrepreneurs. Storing commodities, however, implies costs and risks in terms of the capital tied up in inventories, storage losses, etc. and the risk of losing money by unexpected sharp declines in commodity prices. A number of the interviewed traders voiced concern about the sudden decline in prices brought about by the government injection of sizable

quantities of food aid into the market. Traders clearly see this pattern as a major deterrent for holding inventories for long periods of time.

Table 6.6 shows the estimated returns for storing maize (for 9 months) and sesame (for 8 months) in 1987 by a representative Mogadishu-based trader. Nine-month storage returns per Quintal during this period for maize are So.Sh. 382, and an eight-month storage returns for sesame are So.Sh. 1,034 per quintal. The monthly return on stored maize for nine months is in fact smaller than what traders currently make by the turning over of their stocks quickly (length of storage period of up to two weeks). Similarly, the returns for sesame storage for eight months are less than estimated gross margins per quintal for the sesame stored only up to two weeks. Estimates for physical losses are not included in the cost estimates because of lack of information on post-harvest losses. Furthermore, the returns are based on low opportunity cost of capital stemming from the low interest rates paid by the banks on deposits. If we assume interest to be double their current levels (which makes interest rates at least equivalent to the inflation rate), monthly storage returns decline to So.Sh. 81 and 328, for maize and sesame respectively.

Table 6.6
Returns to Maize and Sesame Storage, 1987

	1 Qt. of Maize	1 Qt. of Sesame
Purchase Month ^a	September	April
Sales Month ^a	June	December
Length of Storage	9 months	8 months
Acquisition price(So.Sh.)	1,540	6,500
Storage cost (So.Sh. 30/month)	270	240
Other variable cost(So.Sh.)	197	320
Opportunity cost of capital (15 % p.a.)	301	706
Total cost	2,308	7,766
Sale Price	2,690	8,800
Storage returns	382	1,034
Monthly return	42	129
15-day return	22	65

a) Purchase and sale month for the two commodities correspond to the time when each commodity reaches its lowest price at the farm-level and highest wholesale prices, respectively.

b) Cost items are average reported cost for storage while the opportunity cost of capital represents the official annual interest rate of deposit accounts. No physical losses cost is included in the analysis.

Source: FSP Market Surveys.

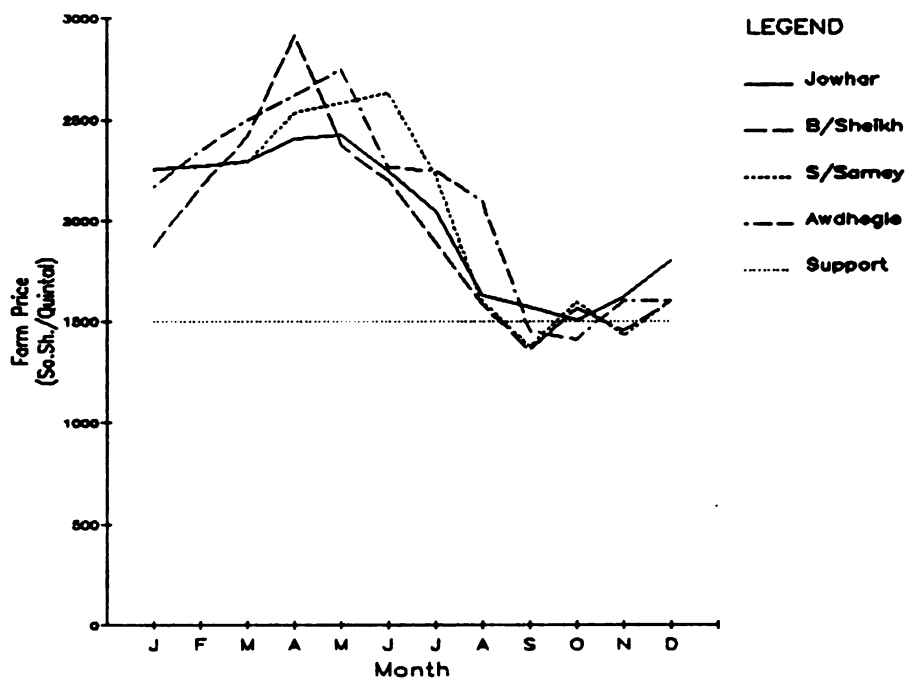
These storage returns indicate that under current market conditions and seasonal price patterns, farmers perhaps have an edge over traders in storing maize and sesame over long periods of time. Farm storage is conceivably cheaper than above-ground storage in major market towns since farmers do not incur some of the costs involved in town stores. The significant time and cost saved on bagging and pest control further increase the advantages of farm storage facilities over others. Furthermore, most observers agree that maize stored in farmers' underground maize storage pits is of better quality and is less damaged by insects and other pests than maize held in either ADC or private trader stores.

6.3.3. Maize Price Seasonality and Parastatal Role of Price Stabilization

The Somali government has decided to retain the former grain marketing parastatal after the policy reforms and change its previous mandate of being sole buyer and seller of grains. The redefined role of ADC includes consumer and producer price stabilization, maintenance of food security reserves, and the purchase and sale of grain in the more remote or deficit areas where private traders may be unwilling to serve.

Figure 6.3

**The Official Support and Actual
Farm Prices in Selected Markets, 1987**



Note: Jowhar prices are the observed farm market prices, while all other prices represent village level farmer selling maize prices.

Source: FSP Surveys.

The parastatal function of price stabilization is intended to protect farmers and consumers from extreme price fluctuations. While the agency has been able to purchase significant amounts of maize during the three years between 1985 and 1987 compared to the early 1980s, the agency has had limited success in keeping producer prices from going below the official support price and/or significantly dampening consumer prices at other times of the year.

Sale price information gathered from the sample farmers suggests that ADC was, at the Gu 1987 harvest period, able to keep farm prices from dropping below the effective support prices (i.e., So.Sh. 1,500/Quintal). Figure 6.3 shows the observed farm prices in the three locations of the study area in 1987; the two villages of Awdhegle in Afgoi and Bulo Sheikh in Qorioley, Jowhar farmers' market, and the effective maize support prices of So.Sh. 1,500 per Quintal in 1987. The figure shows that actual market prices for maize was, for all practical reasons, close to the effective support prices during the Gu harvest months of September through October.

Due to financial constraints imposed by a shortage of operating capital, ADC was forced in 1987 to curb its grain collection campaign by reducing the number of buying stations to a few key villages. Long lines developed in front of the ADC's few open buying stations in the study area. Farmers were compelled to stay in the queue for several days to sell to the

agency. The inability of ADC to purchase all of the grain offered to it at the official price caused farm prices in the Lower and Middle Shabelle to go below the government announced nominal floor price during the 1987 Gu harvest period.

In the light of the above evidence, ADC's capacity to affect consumer prices nationwide, using its domestically purchased maize, seems dubious given the limited presence of the agency mainly in the surplus regions. Using food aid maize stocks, in addition to its domestic purchases, the agency in 1987 had limited success in keeping consumer prices from rising too high and too quickly in some major cities, such as Mogadishu. During the drought period of 1986/87, the agency was able to keep the retail maize price in Mogadishu lower than expected prices (Wehelie, 1987)³. In late April 1987, ADC stepped up its sales volume in the capital city using both domestic purchased grain and food aid stocks. Average monthly retail maize prices for the four months period between April and July were five percent (or 1.5 Shillings/Kg) below expected retail prices.

In a well-functioning economy, prices of a storable commodity such as maize should rise after the harvest to reflect the costs of storing maize. A certain degree of seasonal price variability is normal, desirable and indeed necessary to encourage farmers and private traders to store

³. Based on the 1986 observed prices and the seasonal index.

commodities. In instances where seasonal price variability becomes excessive (i.e., beyond reasonable seasonal variation), some type of government action may be expected or even required to improve the situation. Excessive variability in prices, beyond what it will take to store maize, might require offsetting government responses, such as releasing/buying stocks or increasing/reducing imports of grain. The disturbingly abrupt rise in real maize retail prices from February through July in both 1984 and 1987 were two instances where price variability was certainly excessive.

6.3.4. Some Aspects of Maize and Sesame Market Efficiency and Market Failure

One aspect of the policy reform in Somalia is that it has improved the competitiveness and efficiency of the Somali grain markets. Since the liberalization of grain trade in 1984, the system of grain marketing has undergone a significant transformation of public and private-sector roles in the marketing of grains. The previously illicit private grain trade has become the leading component of the grain marketing system, while the parastatal role declined to a price stabilization function. Many former grain wholesalers who were involved in the parallel market have obtained legal sanction for their business, and numerous other individuals have entered into the wholesale, retail and rural assembly of grain in recent years (Jaffe, 1985).

Available information on Somali grain markets suggest that Somali maize and sesame markets are not dominated by a few individuals or distinct ethnic or tribal groups. Due to the relatively small amounts handled by traders and the lack of obstacles deterring prospective entrants into the wholesale or retail business of maize and sesame, trading in maize and sesame, or in any other products, is open for anyone interested in the business. Generally, the government does not require trading licenses for small-scale trade of food in either urban or markets. Maize and sesame retailers are expected to pay local government fees of So.Sh. 5-10 for market ground space, while wholesalers pay sales tax on merchandise sold⁴.

The observed modest marketing margins provide a further indication about the competitiveness of the maize and sesame markets. Maize wholesale-retail markups are generally less than So.Sh. 2 per Kg. on a purchase So.Sh. 18-27 per Kg. (or 5-10 percent of the retail price). The representative trader budgets provide a further proof of the relatively meager returns to trader investment, labor, and risks.

In spite of the competitive structure and the lack of legislative controls on the entry, however, the maize and sesame markets do not conform to the "perfect competition"

⁴. Store-owners, in contrast, are required to have a license and pay an annual license fee and income tax.

model where, in addition to the large number of buyers and sellers, each individual market participant is assumed to have perfect information about supply and demand conditions. Traders as well as farmers do not generally have good knowledge of commodity prices beyond their immediate markets. Market participants depend only on informal methods of information flow. The limited trucking routes make a large number of villages in the country inaccessible, limiting the flow of informal market information to these off-route areas.

Because of the public good nature of an information system, a public agency (preferably the Ministry of Agriculture) needs to conduct the collection and dissemination of market information on a regular basis. Systematic price information collection was begun in 1987 by the Ministry of Agriculture with the assistance of the Food Security Project. The market price information collected is still to be disseminated through the national radio⁵.

Complementary to a market information system is a system of standard measures and grades for the information to be comprehensible to its users. Standard grades need to correspond to economically important characteristics of the product. Thus, the price information being provided to the public should relay information not only of the commodity

⁵. There are no national newspapers or television. Currently, the national radio represents the only mass medium that reaches all parts of the country (both rural and urban), and it is expected to remain so in the foreseeable future.

about also of the major grades of the product. Currently, retailers and wholesalers use a multitude of non-standard volumes and no system of grades in their purchases and sales, which are different from one market to another.

Retailers sell maize and a host of other commodities by the tin; and the volume of these tins vary from one market to another and also the type of tins change over time. All but a few traders continue to use the original standard retail tins (Suus) that have existed since colonial times. The change from the original retail weights to the current non-standard measures may, perhaps, have been caused by lack of local government enforcement and inspection. Traders currently use whatever containers of some imported goods they can put their hands on. As certain brands cease to be imported over time, traders switch to the available containers and sacks. At the wholesale level, at least seven different types of sacks with different volumes are used. Sesame wholesale and retail units are somewhat more standardized than those for maize, sorghum, and beans. Sesame, at the wholesale level, is generally traded by a standard 100 Kg. (or Quintal) sack. On the other hand, sesame oil is purchased and sold by the standard liter. Table 6.7 shows the variety of retail and wholesale units that were in use in 1987 in six different market towns in southern Somalia.

Table 6.7
Wholesale and Retail Non-Standard
Units in Several Market Towns and Their Estimated Weights

Market Town	R E T A I L		W H O L E S A L E	
	Types of Retail Cans	Average Weight	# of Different Wholesale Sacks	Range of Weight
		- gms -		- kgs -
Mogadishu	Coconut Oil	750	4	45-75
Jowhar	Powdered Milk	797	3	48-78
Bulo Burte	Pineapple	505	1	30
Baidoa	Powdered Milk	760	1	45
Jilib	Coconut oil	730	1	44
Kismayo	Coconut oil	740	1	74

Source: FSP Market Surveys.

The Somali government has never established a grading system for agricultural products. In addition to variety differences, most agricultural product grades range from the recently harvested to those which have been in storage for several years. Price differences between different grades of the same crop are often significant. For example, bakaar maize usually sells for a 10-30 percent discount (depending on the condition of the product) relative to newly harvested maize.

Similar to a market information system, standardization of weights and grades is in the domain of the public sector. A grading system for agricultural products in the country would improve market efficiency by allowing long-distance trading without the necessity of so much visual inspection of the commodities. Established standard measures and grades reduce marketing costs by increasing confidence and lessening uncertainty about the quantities and qualities of the commodities being traded. However, there are costs (as there are benefits) for establishing and managing a grading system. Time and money would be required for establishing the different grades of the marketed products. Some impartial third person (preferably, a government agency) has to establish the grades of the different commodities.

The above discussion highlights that there are certain important social objectives which the market (no matter how

competitive) cannot by itself accomplish without some careful public sector actions. Other examples of instances where the government action may be required, particularly in the maize and sesame markets, are: 1) price stabilization during harvest and hungry seasons, 2) during droughts and/or other natural calamities, and 3) reinforcement of competition if non-competitive market behavior situation arise where a small number of traders begin to exploit consumers and producers.

In large urban markets and their surrounding food sheds, such as Mogadishu, where there are many buyers and sellers and where cereals supply and price information is relatively widely available, such exploitative trader behavior is uncommon. The available empirical evidence on the price spreads between farm prices and retail prices suggests that there is no collusive behavior in grain trading in and around major urban markets, despite the views of many government officials to the contrary. However, marked seasonal price variability due to inefficiencies in the marketing system may also call for some sort of corrective government activities to stabilize prices. The problem of inter-annual price stabilization appears to be feasible, given Somalia's limited resources, if support prices are announced well ahead of the harvest period and ADC is given the necessary resources to defend such prices. The problem of year-to-year price fluctuation, however, seems to be more difficult to tackle. Obviously, sufficient grain and foreign currency reserves

would be needed in the event of major drought years. In addition to these strategies, investments in improved infrastructure and communications will be required to overcome high marketing costs and poor market information that potentially cause inefficiencies in the system.

6.4. Chapter Summary and Policy Implications

The private sector has become the leading component of the maize and sesame marketing system in Somalia. Despite its leading role in terms of marketed quantities, the private trade sector has received little formal assistance in carrying out its functions. Formal credit to private food merchants is virtually non-existent, while lack of financial resources appear to be an obstacle in increasing the volumes handled by private traders. The private maize and sesame sector is highly competitive, with very modest returns for storage, transportation, and risks in carrying out the marketing function. The previously-held perception by government officials about the exploitative nature of domestic food merchants appears to be unfounded. Maize and sesame trader net margins appear to be relatively very small.

Rather than being exploitative and an obstacle to agricultural development, Somalia appears to be blessed with a resourceful and competitive group of traders who efficiently perform the socially beneficial role of moving food supplies from where and when these are least needed to where and when

commodities are most needed. Unfortunately, the early prejudices about the exploitative nature of private grain traders continue to linger in the backs of the minds of many policymakers, as shown by the lack of attention given to the private market sector in the agricultural sector development plans. Formal credit to finance private grain trade in the country is non-existent, in contrast to the several billions of Shillings given to the state-run grain trading agency (ADC). It is worth mentioning that ADC, despite the significant financial and technical support it gets, handles only a small fraction of the marketed grain surplus.

Under current market conditions and costs, farmers seem to have an edge over traders in storing maize and sesame for significant periods of time. The previous experience of sudden falls in the maize price caused by unexpected injections of food aid maize into the market during 1984 and 1985 perhaps have made traders more wary of storing maize for long periods. Furthermore, farm storage techniques may be relatively more efficient in reducing post-harvest losses. However, very little work has been done on investigating and improving current farm storage practices. Given the fact that the bulk of domestic maize and sesame stocks are held at the farm level, improvements in farm storage techniques could reduce the losses due to pest damage and enhance domestic food security.

The ability of ADC to keep producer prices from falling below the support prices influences farmers' confidence about guaranteed support prices, which in turn is instrumental in affecting positive supply response. On the consumer price stabilization side, the agency requires a system of determining the level or range in which consumer prices should be held and the adequate stocks to defend such prices. Even then, a major constraint to stabilizing producer and consumer prices ADC will face is whether it will be given the financial backing necessary to undertake such a clearly unprofitable undertaking.

In spite of the relative competitiveness of the maize and sesame markets in Somalia, several careful public sector actions such as a market information service, grading and standardization of weights and measures may significantly improve performance. Market prices over time and across different market channels and locations are a simple and universally understood measure of the performance of the market. Price behavior at different points in time and space provide valuable information to policymakers as to whether consumers are being able to buy adequate quantities of maize at affordable prices. Such information is also useful to market participants for timing their purchases, sales and generally for performing arbitrage functions. Furthermore, price information provides policymakers signs of upcoming droughts and crop failures.

The social benefits of a transparent market, i.e., the universal knowledge of supply and demand conditions by all interested individuals and groups, justifies public investment on market and price information system. Weekly transmission of commodity price information through the national radio could enhance market performance and transparency by providing a more reliable information system which may replace the traditional method of information by-mouth that traders and farmers currently rely upon.

CHAPTER SEVEN

SUMMARY AND POLICY IMPLICATIONS

The general objective of this study was to examine selected policy options open to Somali policy-makers to increase domestic food production and improve food security. The study focused on maize and sesame grown under supplemental irrigation as a case study for understanding the complex interaction between policies, institutions and technology that affect the agricultural sector in general, and the maize and sesame subsectors in particular. The specific objectives of the study were: 1) to analyze the factors associated with the recent growth in maize production, and to examine the effect of these changes on national and household level food security; 2) to examine the resource base and institutional environment under which farmers in the Lower and Middle Shabelle regions operate; 3) to identify and assess the existing improved technologies for maize and sesame, the economic and non-economic factors affecting adoption of these technologies, and the yield differences among farmers; and 4) to examine farmers' marketing outlets and product price seasonality, and to examine the potential government role in improving market performance and reducing price instability.

The analysis was based on data collected by the Food Security Project (FSP) in Somalia. The FSP was conducted by the Ministry of Agriculture of Somalia in collaboration with the Department of Agricultural Economics at Michigan State University (MSU) with funding from USAID Washington and its Mission in Mogadishu. Field work was completed over a 19-month period in 1986-87. Primary data were collected from 308 maize and sesame farmers located in the Lower and Middle Shabelle Regions concerning production, technology use, farmer sales and purchases. A combined total of about 70 private maize and sesame traders were also interviewed twice during 1987. Data were also collected over the entire period on commodity prices from 7 major market towns and the sample of 10 selected villages. In addition to the primary information, relevant secondary data were gathered from various sources during the project implementation period. Coding and computer data entry, and considerable preliminary analysis, were done at the FSP Mogadishu offices. More elaborated data analysis and final write-up were conducted at the MSU campus.

This chapter reviews the major findings of the study, and then briefly discusses the principal policy implications of the results. A short list of various topics for further future research is also suggested.

7.1. Summary of the Major Findings

7.1.1. Maize and Sesame Aggregate Supply Response to Policy Reforms

There were significant changes in Somali agriculture in the 1980s. Beginning in 1982, the government instituted a series of reforms that have notably improved farmers' incentives and expanded domestic maize and sesame production. The reforms included the liberalization of the cereal markets, increased official producer prices, devaluation of the domestic currency, and several institutional reforms aimed at increasing domestic food output. Overall, maize prices rose dramatically in 1985 and 1986 compared to their levels during the preceding five years. Official ADC maize producer prices were raised in 1985 by over 220 percent in real terms or 1,250 percent in nominal terms compared to the 1980 official prices.

The analysis suggests that maize- and sesame-producing farmers responded positively to the improved economic incentives. After the policy reforms, maize cultivated area more than doubled, while sesame cultivated area increased by more than 25 percent relative to the preceding eleven years. Maize and sesame supply elasticities were estimated to be 0.4 and 0.1, respectively. Between 1982 and 1986, maize output grew at an annual rate of more than 17 percent compared to the 2 percent per year achieved during the 11-year period of 1971-1981. These increases were sufficient to allow per capita

maize growth to reverse its declining trend and to attain an annual growth of over 15 percent for the period 1982-86. The relatively smaller response of sesame to the policy reforms, in contrast to maize, was perhaps due to the lack of rigorous state monopoly in sesame marketing before the policy changes.

The lack of a disaggregated historical national data base on maize and sesame area makes it hard to measure precisely where the expansion in cultivated area occurred in the country. But cross-section recall information collected by the FSP team indicates that most of the area expansion, at least within the study areas (Lower and Middle Shabelle regions), occurred in the relatively more accessible districts of Afgoi and Merca. These are located closer to the Mogadishu market and have better access to government support services than other areas. These two districts are also where many relatively large private farms have been established in the 1980s.

Notwithstanding the increase in area planted to maize and sesame, the evidence suggests that average maize yields remained virtually stagnant, while average sesame yields declined after the reforms. Almost all of the increase in maize and sesame output resulted, therefore, from extensification rather than intensification. Continued expansion of cultivated area, however, is very difficult over the long-run given the limited availability of good agricultural land along the river valleys. Future output

growth of these two crops as well as other food crops must, therefore, come mainly from improved productivity rather than area expansion.

7.1.2. National and Household Food Security Status

The recent changes in agricultural policy, and consequent effects on the country's agricultural performance, have affected the food security status both at the national and farm household level. The increase in aggregate maize output significantly reduced Somalia's dependence on imported maize. No maize was, in fact, imported in 1986 compared to yearly average imports exceeding 345,000 metric tons between 1981 and 1985. Therefore, the country regained, in an aggregate sense, its self-sufficiency in maize in 1986.

At the farm household level, in the Shabelle river valley maize is the basic staple food. Yet the analysis found that almost half of the sample farmers still produce less maize than they consume, and were estimated to be deficit in maize availability in 1987 when measured against an estimated household requirement of 157 kg. per person per year. That is, even with purchases, these farm families had inadequate maize supplies for household consumption.

The analysis shows that the relatively larger farmers, with greater access to resources, inputs, technology and support services, have responded most to the new economic opportunities, thereby capturing the majority of the direct

benefits of the increased producer prices. About 50 percent of sample farmers were estimated to be surplus, and these farmers produce the marketed surplus of the maize and sesame in the study area, own more cattle, are more likely to have a secure land registration title, use more technology and are more likely to be situated in Afgoi and Merca districts.

The farm households not producing enough for own household consumption needs (about 50 percent of the sample) have not shared directly in the benefits of increased real prices. But these households appear to have gained somewhat from the secondary effects of policy reforms through increased rural employment and a generally more accessible food supply in rural areas. The increased demand and use of labor by the larger farms has increased the income of small-scale farmers, who were shown to depend heavily on off-farm employment. Furthermore, the expanded aggregate maize supply in the country, and the market liberalization, appear to have allowed deficit farmers to purchase grain more easily in the rural markets, albeit at higher prices. The increased commodity prices may have had a negative income effect on deficit farmers' acquisition of needed household food. Overall, it is very difficult to make a firm judgement on this issue because the real prices paid and quantities transacted by small farmers before the reforms are not known.

7.1.3. Resource Ownership Patterns

As suggested in the above results, farmers in the Lower and Middle Shabelle regions differ significantly in their resource endowments. Among the group of control sample farmers, farm sizes were found to range from landless peasants to farms of over 300 hectares. About 55 percent of the FSP control sample farmers owned 2 or fewer hectares, another 23 percent owned 2.1 to 5 hectares, 12 percent had 5.1 to 10 hectares, and those with over 10 hectare farms consisted of about 11 percent of the sample. The largest farms (those with 10 or more hectares) were exclusively concentrated in the Lower Shabelle region, particularly in the Afgoi and Merca districts, and occupied about 68 percent of the total land available to sample farmers. There were no farms in the Jowhar district with over 10 Ha.

Virtually all farmers depend on rented tractors and other heavy farm machinery for land preparation, canal construction and canal maintenance. Most of the demand for rented tractors and other machinery is satisfied by private owners. However, the frequent shortages of imported spare parts and diesel fuel often limit the availability of tractors to rent. Strikingly, the use of animal traction is virtually unknown in the Shabelle valley. Tsetse fly infestation, a nomadic culture that resists putting animals to burdensome farm work, and the heavy clay soils of the Shabelle valley are allegedly the main factors limiting animal traction in the area.

More than a third of the sample farmers reported owning cattle and four out of every five farmers reported raising chickens. Ownership of livestock, in addition to milk and meat provision, was found to serve farmers as a food security hedge. But again, this food security strategy works much better for the larger farmers who own most of the livestock. For example, farms of over 10 hectares own an average of more than 14 head of cattle, while farms of 2 or fewer hectares have on average less than one head of cattle per household. Therefore, the large farmers are relatively more able to monetize part of their livestock wealth to gain access to cash in times of need.

More than 70 percent of sample farmers depend on off-farm income for a significant part of their total household income. The importance of off-farm income as a coping strategy declines with increases in land ownership. The smallest farmers, i.e., those with 2 or fewer hectares, obtained more than half of their total cash income from off-farm sources. Farms with 10 Ha. or more obtained less than 20 percent of their estimated annual cash income from off-farm sources. Labor sales to other farms and remittances represent the two leading off-farm income sources for the small farmers, while petty trade appears to be more relevant to the larger farmers. Food consumption levels of the poor farm households during much of the year depends, to a large extent, on off-farm income opportunities.

Differential access to land significantly influences farm households' capacity to produce for home consumption as well as for the market. The bulk of the maize and sesame output is produced and sold by the relatively better endowed farmers. The large farms (with 10 or more hectares), which accounted for about 11 percent of the sample farms, produced more than 45 percent of the maize output of the sample farmers in Gu 1987. In contrast, farms of 2 or fewer hectares, which represented more than half of the sample farms, produced only 24 percent of the Gu 1987 maize sample output, and only 37 percent of these farms reported selling any maize at all in the market.

Being more influential in village affairs, the relatively larger farmers appear to have better access to credit and other institutional support than small-scale farmers. The farm size distribution of the households that received credit in kind from the UNCDF program both in 1986 and 1987 shows that farmers with access to credit had on average significantly larger farms than those without credit. In 1986, for example, the credit participants had an average farm size of 12.5 Ha. compared to 7.4 Ha. for those without credit, while the 1987 credit participants had an average farm size of 18.8 Ha. compared with 5.5 Ha. for those without credit. Similarly, farmers selling maize to ADC both in 1986 and 1987 Gu harvest period had, on average, three to five times more land than those selling to private traders. This is partially due to the

fact that ADC buys grain from farmers in minimum quantities of 100 kg. bags. Most small-scale farmers, when selling, have smaller transaction quantities. Larger farmers also have higher incidence of land registration and participation in extension training.

7.1.4. Technology and Input Use

Farmers in the study area currently obtain an average yield of one metric ton of maize per hectare, or about one-third of the potential achievable yields of three metric tons/hectare found in well managed on-farm field trials in the study area. These current on-farm yields are also significantly lower than those achieved in other African countries, especially when considering the availability of supplemental irrigation in this region of Somalia. Strikingly, selected components of a maize technology package which can potentially double or triple current average on-farm maize yields have been proven to work in the country. A relatively small number of farmers were found to use these improved maize technology components, and in fact obtained maize yields of up to triple the current on-farm average. The study found that there are no improved sesame technology packages currently available to farmers.

The small number of farmers employing selected parts of the improved maize technology package obtained significantly higher yields than those using traditional low-input

practices. The highest yields were achieved by the group of farmers who employed a combination of fertilizer, insecticide and Somtux seeds with supplemental irrigation. Yet 65 percent of the control sample farmers utilized no fertilizer, insecticide or Somtux seeds. Another 33 percent of the control sample used either one or a combination of two of the above three inputs with supplemental irrigation. Less than 2 percent of the control sample of farmers used a combination of Somtux seeds, fertilizer and insecticide with supplemental irrigation. In contrast, more than 23 percent of the sample participating in the UNCDF credit program used all three inputs together with irrigation.

A multivariate analysis of the factors affecting yields, however, suggests that users of the Somtux variety (keeping all other things constant) did not achieve better yields than those using the local maize variety. Therefore, the alleged yield superiority of Somtux over the local maize variety appears to be suspect given the available evidence. Some ARI scientists suggested that the Somtux maize variety may have degenerated over the years due to lack of proper seed storage and seed multiplication techniques. The regression analysis does indicate that maize yield differences were mainly due to differences in fertilizer and insecticide use, row planting, early planting in March, and the location effect of having a farm in Afgoi and Merca districts.

The existing improved maize technology was shown to be both financially and economically feasible. In fact, the financial returns to using the improved technology components are quite high. Farmers using supplemental irrigation either with a combination of insecticide plus Somtux variety (i.e., an intermediate technology package) or a combination of fertilizer, insecticide and Somtux seeds (i.e., advanced technology package) obtained from 40 to 220 percent higher returns to land and family labor, respectively. But these inputs require more cash outlays and higher levels of risk than the traditional method of cultivation. Farmers using both advanced (8 percent of the sample) and intermediate (12 percent of the sample) technology packages obtained at least the conventional minimum of a 200 percent return to capital invested in new technology. But considering farm households' capital constraints and associated risks, the intermediate maize technology level currently appears to be more attractive to farmers than the advanced package.

The economic analysis results show that an increased diffusion of selected components of the existing maize technology package in the country is also socially profitable. The profitability of the advanced and intermediate technology levels, when estimated at the social costs and benefits, appear to be even higher than when valued in financial terms. The higher economic returns resulted from correcting for the

underpricing, in the financial analysis, of domestic maize output (i.e., the market price of maize lies below the import parity price). The results, thus, show that an increased diffusion of technology use among farmers will (in addition to improving rural welfare) benefit society in general.

Village-level distribution networks (both private and public) for fertilizers, insecticides and Somtux seeds are virtually non-existent. The few farmers who use these inputs mainly receive them through the pilot UNCDF seasonal input credit program. Thus, access to such yield-increasing inputs is linked with credit program participation. The UNCDF credit program, through its seasonal input loans, played a major role in the diffusion of the use fertilizer, insecticide and Somtux seeds among farmers in the two regions. In addition to access to the UNCDF input credit project, several demographic and socio-economic farm household characteristics also appear to influence technology adoption. Female-headed farm households (constituting about 8 percent of the control sample) were found to have higher adoption rate of Somtux seeds and insecticide than their male counterparts. A secure land title also appears to influence farmers' propensity to change and adopt new technology.

7.1.5. Market Behavior

Most of the maize and all of the sesame are currently marketed through private marketing channels. The private marketing sector has attained the leading role of the maize and sesame marketing in the country since the policy reforms, and plays a more important role in helping assure the food security of small farmers than does ADC. Contrary to the general perception held by many policymakers, the analysis suggests that Somali maize and sesame traders are resourceful and perform relatively efficiently the socially beneficial function of marketing. Estimated returns to the private maize and sesame trade are very modest, and previous suspicions about the exploitative nature of domestic food merchants by government officials appear to be unfounded. Income derived by maize and sesame traders appears to be low when compared to the equivalent wages offered to, for example, trucks drivers. Large traders who may achieve economies of scale, and possibly lower distribution and storage cost, are absent from the marketing system of maize and sesame.

Returns to long-term maize and sesame storage by private traders appear to be lower than what these traders achieve by turning over stocks quickly. Traders currently make a net margin of So.Sh. 30 per Quintal of maize for about two weeks of storage. In contrast, the return to long-term storage (9 months) of maize normalized return to a two-week basis is only So.Sh. 21.

The perception that farmers make forced sales during the low-price harvest season and buy back maize later at much higher prices, is not generally supported by the data. About 60 percent of the farmers did not sell maize during the low-price Gu harvest season and half of these did not buy maize during the hungry season. The other half are farmers who sell nothing and purchase maize when their own supply becomes inadequate. Thirty percent of sample farmers did purchase maize during the hungry season. About two-thirds of this groups sold maize during the immediate post-harvest low-price period. These households may either have misjudged their total household maize requirements or have encountered extraordinary cash needs during the immediate post-harvest period that could only be met by selling maize.

Despite its limited resources, ADC was somewhat successful in 1987 in keeping floor prices from going below the effective maize support prices of So.Sh. 1,500 per Quintal. Furthermore, the agency was also able in 1987 to prevent maize consumer prices from rising higher than the normal seasonal rise of prices (as suggested by the seasonal index) in some major market cities. In contrast to its previous role as monopsonist of grain, ADC currently plays the role of a price stabilizing agency.

The study helps document that there is a weak system of standard grades and measures for major food grains. Numerous haphazard weights and measures are currently used in the grain market which, obviously, is not conducive to market efficiency. Even though ADC buys grain in standard one Quintal sacks, private wholesalers and retailers use a multitude of sacks and cans with different volumes and weights. This lack of standards limits the capacity of market participants to conduct business from a distance without the necessity of visual inspection, and likely increases marketing costs. While a market information collection system was begun by the MoA in collaboration with the FSP, this information is not yet transmitted regularly to potential private and public users.

7.2. Policy Implications

7.2.1. The Effect of Past Policy Reforms and Future Potential

Recent agricultural policy reforms and their impact on the country's agricultural production provide an excellent historic lesson to Somali policymakers. Suppressing human initiative, through public control of the economy in general and the agricultural sector in particular, ultimately becomes counter to national interests. The significant expansion in maize output after the policy reforms confirms the positive role that remunerative producer prices and a more open food marketing system can have in improving economic incentives and increasing domestic food production.

Yet, so far, a relatively small group of larger farmers, producing the greatest marketable surplus, have benefited most from the increased producer prices and other system reforms. In contrast, smaller farmers who are most likely to be deficit in maize production and consumption, and urban consumers as well, appear to have shared very little of the direct benefits of policy reforms. Thus, while the policy reforms have improved the country's aggregate maize production, the benefits of the reforms are distributed quite differently among groups of the population.

This raises the issue of whether the total gains from the reforms outweigh the losses suffered by the deficit farmers and urban consumer facing higher commodity prices. Domestic prices of maize and sesame were artificially lowered before the reforms by a combination of an overvalued exchange rate, depressed official producer prices, and a public trade monopoly. As commodity prices rose after the reforms and the markets were liberalized, cultivated area and output of maize and sesame consequently expanded. This fueled an increase in the demand for the labor of small-scale, and possibly deficit, farm households and potentially raised real rural wages. Thus, the policy reforms expanded domestic food output and replaced to some extent the previously cheaper grain and vegetable oil imports with higher priced domestically produced maize and sesame. Urban consumers clearly paid higher prices after the

reforms. But since most of ADC's cheap grain before liberalization was sold in the urban areas and not in the rural areas, the effect of the reforms on the deficit farm households is less clear because the real prices paid and quantities transacted by small farmers before the reform are not known. Overall the reforms clearly improved the terms of trade in favor of agriculture, and have reduced the country's dependency on food aid maize and other cereals.

Even though it is hard to quantify the gains and losses accruing to different groups of the population stemming from the correction of structural deficiencies, it is clear that the distribution of the benefits of higher commodity prices among the farming population was skewed towards the larger farmers who produce the bulk of the marketed surplus. At the same time, the evidence suggests that public support programs that might have improved small farmers output and income have also been captured by the larger farms. This indicates that smaller farmers are left in the doldrums, both from the standpoint of sharing in the direct benefits of the higher commodity prices and in receiving yield- and income-enhancing public support programs. It also appears that the reforms may have stimulated additional concentration of land among a relatively small group of larger farms.

7.2.2. Technology Development and Utilization

The results of the analysis suggest that current on-farm maize yields could realistically be doubled by utilizing selected components of the existing improved technology package. To actually get such increases in productivity would entail a concerted government and private sector effort on various fronts: 1) a favorable price policy to the farm sector, 2) better institutional infrastructure, 3) effective input and output markets, and 4) a reliable research capacity able to generate and update viable improved technologies.

Policy reforms undertaken in the 1980s have substantially raised farm prices and considerably improved the profitability of producing maize and sesame for the market. But current average maize yields remain very low and are only one-third of the potential yields. There does appear to be a technology package to help close this yield gap. This is shown by the relatively small number of farmers who do obtain and utilize improved technology and obtain up to three and half times the average maize yields. But poorly operating institutional infrastructure and input markets make it practically impossible for a large percentage of the farmers actually to obtain and utilize the technology.

Improved technology could be one way to increase domestic food production at a lower cost, and thereby improve the food security of the farm and urban households that are currently purchasing maize and other foods. Producing more maize and

sesame (as well as other food crops) more efficiently provides the most practical way that a growing population could be fed adequately over time. An alternative might be to produce some other product(s) for the international market, in which the country has a comparative advantage, and to import cheap food from abroad. But Somalia does not appear at this moment to have such an alternative and must be concerned with producing domestically most of its food requirements. Major questions facing policymakers, therefore, concern the design of policies and yield-enhancing support programs to small and/or large farmers in such a way that these would reduce rural poverty and, at the same time, increase aggregate national productivity and output.

Public support programs that focus on, or are dominated by, one group or the other of farmers will have different effects on income distribution, output and quantities marketed, as well as long-term growth potential. Most of the existing support programs and services (credit, land registration, extension training, ADC purchases) appear to have been captured by the larger farms. The question needs to be raised of how to make existing support services more accessible to the small-scale farmers. There is also a question of the design of future policies and programs to carefully examine their potential impact on different groups of farmers. Both theoretical and empirical work have shown that a unimodal strategy, properly implemented, can lead to:

- a) faster growth in agricultural output (small farm vs. large farm productivity argument),
- b) faster growth in non-farm output, by stimulating demand for labor-intensive non-farm products (linkage effect). This could be very important in Somalia, where non-farm income is so crucial to the rural poor,
- c) greater incentives for rural people to invest in education and other forms of human capital.¹

The research system needs to re-evaluate and update its relatively small stock of improved varieties and other technology components. Study results question the desirability of disseminating and promoting the adoption of the Somtux maize variety until further research either confirms or rejects its alleged yield superiority. As has been previously discussed, the study indicates that Somtux might have genetically degenerated to the point where it has to be completely regenerated or another variety developed. Obviously, the new Somtux (or any other variety) will have to have the potential to yield as well or better than the local maize variety under traditional levels of management, but to

¹. For details, see Johnston, Bruce F. and William Clark, 1982. Redesigning Rural Development: A Strategic Perspective, Ch. 4, p. 245-48.

perform substantially better under slightly higher input levels.

To shift the current production function outward, continued investment in appropriate biological, chemical and mechanical technology research will clearly be necessary. And this will require a clear long-term public financial commitment to the agricultural research system. As commendable as Somalia's post-independence establishment of a national agricultural research organization might be, the existing limited research output points out the need to strengthen the country's research system. So far, most of the existing limited maize research stock was generated when external financing was available from international donors. Operational difficulties and lack of proper domestic funding appear to have limited research output. To be effective, the research system requires trained personnel, adequate facilities and operating funds. And the national objectives from the research system are best served if research funding is not held hostage by the availability of external donor financing alone.

To get nation-wide productivity gains will also require an effective input distribution system that responds to the country's evolving input requirements. The current input distribution system of fertilizer, insecticide, improved seeds, and fuel has so far been dominated by public parastatals and projects. Private initiatives in input importation appears to be restricted by policy design and lack

of foreign exchange allocations. The current system of foreign exchange allocation, which gives preference to parastatal and private importers of consumption and luxury goods, needs to be re-examined. Somali merchants and farmers will respond as they have in the past if given the opportunity to raise their living standard and income.

7.2.3. Current Land Ownership Patterns and Possible Reforms

Unequal distribution of land among sample farmers appears to be a dominant factor in households' food production capacity and availability of food for home consumption. Since more than 75 percent of the farms subsist on farms of less than five hectares with existing low yields (more than 50 percent have 2 or fewer hectares), a large number of the small-scale farmers are likely to be deficit in maize production, and perhaps in food consumption.

Study results about existing land ownership patterns indicate that numerous large farms have emerged in recent years. These are beyond the 30-hectare maximum ceiling for individual land leases set by the government to limit disparities of land ownership among farmers. But not only have large-scale farms beyond the ceiling been established, but most of these farms appear to be concentrated in the relatively more accessible and perhaps more fertile districts of Afgoi and Merca. As a result of their financial and political influence in village affairs, these farms have also

been able to capture most of the inputs and public services. Individually-owned large farms exceeding the 30-hectare limit currently make up about 4.9 percent of the control sample of farms. But these farms were responsible for 32 percent of the sample output and about 42 percent of total sample sales in Gu 1987.

The aggregate growth in maize output in the recent past appears to have mostly come from area expansion of these larger farms. By capturing the few inputs provided under the UNCDF seasonal credit in-kind program, some of these larger farms have also been able to attain higher yields. But the regression analysis of the yield factors suggests that maize yields are negatively correlated with farm size, when the use of all other inputs are held constant. In other words, a reduced average farm size will likely raise maize yields under conditions of equal access to inputs by small farmers. A limited number of observations available for both the smaller and larger farms using various inputs calls for caution in interpreting these results.

Nevertheless, it appears that a land reform program needs to be carefully examined as an alternative means of increasing food production in the long-run as well as distributing resources more equitably. Following the arguments of Johnston and Clark, a more unimodal approach to agricultural growth will help stimulate more dynamic growth linkages in the non-farm sector. But meanwhile, a more strict enforcement of the

1975 land law setting individual farm land ownership ceiling would help reduce the pace of ongoing land concentration in the irrigated areas.

To get an increase in national maize yields, especially among smaller farmers, will require various institutional support programs including extension training, land registration, a well functioning private input distribution system, seasonal credit and possible organization of the small-scale farms into grass-roots cooperative societies. But further studies will be needed to more carefully inform the considerable uncertainties a land reform program might have on aggregate national food output, rural labor demand and supply, farm productivity, household food security, household consumption and marketed surplus.

In addition to land ownership, off-farm income opportunities also play a significant role in rural incomes. Off-farm income from labor sales to the larger farms significantly contributes to the total earnings of smaller farm households and their access to purchased food. Analysis of a land reform program must consider these potential effects. Likewise, with increases in farm productivity in the future, many of the small-scale farmers might be able to satisfy their household food consumption requirements, although there still may be a need to increase their non-farm income earning opportunities.

Despite their importance in rural welfare, government development plans have often overlooked the potential role of off-farm agricultural wage employment and rural non-farm income-earning activities as primary measures of combatting rural poverty. A vibrant rural labor market, handicrafts and other small-scale rural industries could provide additional means of increasing the level of living standards of the rural poor.

7.2.4. Improving the Performance of the Market System

Contrary to what government officials have previously believed about the exploitative nature of private traders, Somalia is blessed with resourceful and competitive private traders who perform marketing functions relatively efficiently given the level of infrastructure and overall state of development of the Somali economy. But despite the recent liberalization of private trade, the government has been reluctant to provide needed technical and financial support to facilitate new activities and investment by the private market sector. There are no formal loans given to traders, while the parastatal has virtually unlimited access to official soft loans. The trust of farmers and private traders seems to have also been shaken by the unexpected injection of food aid products into the market that reduce the value of investment in inventory.

Several careful public sector actions will be required to promote improved market performance. These likely actions include the continuation of some sort of the price stabilization program, dissemination of collected market information, and the establishment of a better system of standard grades and measures. The implications and financial requirements for instituting a minimum price stabilization programme need to be spelled out clearly. Furthermore, future reforms need to be examined in their equity impact, so that sufficient measures will be taken to minimize the potential negative income distribution effects.

7.3. Need for Further Research

There are a number of important areas for policy design that have been raised in this study that require further research. A follow-up study is needed to examine whether Somtux maize variety has in fact lost much of its higher yield potential due to cross-breeding with the local variety, such that the two varieties behave about the same at various input levels. Such a study should be carried out both in a controlled experiment station environment and on farmers' fields, at various input levels and locations using the Somtux seeds currently distributed by the seed multiplication farm and the UNCDF credit program together with the local maize variety.

Another important area for further research concerns the issue of land access, apparent growing concentration and the overall case for land reform in the country. This issue is especially important in the Shabelle and Juba regions, as new investment is planned in the irrigation system. The present study identifies significant land ownership concentration in selected districts, yet the sample is relatively small in the 10 villages studied, and a more extensive study is needed to examine the extent and incidence of ownership concentration in other parts of the country. And there are a number of uncertainties and complex design questions with any land reform program, such as its potential impact on aggregate production, marketed surplus, productivity, rural employment and household food security.

To gain useful insights about rural food consumption behavior and nutrition, a consumption and nutrition study would help shed light on the extent of rural hunger and malnourishment. Very little attention has been previously given to understanding the nutritional status of different groups of the population. This study estimated (roughly) that almost half of the farming population in the study area are production deficit and many of these are potentially consumption deficit in the staple food - maize. Yet this estimate alone falls far short in completely understanding

the extent of rural hunger, the action programs needed to raise the food consumption of the rural poor, and possible ways of linking these programs into agricultural development and nutrition policy. Low farm productivity may after all not only be caused by lack of adoption of new technology but could also be a symptom of reduced vitality of the farmers due to sickness and malnutrition.

In view of their great importance to the livelihood of the poorest segments of the rural population, off-farm income opportunities need to be further investigated. Further research on the existing or potential role of rural small-scale industries could provide insights into alternative means of improving rural incomes. This issue must also be carefully related to questions of land reform, agricultural development investments, and growth of the rural labor market within agriculture.

Another important area for further research revolves around the issue of supply-demand balance for domestically produced maize. Assuming that the reforms of the early 1980s are not reversed, with the recent economic and political problems, and that aggregate production levels stay at the higher levels achieved in 1985-86, what is the potential for future domestic growth of supply and utilization of maize? Obviously, if more poor people could raise their incomes, demand would likely expand for maize. Furthermore, improved

processing of maize might expand its attractiveness to urban consumers. But further research is needed to more precisely shed light on how far Somalia might expand its domestic maize supply before saturating domestic demand of the commodity.

Farm storage techniques and current post-harvest losses need to be further investigated. Given the fact that the bulk of domestic maize and sesame stocks are held at the farm level, improvements in farm storage techniques would reduce the losses due to pest damage and enhance domestic food security. However, very little work has been done in the country on the important issue of current farm storage practices and potential methods of reducing post-harvest losses.

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**THE EFFECTS OF POLICY ADJUSTMENTS ON
FOOD SECURITY IN SOMALIA: THE CASE OF MAIZE
AND SESAME IN THE SHABELLE RIVER VALLEY**

Volume II

By

Yassin Jeyte Wehelie

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

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APPENDICES

APPENDIX I

Research Planning Matrix
SOMALIA FOOD SECURITY RESEARCH PROJECT

COMPONENT	SUBCOMPONENT	GENERAL QUESTION	SPECIFIC QUESTION
=====			
I. FARMER BEHAVIOR	A. FARMERS' AVAIL- ABLE RESOURCES	1.What is the variability of the the resource base among farm- mers?	1.How much farm land do farmers own? And what proportion of that land is devoted to maize and sesame cultivation? 2.What are farmers' family sizes and composition? 3.What proportion of farmers own/ rent tractors,irrigation pumps, livestock,and other assets?
		2.What resource constraints do farmers face?	1.Is hired labor available to farmers during peak labor use periods? 2.Are credit,fuel,agro-chemicals, and improved seeds available to at required time and form ? 3.Can farmers profitably expand their current land holdings? 4.Is lack of essential inputs preventing farmers from adopting yield-increasing technologies?
		3.Is marketed surplus a function of farm size and/or family size?	1.What is the correlation between farm/family sizes and quantities marketed by farmers?

	B.FARMER CROP AND TECHNOLOGY DECI- SIONS.	1.How do farmers combine their available resources to meet various household needs?	1.What are cropping patterns in the Gu and Deyr seasons? 2.What are the acreages for the different crops? 3.What is the cultivation calendar of each crop? 4.What are the input/output relat- ionships of maize and sesame? 5.What are the important off-farm economic activities of farmers? 6.To what extent do small farmers depend on labor sales to larger farmers for their livelihood?

COMPONENT	SUBCOMPONENT	GENERAL QUESTION	SPECIFIC QUESTION
=====			
		2.Do input and product market conditions influence farmers' planting decisions?	1.Do farmers take into account actual or expected product prices in their planting decisions, or merely market incidental surpluses? 2.Will a change in the price of a single crop change total output or merely alter cropping pattern? 3.Are input prices or availability and access to inputs most important to farmers' production decisions?

		3.What technologies are available to farmers and what has been the adoption rate?	1.Are farmers aware of alternative technologies, and are these available to farmers? 2.What technologies are used by maize/sesame farmers? 3.To what extent is the yield gap between farmers explained by differences in technologies?

		4.What is the profitability of adopting new technology?	1.What are the incremental costs and benefits associated with the adoption of new technology? 2.In which case are returns to family resources higher? 3.Do new technologies require more labor and cash costs?

		5. What has been the impact of recent liberalization policies on maize/sesame input use and output?	1. How did maize/sesame acreage change over the last three to four years? 2.When did major input use changes occur? 3.Did such changes follow the recent policy reforms?

COMPONENT	SUBCOMPONENT	GENERAL QUESTION	SPECIFIC QUESTION
=====			
	C. FARMER COPING STRATEGIES AND MARKET INTER-ACTION	1.What strategies do farmers adopt to ensure household food needs?	1.How much of the farm family consumption comes from home production and how much is acquired through market and non-market transactions? 2.What are the farmers' storage & marketing strategies? 3.Do farmers' inter-temporal on-farm storage decisions reflect price expectations or sole determinat. by family food needs? 4.Are farmers unwilling to experiment and try new methods of cultivation? 5.To what extent do small-scale farmers' sale of own labor contribute to their livelihood?
		2.What are the relationships between farmers and traders?	1.Do traders assist farmers with credit,technical inputs,and market information? 2.Do traders engage in production contracts with farmers?

II. TRADER BEHAVIOR	A. TRADER CHARACTERISTICS	1. Who are the people/firms trading inputs, maize and sesame? 2. What assets/facilities do they have for transporting and storing grain & sesame? sesame?	1. Describe and classify the firms & organizations trading inputs, maize & sesame. 2. What are the roles of public and private agents? 3. Describe the transportation & storage assets for different firm types.
	B. TRADER SOPs, BUSINESS PRACTICES, CONSTRAINTS	1. What types and mix of inputs and products do traders handle? 2. How do traders procure stocks of inputs and products? 3. Are traders price takers or price makers? 4. Are traders aware of market conditions & prices in different areas? 5. How long do traders store products? 6. What are the major problems facing input distributors and grain/sesame traders? products?	1. Do traders handle a mix of inputs & products to offset risk and uncertainty? 2. Do input distributors have ready access to inputs? 3. How do traders coordinate purchases and sales? 4. Are input suppliers aware of local needs? 5. Are traders aware of stocks and prices in rural areas? 6. Are price differences between seasons predictable enough to induce storage? 7. Do traders have access to sufficient funds for investment and working capital?

COMPONENT	SUBCOMPONENT	GENERAL QUESTION	SPECIFIC QUESTION
=====			
IV. FOOD SYSTEM	A. PUBLIC PROGRAM	1. What are the roles of public agencies and private firms in the importation and distribution of inputs?	1. What are the roles of public agencies (ONAT, ENC, ADC, AFNET)? 2. Are these roles conflicting? 3. How are scarce inputs (ferts, seeds, insecticides, tractor hire) allocated among distributing firms and end users? 4. Do particular firms/end users gain preferential access?
	PROGRAMS, ACTIVITIES		
	POLICIES,		
	PERFORMANCE		

		2. What is the role and what are the functions of ADC following liberalization?	1. What is ADC's mandate and how has its role changed? 2. Does ADC buy maize? Is it a residual buyer? Active buyer? 3. Does ADC accumulate maize stocks as a reserve? How are stocks managed? What decision rules govern their release?

		3. How is food aid distributed and how does this affect domestic production and marketing incentives?	1. What are parastatal strategies for timing of food aid (f.a.) acquisition, sales and distribution? 2. What are SOPs and distribution channels for releasing f.a.? 3. What is the impact of f.a. on prices in domestic markets and farmer production/marketing strategies? 4. What is the effect of f.a. on marketed flows and consumption patterns in secondary towns?

B. FOOD SYSTEM		1. Are inputs widely available to those firms and farms that want to use them?	1. Which inputs are available to which types/sizes of farms, firms & farm organizations? 2. Are inputs available when, where and in forms needed?
	PERFORMANCE		

COMPONENT	SUBCOMPONENT	GENERAL QUESTION	SPECIFIC QUESTION
=====			
		2. Are input and product markets effectively competitive?	1. Are input markets competitive? Or is access differential? 2. Do farmers have access to alternative market outlets? 3. How well informed are farmers of input/output market prices and supplies/opportunities?

		3. How well are improved technological packages adapted to different size/type farms?	1. Do farmers have knowledge of improved technology? 2. Do they have access to it? 3. Have they tried new technology? 4. Have farmers adapted improved technology? If not, why not? 5. What factors constrain adoption of improved methods? Why are yields so low?

APPENDIX II
DATA SUMMARY

The following section summarizes the data collected during the various surveys. Data summary, and the questionnaires, are sequenced as follows:

- 1.1) Village Reconnaissance Survey
- 2.1) Farmer I Survey
- 2.2) Farmer II Survey
- 2.3) Farmer III Survey
- 2.4) Farmer IV Survey
- 3.1) Trader I Survey
- 3.2) Trader II Survey

The Village Reconnaissance and the two Traders survey questionnaires were written in English, while Farmer Surveys I through IV were written in Somali. On page of the questionnaires, the interviewer recorded the region, district, village, (and market in the case of traders), and name of the respondent. Each questionnaire was then coded with identification numbers for each respondent. For their own records, each of the village enumerators kept a list of the village sample. The interviewer also recorded his own name and the date of the interview, while the supervisor who checked the questionnaire in the field signed his name and the date of checking.

1.1. Reconnaissance Survey

This interview with settlement chiefs was intended to provide information on the diversity of the different settlements, resource bases, access to inputs, markets, and farm technology in the Lower & Middle Shabelle regions.

1.2. Farmer I Survey:

Data was collected during the first Producer Survey on the following:

I. General and Demographic Characteristics of the Household

Information was gathered on the age and sex of the household head, marital status, and the number of family members living together in the household and those that live outside the village. The separate enumeration of family members living together in the village and those living outside the village was important for the determination of the average household (as defined here), its size and the discovery about the economic ties between the household and its family members living elsewhere. Also recorded under this item were the educational level of the household head and his participation in extension training and cooperatives. From this information was established the average household size and a variety of other important demographic characteristics. These data also provided information about the farmer's awareness and know-how of alternative cultivation practices and the correct use of modern farm inputs.

II-IV. Resource Ownership

In addition to household labor that was obtained from above, the major household resource is the quantity and quality of farm land available to the family. Since farmers generally own several plots of land in different location within the village boundary, information was gathered on the number of plots, their location with respect to the source of irrigation water, plot sizes, and whether these plots have been and continue to be cultivated by the household. Farmers were allowed to give area estimates in either local land measures (i.e. Jibaal or Darab) and standard hectares. Information on the extent and quantity of land either leased or rented from other farmers by the household and land registration with the Ministry of Agriculture were also included in this item. Other household resources also under this item included the ownership of tractor(s), livestock, vehicles, donkey-carts, shops and other wealth.

V. Cropping Pattern

Detailed information was gathered on the Gu and Der cropping patterns, area cultivated to each crop, and information on whether and why recent changes have taken place on each household's cropping pattern.

VI. Production Decisions

Farmers were asked whether commodity market prices affect the choice of crops and the total cultivated area of each crop. This information was sought to determine farmers' response to recent government price policy reforms.

VII. Gu 1986 Output, Sales and Storage

The sale of a marketable surplus is a very important source of cash income used to purchase other foods not produced by the household, clothes, a host of other goods and also for paying various farm expenditures. Quantities of different farm commodities produced and sold, the type of buyer, and the sale prices were recorded from the sample farmers for the period between the last Gu harvest (September 1986) up to the time of the interview (January 1987). Types of buyers included ADC which bought maize at the support price and private traders whose prices differed from farmer to farmer.

VIII. Household Food Security

Farmers were asked general information on their household food security status, such as whether they did run out of home-produced maize within the last twelve months and what have they done to gain access to food for their household consumption. In the event of crop failure during the Der

season, farmers were asked if they would have any difficulty of gaining access to sufficient income to feed themselves until the next harvest and what type of household food security strategy would they adopt to insure that they get adequate food. Various sources of income used to purchase household food requirements were recorded.

IX-X. Der Maize and Sesame Cultivation Practices and Budgets

Detailed information on cultivation practices, technology type and input use, and budgets were gathered. Since numerous farmers planted maize or sesame in different plots, it was difficult to obtain quantitative information on labor and other input use on all of the plots combined. Thus, quantitative information on labor and other input use were gathered on a one hectare basis; for example, the number of hours of land preparation time per hectare were asked instead of the total planted acreage. This strategy simplified the data collection process. Farmers were asked whether they have used row planting, improved seed, fertilizer, insecticide and a number of other technology and cultivation practices.

1.2 Farmer II Survey

I-II. Der 1987 Harvest

Because the first producer survey was carried out before the Der harvest, Farmer II survey was intended to supplement the former survey with information on the harvest cost for the

complete estimation of the partial crop budgets. Thus, information on maize and sesame harvest cost and plans for the upcoming Gu cropping season was collected during this survey.

1.3. Farmer III Survey

I. Gu Crops

The first part of the questionnaire covered information on total Gu planted acreage, whether Gu season acreage has increased relative to the year before, and the different crops planted and their cultivated areas. Cropping pattern was recorded by plot, and total cultivated land to specific crops computed later. Farmers were also asked to estimate the acreage under fallow and the reason(s) for letting part of his land to be under fallow.

II-V. Der Crop Production, Sale, Gifts and Storage

From the Gu cropping pattern, the interview moved into the subject of the last Der season output, sale and stored quantities. Since the Der season is minor season with respect to the Gu season and because of the Der drought that occurred earlier in the year, farmers were first asked whether they had planted crops during the Der. Only if the replay was "yes" did the interviewer pursued further questions regarding output, sale and storage. If the respondent reported having produced and sold crops, the quantities sold of each crop, type of buyer, and sale prices were recorded. Current stocks of the

Der harvest still held by the farmers were registered, and the level of stocks compared to what farmers held at this time during last year when the Der harvest was relatively better. The non-monetary transactions of barter and Islamic charity obligation (i.e. "sako") to the poor were recorded, including those who had received sako from others.

VI-VII. Household Food Security and Food Purchases

More specific questions on household food security status including cereal and oil consumption requirements and food purchases from the market for a month period were recorded during the third farm survey. Since the survey was carried out at the height of the hungry season, information on the level of grain stocks and the capacity of purchasing food from the market provided some idea of the household food security and the degree of reliance on purchased food during the hungry period. Reported purchases and prices paid during the hungry period were expected to give an indication of the whether farmers were forced to sell maize and sesame at harvest when prices were low and buy the same types of food at the hungry season when prices reach at their seasonal highest levels. Because only household heads were being consistently interviewed and the majority of them were males, purchased quantities were asked for the last thirty days than throughout the inter-harvest period because such kind of information was rather difficult for the husbands to know very well.

VIII-X. Off-farm Income Earning Sources, and Expenditures

Off-farm income represents a major source of cash income for a large number of farmers in the two regions. The sale of labor to other farms is one of the most important sources of off-farm income used to supplement income earned from farm activities. Off-farm income earned from wage labor, salary, petty trade, fishing, handicrafts, and fishing were recorded for a six month period. Remittances from family members working elsewhere within the country or outside were also recorded. Farmers were asked about the proportions of the total cash income used for farm expenditure, household consumption, and weddings or funerals.

XI-XII. Gu Maize and Sesame Cultivation Practices and Budgets

Similar to the Der, detailed information on cultivation practices, technology type and input use, and budgets were also collected for the Gu season. Quantitative information on labor and other input use were again collected on a one hectare basis. Information was collected on planting methods, the number of weeding and irrigation, and the use of different farm inputs such as fertilizer, improved seed, and insecticide. Rates of application of the various inputs were also asked.

Producer IV Survey:I. Gu Maize and Sesame Cultivation Practices and Budgets

Information on harvest cost of the maize and sesame produced during the Gu season were collected during the fourth survey. Because the first producer survey was carried out before the Der harvest, Producer IV survey was intended to supplement Producer III survey with information on the harvest cost for the complete estimation of the partial Gu season crop budgets. Thus, Producer IV survey collected information on maize and sesame harvest cost and plans for the upcoming Der cropping season.

II-III. Gu Crop Production, Sale, Gifts and Storage

Farmer Gu season maize and sesame output was recorded at this survey. Because the survey was carried about one month after the harvest, sales and storage information are perhaps incomplete for some farmers since some of the farmers were still in the process of selling their season harvest. The quantities sold of each crop, type of buyer, and sale prices were recorded. Also recorded were the stored quantities for home consumption, and/or perhaps earmarked for later sale to take advantage of the seasonal price increases. The non-monetary transactions of barter and "sako" were also recorded, including those who had received it from others.

IV-V. Household Food Security and Food Purchases

Farmer purchases of maize, cooking oil, sugar, beans, rice and pasta were recorded for the one month period preceding the interview. Interviewers asked farmers the quantities purchased, prices, and the reasons for the purchases of these foods. Farmers were also asked whether their stored grain was sufficient to feed the family up until the next Gu season harvest.

VI. Off-farm Income Earning Sources, and Expenditures:

Off-farm income during the Gu season was recorded in this section.

VII-VIII. Farmers' Der 1988 Production Plans and Gu 1986

Questions about whether farmers began Der land preparation, crop mix, and whether they intended to cultivate more maize and sesame than the previous Der were asked.

IX. Irrigation and Land Leveling

While all sample villages lied within the irrigation infrastructure of the two regions, some farmers had better access and made use of irrigation water relatively more efficiently than others because of the degree of land leveling. To get a better understanding of farmers' irrigation efficiency and related possible problems, a whole section of

the interview was devoted to discuss these issues with the sample farmers. Farmers were asked whether they had access to a water pump when river level goes down and gravity irrigation becomes infeasible. To obtain information on land leveling, each farmer was asked whether irrigation water reached evenly all of his land or whether he/she observed the existence of patches of dry and wet areas during irrigation. Also asked was whether farmers would contemplate to change their cropping pattern if potential irrigation constraints were solved. Because water distribution among farmers is managed by local water committees, farmers were asked to describe the role of their committee members and if they were satisfied with the performance of the committee in terms of the fairness of water distribution and the settlement of irrigation disputes and the cases involving transgressions of the local rules by certain farmers.

Trader I Survey:

I. Background

Include under the trader background information were age, sex, and the level of education. Business background information was also gathered concerning whether the trader was exclusively involved in wholesaling or rural assembly, the number of years in the business and what commodities did he/she traded.

II. Standard Purchasing Procedures

Traders were asked to select from a checklist of possible sources from which he/she normally purchase commodities from and whether these are customary sellers that usually supply him/her. The question about the existence or not of customary suppliers that a trader has business ties with was intended to discover whether there was any vertical integration in the maize and sesame subsectors and whether such a network informally shared information and credit services. Traders were also asked about sources of market information and the units used in their purchases. Methods of financing purchases, sources of credit, and whether traders had sufficient capital to handle large quantities and store the products for significant period was asked to understand the existence of financial constraints.

III. Standard Sales Procedures

First, traders were asked about the length of time they store products before they sell them and how and where they store these products. Next, traders were asked if they had an idea about the optimum time for storing products to benefit from the seasonal price increases. A question regarding the type of buyers the traders sold commodities to and possible business ties between them were also asked.

IV. Trader Felt Constraints

A short open-ended section was devoted to recording traders' felt problems and constraints.

V. Description of the Last Transaction

To obtain objective information on purchases and sales, traders were asked to describe their most recent transaction. First, traders requested to tell whom, where, when, and how much they paid for their most recent transaction. Several questions were asked about how they financed the transaction, how they transported the products, and how long did they store it. Next, a number of questions were asked about how, to whom, and their sale price. These questions allow the computation of the marketing cost and trader returns.

Trader II Survey:

I. Background and Other General Information

Since the two trader surveys have generally interviewed different traders during the interviews, a short background information on trader's age, education, and experience in the business were also collected during the second survey. During this second trader survey which was carried in November and at the height of the maize marketing season, traders were asked about the length of time during each year that they engaged in maize and sesame marketing activities and whether

they trade in other types of products during the off-season period. The next questions involved the participation of private marketing sector in farm input distribution. By asking whether traders supplied inputs to farmers, the study team expected to ascertain the lack of private sector involvement in input marketing and distribution. Other general questions asked in this section concerned traders' memory of the crash of domestic maize prices during 1985 as a result of the injection of large quantities of food maize into the market. Finally, traders were inquired to assess the effect of ADC competition with them on their income and that of farmers.

II-III. Description of the Last Transaction

To obtain objective information on purchases and sales, traders were again asked to describe their most recent transaction. First, traders requested to tell whom, where, when, and how much they paid for their most recent transaction. Several questions were asked about how they financed the transaction, how they transported the products, and how long did they store it. Next, a number of questions were asked about how, to whom, and their sale price. These questions allow the computation of the marketing cost and trader returns.

APPENDIX III

SURVEY QUESTIONNAIRES

**MASHRUUCA FOOD SECURITY
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)**

Village Reconnaissance Survey

Region:.....

District:.....

Village:.....

Respondent Name:.....

Indentification Number:.....

Interviewer:.....

Date:.....

Item	Specific Question	Response	Code
1.Population	1.What is the approximate population of the settlement?	# Houses..... # Families... # People.....	
	2.What proportion of the residents are farmers?	%	
2.Cropping system	1.Are settlements farms irrigated and/or rainfed?	Irrig..... Rnfed..... Both.....	
	2.What are the major crops grown during: a)Gu season?	a)Gu:..... b)Der:.....	
	3.What is the settlement's: a)Best maize yield? b)Average maize yield?	a).....Qt/Ha. b).....Qt/Ha.	
	4.What factors affect maize yield the most?	1)..... 2)..... 3)..... 4)..... 5)..... 6).....	
	5.Do farmers use the following maize technologies: a)Fertilizer? b)Insecticide? c)Improved seeds? d)Row planting? e)Improved package?	a)Yes... No... b)Yes... No... c)Yes... No... d)Yes... No... e)Yes... No...	
	6.Do the UNCDF provide credit in this settlement?	Yes... No...	
	7.Is there an FEA assigned in this settlement?	Yes... No...	
	8.From whom do farmers get farm inputs?	.....	
	9.How many tractors are owned by settlement residents?	.....	
	10.Are there banana plantations around the settlement?	Yes... No...	

Item	Specific Question	Response	Code
(Cont.)	11. Do banana plantations give small parcels of land to their laborers?	Yes... No...	
3. Farm sizes & resource availability.	1. How many hectares is the largest farm in the settlement?	Ha.	
	2. What is the average farm size ?	Ha.	
	3. Is farm land rented in the settlement?	Yes... No...	
	4. Do farmers own the following: a) One or two cows kept at home? b) Large cattle herds grazed outside the settlement?	a) Yes... No... b) Yes... No...	
4. Product marketing.	1. What proportion of maize harvest do farmers normally sell?	%	
	2. To whom do they sell maize: a) ADC? b) Itinerant private traders? c) Local market?	a) Yes... No... b) Yes... No... d) Yes... No...	
	3. Which major market residents sell most of their products?	.....	
5. Liberalization impacts.	1. Has any changes occurred over the last 3 or 4 years in the settlement's: a) Production? b) Technology use?	a) Yes... No... b) Yes... No...	
	2. Did cropped area expanded over this period?	Yes... No...	
	3. Was the change of area cropped due to: a) Reduction in the fallow period and fallow land? b) New land under production?	a) Yes... No... b) Yes... No...	

MASHRUUCA FOOD SECURITY
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)

Wareeysiga Beeralayda
Midka Kowaad

Gobol:.....

Degmo:.....

Tuulo:.....

Magaca Beeralayga:.....

Lambarka Aqoonsiga:.....

Magaca Fidiyaha:.....

Taariikhda:.....

Hubiyay:.....

Taariikhda:.....

Qaybta	Su'aalaha	Jawaabaha																														
	d.Sheeg dadka qoyska ka mid ah oo aan hadda reerka la noolayn:																															
	<table><tr><th>Cadadka</th><th>Da'da</th><th>D.Ouraan</th><th>Iskool</th><th>Ku nool?</th><th>Qabta Shaqo</th></tr><tr><td>-</td><td>....</td><td>H M</td><td>H M ..</td><td>.....</td><td>.....</td></tr><tr><td>-</td><td>....</td><td>H M</td><td>H M ..</td><td>.....</td><td>.....</td></tr><tr><td>-</td><td>....</td><td>H M</td><td>H M ..</td><td>.....</td><td>.....</td></tr><tr><td>-</td><td>....</td><td>H M</td><td>H M ..</td><td>.....</td><td>.....</td></tr></table>	Cadadka	Da'da	D.Ouraan	Iskool	Ku nool?	Qabta Shaqo	-		H M	H M ..			-		H M	H M ..			-		H M	H M ..			-		H M	H M ..			
Cadadka	Da'da	D.Ouraan	Iskool	Ku nool?	Qabta Shaqo																											
-		H M	H M ..																													
-		H M	H M ..																													
-		H M	H M ..																													
-		H M	H M ..																													
	4.Iskaashato xubin ma ka tahay? <u>Haddii ay Haa tahay jawaabta:</u>	4) Haa.. Maya..																														
	a.Sheeg nooca iskaashatada aad xubinta ka tahay?	a)Tacabwadag..Ujeeddobadan..																														
	b.Iskaashatada xubnaheeda ma ka kaalmeysaa waxyaabaha soo socda:																															
	- Dayn Qaasho?	-Haa.. Maya..																														
	- Bakhaar (ama kaydinta miraha)?	-Haa.. Maya..																														
	- Suuq-Gaynta miraha?	-Haa.. Maya..																														
	- Dhul ma ku siisay?	-Haa.. Maya..																														
	<u>Hadii ay Maya tahay jawaabta:</u>																															
	c.Ma jeceshahay inaad xubin ka noqotid iskaashato?	c)Haa.. Maya..																														
	5.Ma ka mid tahay beeralayda xiriiriyaasha Fidinta ah ee tuulada?	5)Haa.. Maya..																														
	6.Ma la socotaa faa'iidada waxyaabaha soo socda:																															
	- Saf-saf u abuuridda galayda?	-Haa.. Maya..																														
	- Abuurka cusub galayda(SOMTUX)?	-Haa.. Maya..																														
	- Nafaqaynta dhulka (Bacrinta)?	-Haa.. Maya..																														
	- Sunta cayayaanka (Dhunqabad)?	-Haa.. Maya..																														
	- Kala fogeynta dhirta?	-Haa.. Maya..																														
II.Ballaca Beerta	7.Meeqa beer ayaad qabtaa?	7)Tirada beeraha.....																														
	8.Sheeg ballaca iyo tilmaamaha beertaada:																															

Cadadka Beerta	Meeqa Hek/Jib	Ma roobaa misa Waraab	Gugigii la soo dhaafay meeqa H/J ayaad ka tacabtay	Xilliga Deyrtan Imisa	Meeqa sano aya beerta tacbaysay
1aad	...H/J	Roob Warab	H/J	H/J	sano
2aad	...H/J	R.. W..	H/J	H/J	sano
3aad	...H/J	R.. W..	H/J	H/J	sano
4aad	...H/J	R.. W..	H/J	H/J	sano

Qaybta	Su'aalaha	Jawaabaha
III.Xaaladda Waraabka	9.Ma ijaaratay dhul doonfuul ah xilligan Dayrta? <u>Haddii ay Haa tahay.</u>	9)Haa.. Maya..
	a.Meeqa Hektar/Jibaal ayaad ijaaratay?	a)..... Hektar/Jibaal
	b.Roob misa waraab dhulkaasi?	b)Roob.. Waraab..
	c.Meeqa Shilin oo ijaar ah ayaad Hektar/Jibaal bixisay?	c)..... Shilin Hek/Jib
	d.Sababta aad dhul doonfuul ah u ijaaratay maxay tahay?	d)Sababta
	10.Dayrtan dhul adiga aad leedahay ma iska ijaartay?	10)Haa.. Maya..
	11.Dhul cusub ma ku kordhisay dhulkaad tacabijirtay 5 sano ee la soo dhaafay? <u>Haddii ay Haa tahay.</u>	11)Haa.. Maya..
	a.Xageed ka heshay dhulkaasi?	-Waan Geed qaaday -Waan Gatay -Waan Dhaxlay -Iskaashataa i siisay
	12.Dhulkaaga oo dhan ma ka diiwaan gelisay Wasaaradda Beeraha?	12)Haa.. Maya..
	13.Dhulkaaga waraabka xaggee ku yaal?	B E E R T A laad | 2aad | 3aad | 4aad
	-Webiga jiinkiisa	.... | .... | .... | ....
	-Kanaal Gummeed	.... | .... | .... | ....
	-Far Gummeed	.... | .... | .... | ....
	-Kanaal Gaar ah	.... | .... | .... | ....
IV.Lahaashaha qalab iyo xoolo	14.Beeralaeey kale ma la qaybsataa kanaalada aad ka waraabtid? <u>Haddii ay Haa tahay.</u>	14)Haa.. Maya..
	a.Ma leedihiin guddi u qaybsan waraabka (sida Aw iyo Sagaalad)?	a)Haa.. Maya..
	b.Ma ka mid tahay guddigaasi?	b)Haa.. Maya..
	c.Guddiga waraabka muxuu qabtaa?	c).....
	15.Maxuu yahay nooca waraabkaaga sannadka oo dhan?	
	a.Daadooy (Gravita) keliya?	a)Haa.. Maya..
	b.Matoor keliya?	b)Haa.. Maya..
	c.Daadooy iyo matoor isku jira?	c)Haa.. Maya..
	16.Ma qabta qalabka iyo waxyaabaha kale soo socda:	
	a.Matoor bombo waraab?	a)Haa.. Maya..
	b.Cagaf?	b)Haa.. Maya..
	c.Lo'	c)Haa.. Maya..
	d.Geel	d)Haa.. Maya..

Qaybta	Su'aalaha	Jawaabaha
		<u>Tirada</u>
	e.Ari	e)Haa... .. Maya..
	f.Digaag ama dooro	f)Haa... .. Maya..
	g.Dameer	g)Haa... .. Maya..
	h.Gaari-dameer ama gaari-dibi	h)Haa... .. Maya..
	i.Dukaan	i)Haa... .. Maya..
	j.Baabuur	j)Haa... .. Maya..
	k.Xoolo kale (<u>Caddey</u>)	k)Haa... .. Maya..
V.Dalagyad ka baxa beerta	17.Maxay yihiin dalagyada kuu beeran xilligan Deyrta iyo ballaca dhulka dalag walba?	
	Lambarka Beerta	Dalagyada ku beeran xilligan Deyrta
	1aad	 Ballac...H/J Ballac....H/J .....H/j
	2aad	Ballac...H/J Ballac....H/J .....H/J
	3aad	Ballac...H/J Ballac....H/J .....H/J
	4aad	Ballac...H/J Ballac....H/J .....H/J
	18.Gugii la soo dhaafay maxaad beertay iyo intee dhul ah ayaad dalag walba ku beertay?	
	Lambarka Beerta	Dalagyada aad beertay xilligii Gugii la soo dhaafay
	1aad	 Ballac...H/J Ballac....H/J .....H/J
	2aad	 Ballac...H/J Ballac....H/J .....H/J
	3aad	 Ballac...H/J Ballac....H/J .....H/J
	4aad	 Ballac...H/J Ballac....H/J .....H/J
	19.Meeqa kiintaal saafi ah ayaad ka heshay Hek/Jib xilliyada kala ah:	
	Dalag	Gu 85 Deyrtii sannadki '85 ee hore Gu '86 ee la soo dhaafay
	a. Galley	Kt.....H/J Kt.....H/J Kiintaal.....H/J
	b. Sisin	Kt.....H/J Kt.....H/J Kiintaal.....H/J
	c. Digir	Kt.....H/J Kt.....H/J Kiintaal.....H/J
	d. Bariis	Kt.....H/J Kt.....H/J Kiintaal.....H/J

Qaybta	Su'aalaha	Jawaabaha																								
	20.Tirada dhulka aad Galleyda ku tacabtid sannadkan ma la mid baa misa waa ka duwan yahay kii 5 sano la soo dhaafay?	-Waa kordhay..... -Waa yaraday..... -Waa la mid.....																								
	21.Tirada inta kiintaal oo galley ah aad Hektarkii ama Jibaalkii ka heshid ma la mid baa misa waa ka duwan yahay kii 5 sano la soo dhaafay?	-Waa kordhay..... -Waa yaraaday..... -Waa la mid.....																								
	<u>Haddi tirada dhulka & amadda (yield) korodhay?</u> -																									
	22.Maxaa sabab u ah kororsiimada dhulka aad ku beertid galleyda?	-Sicirka oo kordhay..... -Warab ayaan helay..... -Teknolojiyo cusub..... -Sabab kale (<u>caddey</u>).....																								
	23.Maxaa sabab u ah kororsiimada wax-soo-saarka Hektarkii galleyda?	-Sicirka oo kordhay..... -Teknolojiyo cusub..... -Sabab kale (<u>caddey</u>).....																								
VI. Go'aanka tacabka	24.Maxay tahay asbaabta aad Dayrta u tabcaysid dalagyada kuu abuuran ?	<table><tr><th>Dalag</th><th>Raashin</th><th>Suuqa</th></tr><tr><td>Galley</td><td>.....</td><td>.....</td></tr><tr><td>Sisin</td><td>.....</td><td>.....</td></tr><tr><td>Digir</td><td>.....</td><td>.....</td></tr><tr><td>Bariis</td><td>.....</td><td>.....</td></tr><tr><td>Qudaar</td><td>.....</td><td>.....</td></tr></table>	Dalag	Raashin	Suuqa	Galley			Sisin			Digir			Bariis			Qudaar								
Dalag	Raashin	Suuqa																								
Galley																										
Sisin																										
Digir																										
Bariis																										
Qudaar																										
	25.Ma isku dhex beerta galleyda iyo digirta? <u>Haddii ay Haa tahay,</u> a.Maxay tahay sababta aad iskugu dhex beertid?	25)Haa.. Maya.. a)-..... -.....																								
	26.Xilli kasta ma tixgelisa sicirka sarac kasta uu suuqa ka joogo inta aadan tacbin dalagaasi misa raashinka qoyska keliya ayaad tixgelisa?	<table><tr><th>Dalag</th><th>Sicirka Suuqa keliya</th><th>Suuqa & ras-hinka</th><th>Raas-hinka qoyska keliya</th></tr><tr><td>Galley</td><td>....</td><td>....</td><td>.....</td></tr><tr><td>Sisin</td><td>....</td><td>....</td><td>.....</td></tr><tr><td>Digir</td><td>....</td><td>....</td><td>.....</td></tr><tr><td>Bariis</td><td>....</td><td>....</td><td>.....</td></tr><tr><td>Khudar</td><td>....</td><td>....</td><td>.....</td></tr></table>	Dalag	Sicirka Suuqa keliya	Suuqa & ras-hinka	Raas-hinka qoyska keliya	Galley				Sisin				Digir				Bariis				Khudar			
Dalag	Sicirka Suuqa keliya	Suuqa & ras-hinka	Raas-hinka qoyska keliya																							
Galley																										
Sisin																										
Digir																										
Bariis																										
Khudar																										

Qaybta	Su'aalaha	Jawaabaha					
VIII. Sugnaanta cuntada ee qoyska	32.Ma xususata sannadkii la soo dhafay mar uu badarka beertaada kaaga soo baxa (sida galeyda, bariiska iwm)kaa dhamaaday oo cidda waxaad siisid weyday? <u>Haddii ay Haa tahay,</u> a.Xaggeed ka heshay cuntada dheeradka ah?	32)Haa.. Maya.. -Suuqa ayaan ka soo gatay.. -Badar ayaan soo deynsaday.. -Lacag ayaan soo deynsaday.. -Beeraha tuulada u dhow ayaan ka soo shaqeystay..... -Xoolo ayaan iska gaday..... -Magaalada ayaan ka shaqeystay..... -Waan beecmushtaray..... -Mushaar ayaan qaataa..... -Siyaabo kala (caddee).....					
	b.Haddii aadan soo deynsan xaggeed ka heshay lacagta aad ku so gadatid cuntadaasi?						
	c.Qof qoyska ka mid ah ee tuulada dibadeeda ka shaqeeya oo reerka dhaq- aale ku kaalmeeya ma jiraa?	c)Haa.. Maya..					
	33.Laba iyo tobankii bilood ee la soo dhaafay, ma xusuusataa wax cunto ah aad dibadda ka soo iibsatay?	33)Haa.. Maya..					
	<u>Haddii ay Haa tahay,</u> a.Maxay kala ahaayeen cuntada aad soo gadatay goormaadna soo iibsatay?						
	WAQTIGA AAD SOO GADATAY						
	Nooca cuntada	Beerfalki Dayrtii Hore	Beergoyn Dayrtii Hore	Jilalki Hore	Beeraburki Gugii Hore	Beergoyn Gugii Hore	Beer Abuurkii Deyrtan
	Galley						
	Saliid						
	Digir						
Bariis	.....	.....	.....	.....	.....	.....	
Baasto	.....	.....	.....	.....	.....	.....	
14.Deyrtii sano hore iyo gugii la soo dhaafay miraha kuu soo baxay ee dalagyada soo socda cunto ahaan ma kugu filnaayeen qoyska misa qayb ka mid ayaad gaday?							
		Galley	Digir	Bariis			
Qayb baan gaday		.....	.....	.....			
Waxba ma gadin		.....	.....	.....			
Waan soo gatay		.....	.....	.....			

Qaybta	Su'aalaha	Jawaabaha																																				
	35.Ma jirtaa waxyaabo beerta ka soo go'ay oo dhibaato aad ku qabtid keydintooda? <u>Hadii ay Haa tahay,</u> a.Maxay yihiin cuntaadas: Galley..... Bariis..... Sisin..... Digir.....	35)Haa.. Maya..																																				
	36.Intee badar ah ayaa waqtigan la joogo kuu keydsan? <table><tr><td></td><td>Tirada</td><td>Nooca</td><td>Kaydka</td><td></td><td></td></tr><tr><td>Dalag</td><td>(Kintaal)</td><td>Bakaar</td><td>Barmiil</td><td>Maqaasiin</td><td>Guriga</td></tr><tr><td>Galley</td><td>.....Kt</td><td>.....</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><td>Digir</td><td>.....Kt</td><td>.....</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><td>Bariis</td><td>.....Kt</td><td>.....</td><td>.....</td><td>.....</td><td>.....</td></tr><tr><td>Sisin</td><td>.....Kt</td><td>.....</td><td>.....</td><td>.....</td><td>.....</td></tr></table>		Tirada	Nooca	Kaydka			Dalag	(Kintaal)	Bakaar	Barmiil	Maqaasiin	Guriga	Galley	Kt					Digir	Kt					Bariis	Kt					Sisin	Kt					
	Tirada	Nooca	Kaydka																																			
Dalag	(Kintaal)	Bakaar	Barmiil	Maqaasiin	Guriga																																	
Galley	Kt																																					
Digir	Kt																																					
Bariis	Kt																																					
Sisin	Kt																																					
	37.Ma filaysaa inaad qayb ka mid ah kaydkaaga cuntada aad gadi doontid inta ka horeysa beergoysmada xilligan deyrta? <u>Hadii ay Haa tahay,</u> a.Maxay tahay sababta aad u gadi dontid : -Kor u kaca sicirka si aan uga faa'iideysto.... -Si aan lacag sonkor, shaah, iwm. u helo..... -Si aan u helo lacag aan ku baxsho kharashka beerta (sida shaqaale iwm)..... -Sabab kale (Cadde):	37)Haa.... Maya....																																				
	38.Haddii aanad waxba gedin, meeqa bilood ayaad is leedahay waa ku filan yahay cidda badarka ku yaalla?	38).... Bilood																																				
	39.Maxad u maleyneysaa in xilligan Dayrta uu noqdo?	-Mid xun..... -Mid fiican..... -Mid caadi ah...																																				
	40.Haddii ay Deyrta xumaato, dhibaato ma kaa qabsan doontaa sidii aad cidda cunto ugu heli lahayd ilaa iyo Guga soo socda? <u>Haddii ay Haa tahay,</u> a.Maxaad uga hortageysaa dhibaataadaasi? -Xoolo ayaan iska gadaysaa..... -Magaaladaan u shaqo tagaa..... -Beeraha kale ayaan ka shaqaysanayaa... -Si kale (Caddee).....	40)Haa.. Maya..																																				

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
11. Kharajka Galleyda	41.Galley ma beertay xilligan Dayrta? <u>Haddii ay Haa tahay,</u> a.Meeqa Hek/ Jib oo galley ah ayaad beertay xilligan Dayrta? <u>D H U L D I Y A A R I N</u> 42.Dhulka ma cagaf misa yaambo ayaad ku carro-gedisay? <u>Haddii aad cagaf ku carro-gedisay,</u> 43.Meeqa saac uu cagafka 1 Hektar ku carro-gedin karaa? 44.Cagafka miyaad soo ijaaratay misa adigaa leh? <u>Haddii aad cagafka soo ijaaratay,</u> 45.Meeqa Shilin ayaad cagafka 1 saac ku soo ijaaratay? a.Ninka cagafka wada raashinkiisa iyo sigaarkiisa meeqa lacag ah ayaa kaaga baxay? b.Wax kharaj kale ah ma kaaga baxay carro-gediska, meeqana? 46.Dhulka cagaf ma ku erbishaysay? a.Meeqa saac uu cagafka 1 Hektar ku erbishayn karaa? b.Meeqa Shilin ayaa cagafka 1 saac oo erbish ah ku ijaaratay? 47.Dhulka galleyda cagaf ma ku kawaaweysay? a.Meeqa saac uu cagafka 1 Hektar ku kawaaweyn karaa ? <u>Haddii aad Yaambo ku carro-gedisay,</u> 48.Meeqa Jibaal ayaa qofkii maalin carro-gedin karaa? 49.Intee maalmood ayaa carro-geddiska socday? 50.Intee qof oo reerka ah iyo shaqale ayaa Yaambada ku carro-gediyay? a.Meeqa Shilin oo ijaar ah qofkii 1 Jibaal uu ku carro-gediyay? 51.Ma sameeysay kanaal nadiifin beer-abuurkii Dayrta ka hor? <u>Haddii ay Haa tahay,</u> a.Intee qof oo reerka ah iyo shaqale ayaa kanaalka nadiifiyay? b.Meeqa maalmood ayaa kanaalka la nadiifiyay? <u>A B U U R I T A A N K A</u> 52.Meeqa Suus oo galley ah ayaa 1 Hektar ku abuurtay?	41)Haa.. Maya.. a)..... Hek / Jib 42)Cagaf... Yaambo... 43)..... Saac/Hektarkii 44)Waan soo ijaartay.... Aniga lahaa 45)..... Shilin/Saacaddii a)..... Shilin <u>Kharaj</u> b)Haa... ..Shilin Maya.. 46)Haa... Maya.. a)..... Saac/Hektarkii b)..... Shilin/Saacaddii 47)Haa.. Maya.. a)..... Saac/Hektarkii 48)..... Jibaal/Qofkii 49).....Maalmood 50)...Qof Reerka ...Shaqale a).....Shilin/Jibaalkii 51)Haa.. Maya.. a)...Qof reerka ...Shaqale b).....Maalmood 52).....Suus / Hektarkii

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	53.Nooca abuurka galleyda aad Dayrtan isticmaashay ma kii Fidintaa, misa kii Gugii beertaada ka soo go'ay, misa suuqaad ka soo gadatay? <u>Haddii aad abuurka suuga ka soo gadatay,</u> a.Meeqa ayaad 1 Suus oo abuurka ah ku soo gadatay?	53)Waa kii Fidinta Waa kii beertayda Guga... Suuqaan ka soo gatay
	54.Meeqa Jibaal ayaa qofkii maalinti abuurka karaa? a.Intee qof reerka iyo shaqaale ayaa abuuray? b.Meeqa ijaar ah qofka shaqaalaha ah ayaa Jibaalkii ku abuuray?	a)..... Shilin/Suuskaa 54)..... Jibaal/Maalintii a)...Qof Reerka ...Shaqaale b)....,....Shilin/Jibaalkii
	55.Ma saf-saf ayaad u abuurtay galleyda?	55)Haa.. Maya..
	<u>K A L A D H I M I D</u> 56.Ma kala dhintay galleyda? a.Meeqa Jibaal ayaa qofkii maalintii kala dhimi karaa? b.Intee qof reerka iyo shaqaale ayaa kala dhimay? c.Meeqa lacag ah ayaa Jibaalkii lagu kala dhimay?	56)Haa.. Maya.. a).....Jibaal/Maalintii b)...Qof reerka ...Shaqaale c).....Shilin/Jibaalkii
	<u>F A L K A</u> 57.Meeqa jeer ayaad galleyda fashay? 58.Maalintii meeqa Jibaal ayaa qofkii fali karaa? a.Intee qof reerka iyo shaqaale ayaa fashay? b.Meeqa Jibaalkii lagu falay?	57)..... Jeer oo fal ah 58).....Jibaal/Qofkii a)...Qof reerka ...Shaqaale b) Shilin/Jibaalkii
	<u>W A R A A B K A</u> 59.Galleyda meeqa jeer aad waraabisay? 60.Meeqa jeer ayaad matoor galleyda ku waraabisay xilligan Dayrta? 61.Marka aad daadooy (gravity) ku waraabisay, meeqa Jibaal ayaa maalin tii la waraabin karaa? a.Intee qof reerka iyo shaqaale ayaa waraabiyay? b.Maalintii meeqa lacag ah ayaa qofka shaqaalaha waraabka siisay? 62.Marka aad matoor ku waraabisay, meeqa Jibaal ayaa maalintii uu matoorka waraabin karaa? a.Matoorka ma adiga leh, ijaar miya, misa waa mid dawladda leedahay oo tuulada ka dhexeeya?	59)..... Jeer waraab ah 60).....Jeer matoor 61).....Jibaal a)...Qof reerka ...Shaqaale b).....Shilin/Qofkiiba 62)..... Jibaal a)Aniga leh..... Waa ijaar..... Kan tuulada...

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	b.Meeqa litir oo Nafto ah ayaa matoorka maalintii lagu shubay ? c.Intee qof reerka iyo shaqaale ayaa waraabisay? d.Maalinintii qofkii meeqa lacag ah ayaa la siiyay?	b).....Litir c)...Qof reerka ...Shaqaale d).....Shilin/Qofkiiba
	<u>I L A A L I N (WAARDIYE)</u>	
	63.Galleydaada meeqa maalmood ayay jirtaa?	63).....Maalmood
	a.Goormaa la bilaabay in la ilaaliyo?	a).....Maalin markay jirtay
	b.Meeqa qof ayaa 1 Hektar ilaalisoo?	b).....Qof/Hektarkii
	c.Intee qof reerka iyo shaqaale ayaa ilaalisoo?	c)...Qof reerka ...Shaqaale
	d.Qofkii waardiyaha meeqa maalinintii lacag ijaar ah la siiyaa?	d).....Shilin/Maalinintii
	<u>B E E R - G A S H I (INPUTS)</u>	
	64.Ma siisay bacrin galleyda Dayrtan? Haddii ay Haa tahay,	64)Haa.. Maya..
	a.Maxay tahay nooca bacrinta aad siisay?	a).....
	b.Meeqa jeer ayaad bacrinta siisay?	b).....Jeer
	c.Imisa Kiilo ayaa Hektarkii siisay?	c).....Kiilo
	d.Maxuu yahay qiimaha 50 Kiilo?	d).....Shilin/50 Kg.
	e.Intee qof reerka iyo shaqaale ayaa bacrinta ka shaqeeyay?	e)...Qof reerka ...Shaqaale
	f.Meeqa Shilin ayaa qofka shaqaale ah ku firdhiyay 50 kiilo?	f).....Shilin/50 Kg.
	65.Ma siisay sunta cayayaanka galleyda xilligan Dayrta? Haddii ay Haa tahay,	65)Haa.. Maya..
	a.Maxay tahay nooca suntaad siisay?	a).....
	b.Meeqa jeer ayaad siisay sunta?	b).....Jeer
	c.Meeqa kiilo ayaa Hektarkii siisay?	c).....Kiilo
	d.Kiiladi sunta waa meeqa?	d).....Shilin/Kiiladii
	e.Intee qof reerka iyo shaqaale ayaa sunta ku shubtay?	e)...Qof reerka ...Shaqaale
	f.Meeqa Shilin ayaa qofkiiba Jibaalkii ijaar sunta loo siiyay?	f).....Shilin/Jibaalkii
	66.Ma siisay sunta cawska disha? Haddii ay Haa tahay,	66)Haa.. Mayaa..
	a.Maxay tahay nooca sunta cawska?	a).....
	b.Meeqa jeer ayaad siisay?	b).....Jeer
	c.Meeqa Litir ayaa Hektarkii siisay?	c).....Litir
	d.Litirkii waa meeqa?	d).....Shilin/Litirkii
	e.Intee qof reerka iyo shaqaale ayaa sunta ku buufiyay?	e)...Qof reerka ...Shaqaale
	f.Imisa Shilin ayaa qofkiiba Jibaal ka ku buufiyay?	f)....Shilin/Jibaalkii
	67.Digada xoolaha ma siisay beerta?	67)Haa.. Maya..

S I S I N

Qaybta	Su'aalaha	Jawaabaha
11. Kharajka Sisinta	68.Sisin ma beertay xilligan Dayrta? <u>Haddii ay Haa tahay,</u> a.Meeqa Hek/ Jib oo sisin ah ayaad beertay xilligan Dayrta? <u>D H U L D I Y A A R I N</u> 69.Dhulka ma cagaf misa yaambo ayaad ku carro-gedisay? <u>Haddii aad cagaf ku carro-gedisay,</u> 70.Meeqa saac uu cagafka 1 Hektar ku carro-gedin karaa? 71.Cagafka miyaad soo ijaaratay misa adigaa leh? <u>Haddii aad cagafka soo ijaaratay,</u> 72.Meeqa Shilin ayaad cagafka 1 saac ku soo ijaaratay? a.Ninka cagafka wada raashinkiisa iyo sigaarkiisa meeqa lacag ah ayaa kaaga baxay? b.Wax kharaj kale ah ma kaaga baxay carro-gediska, meeqana? 73.Dhulka cagaf ma ku erbishaysay? a.Meeqa saac uu cagafka 1 Hektar ku erbishayn karaa? b.Meeqa Shilin ayaa cagafka 1 saac oo erbish ah ku ijaaratay? 74.Dhulka sisinta cagaf ma ku kawaaweysay? a.Meeqa saac uu cagafka 1 Hektar uu ku kawaaweyn karaa? <u>Haddii aad Yaambo ku carro-gedisay,</u> 75.Meeqa Jibaal ayaa qofkii maalin carro-gedin karaa? 76.Intee maalmood ayaa carro-gadiska socday? 77.Intee qof oo reerka iyo shaqaale ayaa Yaambada ku carro-gediyay ? a.Meeqa Shilin oo ijaar ah qofkii 1 Jibaal uu ku carro-gediyay? 78.Ma sameeysay kanaal nadiifin beer-abuurkii Dayrta ka hor? <u>Haddii ay Haa tahay,</u> a.Intee qof reerka iyo shaqaale ayaa kanaalka nadiifiyay? <u>D H A A Y</u> 79.Dhulka aad sisinta ku beertay dhaay ma ka dhigtay? <u>Haddii ay Haa tahay,</u>	68)Haa.. Maya.. a)..... Hek / Jib 69)Cagaf... Yaambo... 70)..... Saac/Hektarkii 71)Waan soo ijaartay.... Aniga lahaa 72)..... Shilin/Saacaddii a)..... Shilin <u>Kharaj</u> b)Haa... ..Shilin Maya.. 73)Haa... Maya.. a)..... Saac/Hektarkii b)..... Shilin/Saacaddii 74)Haa.. Maya.. |a)..... Saac/Hektarkii 75)..... Jibaal/Qofkii 76).....Maalmood 77)...Qof Reerka ...Shaqaale a).....Shilin/Jibaalkii 78)Haa.. Maya.. a)...Qof reerka ...Shaqaale 79)Haa.. Maya..

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	a.Daad miyaad ku waraabisay misa matoor? b.Intee qof reerka iyo shaqaale ayaa dhaayga sameeyay? c.Meeqa maalin ayaa dhaayga socday ? d.Imisa ayaa shaqaalaha ijaarka maalintii siisay? <u>A B U U R I T A A N K A</u> 80.Meeqa Suus oo sisin ah ayaa 1 Hektar ku abuurtay? 81.Nooca abuurka sisinta aad Dayrtan isticmaashay ma kii Guga ama Dayrti hore beertaada kaaga soo go'aybaa, misa suuqaad ka soo gadatay? <u>Haddii aad abuurka suuqa ka soo gadatay,</u> a.Meeqa ayaad 1 Suus oo abuurka ah ku soo gadatay? 82.Ma makiinad cagaf ah misa Yaambo ayaad sisinta ku abuurtay? <u>Haddii ay Cagaf tahay,</u> a.Meeqa saac ayaa cagafka 1 Hektar uu aburi karaa? b.Meeqa Shilin ijaar ah ayaa cagafka saacaddii ku ijaaratay? c.Intee qof reerka iyo shaqaale ayaa sisinta abuuray? 83.Shaqaalaha abuurka sisinta shubaay meeqa Jibaal ayaa qofkii maalinti aburi karaa? a.Meeqa ijaar ah qofka shaqaalaha ah ayaa Jibaalkii ku abuuray? 84.Ma saf-saf ayaad u abuurtay sisinta? <u>F A L K A</u> 85.Meeqa jeer ayaad sisinta fashay ? 86.Maalintii meeqa Jibaal ayaa qofkii fali karaa? a.Intee qof reerka iyo shaqaale ayaa falay? b.Meeqa jibaalkii lagu falay? <u>W A R A A B K A</u> 87.Ka dib abuurkii, ma waraabisy sisinta? <u>Haddii abuurki ka dib waraabisay,</u> 88.Sisinta meeqa jeer aad waraabisay? 89.Meeqa jeer ayaad matoor sisinta ku waraabisay xilligan Dayrta?	a)Daadooy (Gravity).... Matoor b)...Qof reerka ...Shaqaale c).....Maalmood d).....Shilin/Qofkiiba 80).....Suus / Hektarkii 81)Waa kii beertayda Suuqaan ka soo gatay a)..... Shilin/Suuskii 82)Cagaf... Yaambo... a).....Saac/Hektarkii b).....Shilin/Saacaddii c)...Qof reerka ...Shaqaale 83)..... Jibaal/Maalintii a).....Shilin/Jibaalkii 84)Haa.. Maya.. 85)..... Jeer oo fal ah 86).....Jibaal/Qofkii a)...Qof reerka ...Shaqaale b) Shilin/Jibaalkii 87)Haa.. Maya.. 88)..... Jeer waraab ah 89).....Jeer matoor

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	90.Marka aad daadooy (gravity) ku waraabisay, meeqa Jibaa! ayaa maalin tii la waraabin karaa? a.Intee qof reerka iyo shaqaale ayaa waraabiyay? b.Meeqa qof ayaa maalintii waraabka ka shaqeysa? c.Maalintii meeqa lacag ah ayaa qofka shaqaalaha waraabka siisay?	90).....Jibaa! a)...Qof reerka ...Shaqaale b).....Qof c).....Shilin/Qofkiiba
	91.Marka aad matoor ku waraabisay, meeqa Jibaa! ayaa maalintii uu matoorka waraabin karaa? a.Matoorka ma adiga leh, ijaar miya, misa waa mid dawladda leedahay oo tuulada ka dhexeeya? b.Meeqa litir oo Nafto ah ayaa matoorka maalintii lagu shubay ? c.Intee qof reerka iyo shaqaale ayaa waraabisay? d.Maalintii qofkii meeqa lacag ah ayaa la siiyay?	91)..... Jibaa! a)Aniga leh..... Waa ijaar..... Kan tuulada... b).....Litir c)...Qof reerka ...Shaqaale d).....Shilin/Qofkiiba
	<u>I L A A L I N (WAARDIYE)</u>	
	92.Sisintaada meeqa maalmood ayay jirtaa?	92).....Maalmood
	93.Sisinta ma la ilaaliyay?	93)Haa.. Maya..
	a.Goormaa la bilaabay in la ilaaliyo?	a).....Maalin markay jirtay
	b.Meeqa qof ayaa 1 Hektar ilaaliso?	b).....Qof/Hektarkii
	c.Intee qof reerka iyo shaqaale ayaa ilaaliso?	c)...Qof reerka ...Shaqaale
	d.Qofkii waardiyaha meeqa maalintii lacag ijaar ah la siiyaa?	d).....Shilin/Maalintii
	<u>B E E R - G A S H I (INPUTS)</u>	
	94.Ma siisay bacrin sisinta Dayrtan? Haddii ay Haa tahay,	94)Haa.. Maya..
	a.Maxay tahay nooca bacrinta aad siisay sisinta?	a).....
	b.Meeqa jeer ayaad siisay bacrinta?	b).....Jeer
	c.Imisa Kiilo ayaa Hektarkii siisay?	c).....Kiilo
	d.Maxuu yahay qiimaha 50 Kiilo?	d).....Shilin/50 Kg.
	e.Intee qof reerka iyo shaqaale ayaa siisay bacrinta?	e)...Qof reerka ...Shaqaale
	f.Meeqa Shilin ayaa qofka shaqaale ah ku firdhiyay 50 kiilo?	f).....Shilin/50 Kg.
	95.Ma siisay sunta cayayaanka sisinta xilligan Dayrta?	95)Haa.. Maya..

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	<u>Haddii ay Haa tahay,</u> a.Maxay tahay nooca suntaad siisay? b.Meeqa jeer ayaad siisay sunta? c.Meeqa kiilo ayaa Hektarkii siisay? d.Kiiladi sunta waa meeqa? e.Intee qof reerka iyo shaqaale ayaa sunta ku buufiyay? f.Meeqa qof iyo imisa qofkiiba ayaa Hektarkii buufiyay sunta?	a)..... b).....Jeer c).....Kiilo d).....Shilin/Kiiladii e)....Qof reerka ...Shaqaale f)....Qof ....Shilin/Qofkii
	96.Ma siisay sunta cawska disha? <u>Haddii ay Haa tahay,</u> a.Maxay tahay nooca sunta cawska? b.Meeqa jeer ayaad siisay? c.Meeqa Litir ayaa Hektarkii siisay? d.Litirkii waa meeqa? e.Intee qof reerka iyo shaqaale ayaa ku buufiyay? f.Meeqa qof iyo imisa lacag ayaa Hektarkii ku baxay?	96)Haa.. Maya.. a)..... b).....Jeer c).....Litir d).....Shilin/Litirkii e)....Qof reerka ...Shaqaale f)....Qof ...Shilin/qofkii
	97.Digada ama hiisha xoolaha ma siisay sisinta xilliga Dayrta?	97)Haa.. Maya..
	<u>G O Y S M O</u> 98.Ma goysay (siibtay) sisintaada? <u>Haddii ay Haa tahay,</u> a.Meeqa Jibaal ayaa qofkii maalintii uu siibi karaa? b.Intee qof reerka iyo shaqaale ayaa goyay? c.Qofkii meeqa ayaa maalintii ijaar u siisay? d.Meeqa ayaa Hektarkii lagy tubay ? e.Meeqa Hektarkii lagu sumcay?	98)Haa.. Maya.. a).....Jibaal/Qofkii b)....Qof reerka ...Shaqaale c).....Shilin/Qofkii d).....Shilin/Hektarkii e).....Shilin/Hektarkii
	99.Meeqa Jibaal sisin ah ayaa kuu soo go'ay Dayrtan? a.Imisa Kiintaal oo sisin ah ayaad heshay?	99).....Jibaal Sisín a).....Kiintaal Sisín

F A A H F A A H I N

Qaybta	Su'aalaha	Jawaabahaha
X. Dhibaataada Beeralayda	32.Maxay tahay affarta (4) dhibaato oo ugu weyn ee kaa haysta xagga wax-soo-saarka beeraha?	1)..... 2)..... 3)..... 4).....
	33.Maxay yihiin labada dhibaato ugu weyn ee hoos u dhiga wax-soo-saarka galleyda?	1)..... 2).....
	34.Ma gadan lahayd bacrin haddii aad heleysid oo tuulada ay taallo?	1.Haa, lacag baan ku gadan..... 2.Haa, haddii dayn laygu siiyo... 3.Maya, in igu filan waan isticmaala..... 4.Maya, uma baahni.....
	35.Ma gadan lahayd sunta dhuunqabadka iyo cayayaanka kale haddii aad heleysid?	1.Haa, lacag baan ku gadan..... 2.Haa, haddii dayn laygu siiyo... 3.Maya, in igu filan waan isticmaala..... 4.Maya, uma baahni.....
	36.Ma gadan lahayd abuurka cusub (SOMTUX) ee galleyda haddii aad heleysid?	1.Haa, lacag baan ku gadan..... 2.Haa, haddii dayn laygu siiyo... 3.Maya, in igu filan waan isticmaala..... 4.Maya, uma baahni.....
	37.Ma gadan lahayd sunta cawska disha haddii aad heleysid?	1.Haa, lacag baan ku gadan..... 2.Haa, haddii dayn laygu siiyo... 3.Maya, in igu filan waan isticmaala..... 4.Maya, uma baahni.....
	38.Dadka qoyska ah ma ku filan yihiin shaqada beerta misa shaqaale ijaar ayaad ijaarataa?	1.Haa, waan ku filanahay..... 2.Maya, shaqaale tacabgoosi ayaan mararka qaarkood u baahanahay 3.Maya, shaqaale tacab-goosi mar walba waan u baahanahay....

Qaybta	Su'aalaha	Jawaabahaha
	39. Shaqaale tacab-goosi ah markaad si aad ah ugu baahan tahay ma heshaa ?	47) Haa.. Maya..
	40. Maxay yihiin dhibaatooyinka ugu weyn ee xagga waraabka?	1)..... 2).....
	41. Maxay yihiin dhibaatooyinka kaa haysta xagga gedida iyo suuq-gaynta galleyda, sisinta, iyo bariiska?	1)..... 2)..... 3).....

MASHRUUCA FOOD SECURITY
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)

Wareeysiga Beeralayda
Midka Labaad

Gobol:.....

Degmo:.....

Tuulo:.....

Magaca Beeralayga:.....

Lambarka Aqoonsiga:.....

Magaca Fidiyaha:.....

Taariikhda:.....

Hubiyay:.....

Taariikhda:.....

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
I. Goysmada galleyda	1. Galley ma beertay xilligii Dayrta? <u>Haddi ay Haa tahay.</u> a. Meeqa Hektar/Jibaal ayaad beertay? b. Meeqa Hek/Jib oo galley ah ayaa kuu soo go'day? c. Meeqa qof reerka iyo shaqaale ayaa shafay galleyda? d. Meeqa Jibaal ayaa qofkii maalintii uu goyn karaa? e. Meeqa Shilin ayaa qofkii shaqaalaha gaysmada Jibaalkii siisay? 2. Imisa Kiintaal oo galley ah ayaa xilligan Dayrta kuu soo go'ay? 3. Meeqa Shilin ayaa lagu tubay galleyda 16kii Jibaal (ama 1 Hektar)? 4. Meeqa qof reerka iyo shaqaale ayaa galleyda fiiqay? a. Meeqa Shilin ayaa galleyda Hek/Jib lagu fiiqay? 5. Ma finjishay galleyda? <u>Haddii ay Haa tahay.</u> a. Ma makiinad misa gacan ayaad ku finjishay? <u>Haddii Makiinad tahay.</u> b. Makiinada finjilka xaggeed ka xaggeed ka heshay? 6. Haddaad soo ijaaratay makiinadda imisa Shilin ijaar kaaga baxay? 7. Haddaad gacanta ku finjishay, imisa qof reerka iyo shaqaale ayaa finjilay galleyda? 8. Imisa Shilin ayaa qofkii shaqaalaha uu Kiintaalkii galley saafi ah ku finjilay? 9. Imisa kiintaal oo galley sabuul ah ayaa noqonaysa 1 kiintaal (100 kilo) oo saafi ah? 10. Imisa Kiintaal oo galley ah ayaad ka gaday tan xilligan Dayrta kuu soo go'day? 11. Cidee ka gaday? 12. Meeqa Shilin ayaad ku gaday 1 Kiintaal oo 100ka kiilo qaada?	1) Haa... Maya... a)..... Hek/Jib b)..... Hek/Jib c)...Qof reerka ...Shaqaale d)..... Jibaal e)..... Sh./Jibaalkii 2).....Kiintaal 3).....Sh. Hek/Jib 4)...Qof reerka ...Shaqaale a).....Sh. Hek/Jib 5) Haa... Maya... a) Makiinad... Gacan... b) -Aniga leh... -Beeralay kale ka ayaan ka soo ijaartay... -ADC ayaan ka ijaartay... 6)..... Shilin 7)...Qof reerka ...Shaqaale 8).....Sh./Kiintaalkii 9).....Kintaal Sabuul ah 10).....Kiintaal 11)..... 12).....Sh./Kiintaalkii

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	13.Ma gaday balka? <u>Haddii ay Haa tahay.</u> a.Meeqa Hek/Jib oo bal ah ayaad gaday? b.Ciddee ka gaday balkaasi? c.Meeqa Shilin ayaad Hek/Jib ee balka ku gaday? 14.Wax sako ah ma ka bixisay galleyda kuu soo go'day xilligan Dayrta? <u>Haddii ay Haa tahay.</u> a.Meeqa Suus ama Kiintaal ayaad sako u bixisay?	13)Haa.... Maya... a)..... Hek/Jib b)..... c).....Sh. Hek/Jib 14)Haa... Maya... a).....Suus/Kiintaal

S I S I N

Qaybta	Su'aalaha	Jawaabaha
II. Goysmada sisinta	1. Sisín ma beertay xilligii Dayrta? <u>Haddii ay Haa tahay.</u> a. Meeqa Hektar/Jibaal ayaad beertay? b. Meeqa Hek/Jib oo sisín ah ayaa kuu soo go'day? c. Meeqa qof reerka iyo shaqaale ayaa siibay sisinta? d. Meeqa Jibaal ayaa qofkii maalintii uu siibi karaa? e. Meeqa Shilin ayaa qofkii shaqaalaha siibidda Jibaalkii siisay? 2. Imisa Kiintaal oo sisín ah ayaa xilligan Dayrta kuu soo go'ay? 3. Meeqa Shilin ayaa lagu tubay sisinta 16kii Jibaal (ama 1 Hektar)? 4. Ma shubtay sisinta? <u>Haddii ay Haa tahay.</u> 5. Meeqa qof reerka iyo shaqaale ayaa shubay sisinta? 6. Imisa Shilin ayaa qofkii shaqaalaha uu Kiintaalkii sisín ku shubay? 7. Imisa Kiintaal oo sisín ah ayaad ka gaday tan xilligan Dayrta kuu soo go'day? 8. Cidee ka gaday? 9. Meeqa Shilin ayaad ku gaday 1 Kiintaal oo 100ka kiilo qaada? 10. Ma gaday qashinka sisinta? <u>Haddii ay Haa tahay.</u> a. Meeqa Hek/Jib oo bal ah ayaad gaday? b. Ciddee ka gaday qashinkaasi? c. Meeqa Shilin ayaad Hek/Jib ee balka ku gaday? 11. Wax sako ah ma ka bixisay sisinta kuu soo go'day xilligan Dayrta? <u>Haddii ay Haa tahay.</u> a. Meeqa Suus ama Kiintaal ayaad sako u bixisay?	1)Haa... Maya... a)..... Hek/Jib b)..... Hek/Jib c)...Qof reerka ...Shaqaale d)..... Jibaal e)..... Sh./Jibaalkii 2).....Kiintaal 3).....Sh. Hek/Jib 4)Haa... Maya... 5)...Qof reerka ...Shaqaale 6).....Sh./Kiintaalkii 7).....Kiintaal 8)..... 9).....Sh./Kiintaalkii 10)Haa.... Maya... a)..... Hek/Jib b)..... c).....Sh. Hek/Jib 11)Haa... Maya... a).....Suus/Kiintaal

Qaybta	Su'aalaha	Jawaabaha
IV. Go'aanka Tacabka	1.Ma bilowday dhul diyaarinta ee xilliga Guga soo socda? 2.Imisa Hek/Jib ayaad ku tala jirtaa inaad beertid Guga? 3.Maxay kala yihiin dalagyada iyo dhulka dalag walba aad ku tala jirtid in aad ku beertid Guga? 4.Galley ma ka mid tahay dalagyada ku tala jirtid inaad beertid? <u>Haddii ay Haa tahay.</u> a.Dhulka galleyda aad ku tala jirtid inaad Gugaan saartid ma ka badan yahay misa waa ka yaryahay kii Gugii sano hore? 5.Maxay tahay sababaha aad uga yaraynaysid ama uga badanaysid? 6.Ma jiraan dhibaatooyin kaa haysta xagga isu diyaarinta xilliga Guga? <u>Haddii ay Haa tahay.</u> a.Maxay yihiin dhibaatooyinkaasi? b.Sideey kula tahay in lagu xallin karo dhibaatooyinkaasi?	1)Haa... Maya... 2)..... Hek/Jib <u>Dalaga</u> <u>Dhulka</u> 3) 1aad ..... ....Hek/Jib 2aad ..... ....H/J 3aad ..... ....H/J 4aad ..... ....H/J 4)Haa... Maya... a)-Waa ka yaryahay..... -Waa ka badanyahay... 5i)..... ii)..... 6)Haa... Maya... a)..... b).....

MASHRUUCA FOOD SECURITY
(MSU-PLANNING DEPARTMENT FOOD SECURITY PROJECT)

Wareeysiga Beeralayda
Midka Saddexaad

Gobol:.....

Degmo:.....

Tuulo:.....

Magaca Beeralayga:.....

Lambarka Aqoonsiga:.....

Magaca Fidiyaha:.....

Taariikhda:.....

Hubiyay:.....

Taariikhda:.....

Qaybta	Su'aalaha	Jawaabaha
I. Dalagyada Xilligan Guga	1. Xilligan Guga wax ma beertay?	1) Haa.. Maya..
	2. Haddii aad wax beertay, meeqa Hektar/Jibaal oo dhul ah ayaad Gugaan abuurtay?	2)..... Hek/Jib
	3. Dhulkaad Gugaan beertay ma la midba, ma ka yaryahay, misa waa ka badan yahay kii Gugii sannadkii hore?	3) La mid..... Ka yar..... Ka badan.....
	a. Maxay tahay sababta dhulkaad ula mid yahay, uga yar yahay, misa uga badan yahay kii Gugii sano hore?	3a).....
	4. Maxay kala yihiin dalagyadada kuu beeran xilligan Guga iyo ballaca dhulka dalag kasta?	
	Lambarka | Dalagyada ku beeran Beerta | xilligan Guga	
	1aad | ..... Ballac....Hek/Jib | ..... Ballac....H/J	
	2aad | ..... Ballac....H/J | ..... Ballac....H/J	
	3aad | ..... Ballac....H/J | ..... Ballac....H/J	
	4aad | ..... Ballac....H/J | ..... Ballac....H/J	
	5aad | ..... Ballac....H/J | ..... Ballac....H/J	
	5. Xilligan Guga meeqa Hek/Jib oo dhul ah ayaa bariyo kuu ah oo waxba aadan ku beerin?	5).....H/J
	a. Maxay tahay sababta aad dhulkaasi baryo uga dhigtay oo aadan u abuurin?	5a).....
	6. Galley ma kuu beeran tahay Gugaan? Haddii ay Haa tahay,	6) Haa.. Maya..
	a. Dhulka galleyda kugu beeran Gugaan ma ka badan yahay, yaryahay, misa waa la mid tirada dhulkaad galleyda ku beertay Gugii sano hore?	6a) Waa ka badan yahay.... Waa ka yar yahay Waa la mid
	b. Maxay tahay sababta dhulka galleyda u badisay, yaraysay, ama aad isula ekeesay?	6b).....

Qaybta	Su'aalaha	Jawaabaha
III. Goysmadii Mirihi Deyrta	7. Deyrtii la soo dhaafay wax ma beertay? <u>Haddii ay Haa tahay.</u> a.Wax miro ah beerta ma ka soo goosatay? b.Goormay ahayd bishii aad goowsay xilligii Deyrtii la soo dhaafay dalagyada soo soocda?	7)Haa... Maya... 7a)Haa... Maya... 7) <u>Dalag</u> | <u>Bishii dalagga la gooyay</u> *Galley | ..... *Sisin | ..... *Bariis | ..... *Digir | .....
	8. Intay la egyihiin mirihii kuu soo go'ay (ay ku jiraan wixii sako aad ku bixisay) Deyrtii la soo dhaafay ee dalagyada soo socda?	8) <u>Dalag</u> | <u>Kiintaal</u> | <u>Ballaca</u> | <u>Saafi</u> | <u>Dhulka</u> | *Galley | ..... Kt. | ....H/J | *Sisin | ..... Kt. | ....H/J | *Bariis | ..... Kt. | ....H/J | *Digir | ..... Kt. | ....H/J
	9. Meeqa Kiintaal ee dalagyada soo socda ee kuu baxay Deyrtii ayaad kaydisay beergoysmadi waqtigeedi?	
	<u>Tirada inta</u> | <u>Nooca Kaydka</u> <u>Dalag</u> | <u>Kiintaal la kaydiyay</u> | <u>Bakaar</u> | <u>Barmiil</u> | <u>Maqaasiin</u> | <u>Guriga</u>	
	*Galley | .....Kiintaal | ..... | ..... | ..... | .....	
	*Sisin | .....Kiintaal | ..... | ..... | ..... | .....	
	*Bariis | .....Kiintaal | ..... | ..... | ..... | .....	
	*Digir | .....Kiintaal | ..... | ..... | ..... | .....	
	10:Maxay tahay sababta aad u kaydisay tirada intaasi Kiintaal ee dalagyadaa?	10) <u>Dalag</u> | <u>Sabata loo kaydiyay</u> | *Galley | ..... | *Sisin | ..... | *Bariis | ..... | *Digir | .....
	11.Qayb ma ka gadday dalagyadii aad goosatay xilligii Deyrta?	11)Haa... Maya...
III. Kaydinta Mirahii Deyrta	12.Maxay tahay macnaha ka dambeeya in waxyabihii aad goosatay xilliga aad qayb ka mid ah aad kaydisid?	12) <u>Macnaha ka dambeeya</u> | *Cuntada reerka..... | *Sicirka oo hooseeyo | beergoysmadi waqtigeedi

Qaybta	Su'aalaha	Jawaabaha																												
	13.Intee muddo ah ayaa galleyda si fiican bakaarta ugu jiri kartaa iyadoo galleydaasi aysan madoobaan oo wax bahal ahna cunin? a.Wax sun ah ma ku shubtaa galleyda aad bakaarta ku kaydisid? <u>Haddii ay Haa tahay.</u> b.Maxay tahay nooca suntaad ku shubtid	13)..... 13a)Haa... Maya... 13b)Nooca:.....																												
IV. Gadistii Mirahii Deyrta	14.Meeqa Kiintaal ee dalagyada kor ku xusan ayaad gaday, goormaad gaday, xagee ku gaday, sababtaad u gaday sheeg, ciddee ka gaday, meeqa Shilin ayaad Kintaalki ku gaday?																													
	<table><tr><th>Dalag</th><th>Kiintaal la Gaday</th><th>Bishii la Gaday</th><th>Meesha lagu Gaday</th><th>Sababtaad U Gaday</th><th>Cidda laga Gaday</th><th>Qiimaha Kiintaalka</th></tr></table>	Dalag	Kiintaal la Gaday	Bishii la Gaday	Meesha lagu Gaday	Sababtaad U Gaday	Cidda laga Gaday	Qiimaha Kiintaalka																						
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3	 Kt.					 Sh/Kt																								
4	 Kt.					 Sh/Kt																								

F U R E

Bisha	Sababta	Cidda Gadatay
*Febraayo=1	*Kharajka	*Ganacsade=1
*Maarso =2	beerta=1	*ADC =2
*Aprile =3	*Masaariifta	*Beeraley =3
*Maajo =4	reerka=2	
*Juun =5	*Sabab kale=3	
*Luuliyo =6		

Qaybta	Su'aalaha					Jawaabaha
V. Sako Bixin & Qaadasho	15.Ma jirta qayb dalagyada soo socda aad sako ama sadaqo ahaan aad ku siisay lacag la'aan waxyabihii Deyrta kuu soo go'ay?					
	Dalag	Haa	Maya	Tirada Kt./Shood	Ciddaad siisay	Qofka maxaa Idiinka Dhexeeya
	*Galley	.....	.....	.....Kt/Shd	.....	.....
	*Sisin	.....	.....	.....Kt/Shd Shilin	.....	.....
	*Bariis	.....	.....	.....Kt/Shd	.....	.....
	*Digir	.....	.....	.....Kt/Shd	.....	.....
	16.Ma jirta qayb dalagyada soo socda aad sako ama sadaqo ahaan adiga lagu siiyay lacag la'aan xilligii Deyrta?					
	Dalag	Haa	Maya	Tirada Kt./Shood	Cidda ku siisay	Qofka maxaa Idiinka Dhexeeya
	*Galley	.....	.....	.....Kt/Shd	.....	.....
	*Sisin	.....	.....	.....Kt/Shd Shilin	.....	.....
	*Bariis	.....	.....	.....Kt/Shd	.....	.....
	*Digir	.....	.....	.....Kt/Shd	.....	.....
VI. Haraaga Kaydkii Deyrta	17.Ma jirta qayb galleydii iyo sisintii Deyrta kuu soo go'day aad cid wax uga beddelatay					17)Haa... Maya...
	18.Waqtigan hadda la joogo meeqa Kintaal ee dalagyada soo socda ayaa kuu kaydsan?					18)Dalag|Tirada inta Kintaal ee kaydsan
						*Galley | ..... Kintaal
						*Sisin | ..... Kintaal
						*Bariis | ..... Kintaal
						*Digir | ..... Kintaal
	19.Meeqa Kintaal ee dalagyada soo socda ayaa Deyrtii sano hore beer- goysmadi waqtigeedi kuu kaydsanaa?					19)Dalag|Kintaal ee kaydsana
						*Galley | ..... Kintaal
						*Sisin | ..... Kintaal
						*Bariis | ..... Kintaal
						*Digir | ..... Kintaal

Qaybta	Su'aalaha	Jawaabaha			
VII. Sugnaanta Cuntada Qoyska & Iibsashada Cuntada	20.Waa imisa tirada qoyskaaga? (marka laysku daro xaasaskaaga, ilmaha, iyo kharaabada kula jooga tuulada)	20).....qof			
	21.Meeqa Kiintaal ee dalagyada soo socda ayaa reerka cunto ahaan ugu filan 30ka beri ee bishii?	21)Galley :Kiintaal Bariis :Kiilo Digir :Shood Sisin :Litir (Saliid ahaan)			
	22.Ma jirtaa qayb ka mid ah dalagyada iyo cuntada soo socota aad suuqa ka soo iibsatay 30kii maalmood ee bishii la soo dhaafay?				
Dalag & cunto	Tirada Kt/Shd/Kg/litr	Qiimaha Kt/Kg/Ltr/Shd	Suuqa ka soo Gaday	Ciddaad ka soo gadatay	Sababta aad u soo Gadatay
Galley	1	Kt/Shood	Shilin.....Kt/Shod	.....	.....
	2	Kt/Shood	Kt/Shod	.....	.....
	3	Kt/Shhod	Kt/Shod	.....	.....
	4	Kt/Shood	Kt/Shod	.....	.....
Saliid sisin	1	litir	litirki	.....	.....
	2	litir	litirki	.....	.....
	3	litir	litirki	.....	.....
	4	litir	litirki	.....	.....
Saliid caddey	1	litir	litirki	.....	.....
	2	litir	litirki	.....	.....
	3	litir	litirki	.....	.....
	4	litir	litirki	.....	.....
Bariis	1	Kiilo	kiladii	.....	.....
	2	Kg.	kiladii	.....	.....
	3	Kg.	kiladii	.....	.....
	4	Kg.	kiladii	.....	.....
Baasto	1	Kg.	kiladii	.....	.....
	2	Kg.	kiladii	.....	.....
	3	Kg.	kiladii	.....	.....
	4	Kg.	kiladii	.....	.....
Digir	1	Shood	shoodii	.....	.....
	2	Shood	shoodii	.....	.....
	3	Shood	shoodii	.....	.....
	4	Shood	shoodii	.....	.....

Qaybta		Su'aalaha			Jawaabaha		
Sonkor	1	Kg.	kiladii	.....	.....	.....	.....
	2	Kg.	kiladii	.....	.....	.....	.....
	3	Kg.	kiladii	.....	.....	.....	.....
	4	Kg.	kiladii	.....	.....	.....	.....
23. Sheeg ma cuntaa dalagyada soo socda waqtiyada kala duwan ee sannadka, xagee cuntadaasi ka keentaa (bakaartaada misa suuqa)?							
Nooca sannadka		dalaga	Cuntadaasi ka timid	Gugan Yebal Baroore	Beerabuur Deyrta	Beergoyn Deyrta	Jiilal Beerabuur Guga
SANNADKA FIICAN	Galley	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% bakaartada		%	%	%	%
		% suuqa		%	%	%	%
	Bariis	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% kaydkaaga		%	%	%	%
		% suuqa		%	%	%	%
	Baasto	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% suuqa		%	%	%	%
	Mesego	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% suuqa		%	%	%	%
SANNADKA ABAARTA	Galley	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% bakaartada		%	%	%	%
		% suuqa		%	%	%	%
	Bariis	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% kaydkaaga		%	%	%	%
		% suuqa		%	%	%	%
	Baasto	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% suuqa		%	%	%	%
	Mesego	Ma cuntaa?		H.. M..	H.. M..	H.. M..	H.. M..
		% suuqa		%	%	%	%

Qaybta	Su'aalaha	Jawaabaha
VIII. Ilaha Dakhliga Beeraleyga	24.Ma u heshaa cunto ku filan reerka waqti kastaa oo 12ka bilood ee sannadka? <u>Haddii ay Maya tahay.</u> a.Maxaad sameeysaan waqtiyada aad cunto idiinku filan haysan?	24)Haa... Maya... 24a).....
	25.Saliidda sisinta (macsaro) maxaad u isticmaasha?	25)Timo iyo kor marsi..... Bunka Cambuulada Maraqa
	26.Saliid caddey iyo macsaro, teeba badan cunidda reerkaaga?	26)Saliid caddey Saliid macsaro.....
	27.Wax dakhli ah ee kaa soo galaa xoolaha, tacabgoosi beero kale, iyo shaqooyin ka baxsan beerta ma jiraa? <u>Haddii ay Haa tahay.</u> a.Xaggee lacagahaasi kale kaa soo galaan, maxayna la egtahay lacagtaasi?	26)Haa... Maya...
	Ilaha Dakhiga <u>Dhaqaale</u>	Tirada <u>Lacagtaasi 6 bilood la soo dhaafy</u>
	1.Tacab goosi beero kale	 Shilin
	2.Gadid xoolo	 Shilin
	3.Beec mushtar	 Shilin
	4.Farsamo gacneed (dermo, dhismo, kabo, iwm)	 Shilin
	5.Shaqo magaalada	 Shilin
	6.Mushaar	 Shilin
	7.Kallumeysi	 Shilin
	8.Geed mirood	 Shilin
	28.Adiga ,xaaskaaga, iyo caruurtaada ma ka shaqeeyseen beero dad kale ay leeyihiin xilligan Guga lagu jiro?	28)Haa... Maya...

Qaybta	Su'aalaha	Jawaabaha
IX. Gadista Xoolaha	29.Dad reerka ka tirsan ee tuulada dibedeeda ku nool ee reerka dhaqaale ahaan ma jiraan? <u>Haddii ay Haa tahay.</u> a.Waa kuwee dadkaasi, maxad isu tihiin, intaysa la egtahay lacagta ay reerka ku tareen 6 bilood ee la soo dhaafay?	29)Haa... Maya...
	Maxaad isu tihiin	Tirada lacagta aad ka heshay 6dii bilood ee la soo dhaafay
	.....	..... Shilin
	.....	..... Shilin
	30.Ma lagama maarmaan baa lacagaahaasi kaa soo gala hawlahaaga ka baxsan beerta iyo kuwa dadka reerka ka tirsan kuu soo diraan nolol maalmeedka reerkaaga?	30)Haa... Maya...
	31.Wax xoolo ah ma soo gadatay misa ma gaday 6dii bilood ee la soo dhaafay? <u>Haddii ay Haa tahay.</u> a.Maxaa xoolo ah ayaad gadatay ama iska gaday 6da bilood?	31)Haa... Maya...
	Nooca xoolaha	Tirada inta aad gaday
	Qiimaha Midkiiba	Tirada inta aad soo gadatay
	Qiimaha Midkiiba	
	*Lo'	neef .....Sh. neef .....Sh.
X. Isticmalka Dakhlaga	*Ari	neef .....Sh. neef .....Sh.
	*Ido	neef .....Sh. neef .....Sh.
	*Geel	neef .....Sh. neef .....Sh.
	32.Imisa lacag ah ayaa qiyaas ahaan kaa soo galay xilligii Deyrtii la soo dhaafay ilahan soo soocda:	
	*Gadistii miraha ka soo baxay beerta:	Shilin
	*Gadistii balka	Sh.
	*Gadistii xoolaha	Sh.
	*Ka xoogsashadii tacab beero kale	Sh.
	*Lacag kuu soo direen caruurtada	Sh.
	*Beecmushtar	Sh.

Qaybta	Su'aalaha	Jawaabahaha
	33.Maxaad ku sameeysay oo isticmaashay wixii lacago ah aad ka heshay gedista mirihii kuu soo go'ay Deyrta, gedista xoolaha, tacabgoosi beero kale, iyo kuwa dadka reerka tirsan ku siiyeen?	
	Nooca isticmaalka lacagtaasi	Qiyaasta lacagta kaaga baxday
	1.Masaariifta reerka (cunto, dhar, daawo)	Shilin
	2.Kharajka beerta (abuur, fal, iwm)	Sh.
	3.Aroos, tacsii	Sh.
	4.Si Kale (Caddey)	Sh.

Qaybta	Su'aalaha	Jawaabahaha
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XI.
Kharajka
Wax soo
saarka
Galleyda

34.Meeqa Hek/Jib oo galley ah ayaad beertay xilligan Guga?
D H U L D I Y A A R I N
35.Goormaad dhulka galleyda ku beertay diyaarisay?

36.Dhulka ma cagaf misa yaambo ayaad ku diyaarisay?

34)..... Hek / Jib

35)Taariikhda markay ahayd.....

36)Cagaf... Yaambo...

Haddii Cagaf yahay.
a.Sheeg hawlaha cagafka kuu qabtay | iyo wixii kharaj ah ee kaaga baxay dhul diyaarinta:

Nooca Shaqada	Tirada Dhulka	Meeqa saac oo cagafa	Kirada Saacadii	Tirada Shaqaaale	Ijaarka Oofkii	Tirada Dadka Oooyaska	Kharaj Kale
*Carro-gedis	 H/J	| .... saac	| .....Sh.	| .... qof	| .....Sh|	| .....qof|	| .....Sh.
*Erbish	 H/J	| .... saac	| .....Sh.	| .... qof	| .....Sh|	| .....qof|	| .....Sh.
*Kawaawe	 H/J	| .... saac	| .....Sh.	| .... qof	| .....Sh|	| .....qof|	| .....Sh.

Haddii Yaambo tahay.
b. Sheeg hawlaha Yaambada ku qabatay | iyo wixii kharaj ah ee kaaga baxay dhul diyaarinta:

Nooca Shaqada	Tirada Dhulka	Tirada shaqaalaha ijaarka ah	Ijaarka Oofkii	Meeqa Maalin	Tirada Dadka Ooyska	Meeqa Maalin
*Carro-gedis	 H/J	| ..... qof	| .....Sh	| .....	| .....qof	| .....
*Kawaawe	 H/J	| ..... qof	| .....Sh	| .....	| .....qof	| .....

A B U U R I T A A N K A
37.Goormaad abuurtay galleyda?

38.Nooca abuurka galleyda aad Guban isticmaashay muxuu ahaa?

37)Markay taariikhda ahayd.....

38)Waa kii daynta.....
Waa kii Deyrta ii baxay..
Suuqa ayaan ka soo gatay..
Abuurbadintan ka gatay....

39.Saf saf ma u abuurtay galleyda?

39)Haa... Maya...

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	40.Waa maxay kharajka kaaga baxay abuuritaanka galleyda?	
	*Abuur :Kg/shood Hek/Jib; Shillin shoodii	
	*Shaqaaale:..... qof ijaar ah, Sh. qofkii, maalin	
	*Dadka qoyska: .....qof qoyska, maalin	
	<u>F A L & K A L A - D H I M I D</u>	
	41.Meeqa jeer ayaad fashay galleyda?	41)..... jeer
	42.Falkii kowaad goormaad sameeysay?	42)Taariikhda markay ahayd.....
	43.Waa maxay kharajka kaaga baxay falkii kowaad iyo kala dhimiddii galleyda?	
	*Shaqaaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin fal ah	
	@2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal fal ah	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....jibaal	
	*Sunta cawska disha (Herbicide):	
	@1.Meeqa litir:..... litir,.....jibaal,.....Shilin/Litirkii	
	44.Waa maxay kharajka kaaga baxay falkii labaad?	
	*Shaqaaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin fal ah	
	@2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal fal ah	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....jibaal	
	*Sunta cawska disha (Herbicide):	
	@1.Meeqa litir:..... litir,.....jibaal,.....Shilin/Litirkii	
	<u>W A R A A B K A</u>	
	45.Ma waraabisay galleydaada Guban?	45)Haa... Maya...
	<u>Haddii ay Haa tahay,</u>	
	a.Meeqa jeer ayaad waraabisay galleyda Guban?	45a)..... jeer daadooy jeer matoor
	46.Kanaalada ma nadiifisay beer-abuur kii ka hor?	46)Haa... Maya...

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	<u>Haddii ay Haa tahay,</u> a.Maxaa kharaj ah kaaga baxay kanaal nadiifinta? *Shaqaale ijaar ah: @1.Joornati :..... qof,.....Sh. maalinti,.....maalin @2.Kuntraad :..... qof,.....tallaabo,.....Shilin *Dad qoyska ah:..... qof,.....tallaabo,.....maalin 47.Ma daadooy misa matoor ayaad ku waraabisay galleyda? <u>Haddii ay Matoor tahay,</u> a.Matoor ma ijaar uu ahaa misa adiga lahaa? 48.Maxaa kharaja kaaga baxay waraabka? <u>Waraabka kowaad</u> *Shaqaale ijaar ah: @1.Joornati :..... qof,.....Sh. maalinti,.....maalin waraab @2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal waraab *Dad qoyska ah:..... qof,.....maalin waraab,.....jibaal waraab *Shidaal :.....litir nafto,.....maalin,.....Sh./litirkii * <u>Ijaarka matoorka:.....Sh./maalintii,.....maalin</u> <u>Waraabka labaad</u> *Shaqaale ijaar ah: @1.Joornati :..... qof,.....Sh. maalinti,.....maalin waraab @2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal waraab *Dad qoyska ah:..... qof,.....maalin waraab,.....jibaal waraab *Shidaal :.....litir nafto,.....maalin,.....Sh./litirkii * <u>Ijaarka matoorka:.....Sh./maalintii,.....maalin</u>	47)Daadooy..... Matoor Daadooy iyo matoor..... 47a)Ijaar..... Aniga leh..... Tuulada leh....

G A L L E Y

Qaybta	Su'aalaha	Jawaabaha
	<u>B E E R - G A S H I (INPUTS)</u>	
	49.Ma siisay bacrin galleyda Guban?	49)Haa... Maya...
	<u>Haddii ay Haa tahay,</u>	
	a.Meeqa jeer ayaad bacrinta siisay?	49a).....jeer
	b.Waa maxay nooca bacrintaad siisay?	49b)Nooca.....
	c.Meeqa Kiilo ayaad Hek/Jib siisay?	49c).....Kiilo Hek/Jib
	d.Guud ahaan meeqa Kiilo ayaad beerta oo dhan siisay?	49d).....Kiilo
	e.Waa meeqa Hek/Jib oo galleyda ayaad bacrinta siisay?	49e).....Hek/Jib
	f.Muxuu yahay qiimaha 50 Kiilo?	49f).....Shilin/50 Kiilo
	g.Xaggee ka heshay bacrinta?	49g)Dayn Bankiga..... Lacag aan ku gatay....
	h.Haddii aad gadatay, ciddee ka gadatay?	49h)Ganacsade tuulada..... Ganacsade magaalada... Beeraley kale.....
	i.Maxaa kharaj ah ayaa kaaga baxay firdhinta bacrintaa?	49i).....Shilin
	<u>Haddii Maya tahay,</u>	
	j.Maxaa u siin waysay bacrin galleyda?	49j).....
	50.Ma siisay sunta dhuunqabadka?	50)Haa... Maya...
	<u>Haddii ay Haa tahay,</u>	
	a.Meeqa jeer ayaad sunta siisay?	50a).....jeer
	b.Waa maxay nooca suntaad siisay?	50b)Nooca.....
	c.Meeqa Kiilo ayaad Hek/Jib siisay?	50c).....Kiilo Hek/Jib
	d.Guud ahaan meeqa Kiilo ayaad beerta oo dhan siisay?	50d).....Kiilo
	e.Waa meeqa Hek/Jib oo galleyda ayaad suntaasi siisay?	50e).....Hek/Jib
	f.Muxuu yahay qiimaha Kiiladii?	50f).....Shilin/1 Kiilo
	g.Xaggee ka heshay suntaasi?	50g)Dayn Bankiga..... Lacag aan ku gatay....
	h.Haddii aad gadatay, ciddee ka gadatay?	50h)Ganacsade tuulada..... Ganacsade magaalada... Beeraley kale..... ADC
	i.Maxaa kharaj ah ayaa kaaga baxay ku shubidda suntaasi?	50i).....Shilin
	<u>Haddii Maya tahay,</u>	
	j.Maxaa u siin waysay bacrin galleyda?	50j).....

S I S I N

Qaybta	Su'aalaha	Jawaabaha					
XII. Kharajka Wax soo saarka Sisinta	51.Sisin ma beertay xilligan Guga?	51)Haa... Maya...					
	52.Meeqa Hek/Jib oo sisin ah ayaad beertay xilligan Guga?	52)..... Hek / Jib					
	<u>D H U L D I Y A A R I N</u>						
	53.Goormaad dhulka sisinta ku beertay diyaarisay?	53)Taariikhda markay ahayd.....					
	54.Dhulka ma cagaf misa yaambo ayaad ku diyaarisay?	54)Cagaf... Yaambo...					
	<u>Haddii Cagaf yahay.</u>						
	a.Sheeg hawlaha cagafka kuu qabtay | iyo wixii kharaj ah ee kaaga baxay dhul diyaarinta:						
Nooca Shaqada	Tirada Dhulka	Meeqa saac oo cagafa	Kirada Saacadii	Tirada Shagaale	Ijaarka Qoofkii	Tirada Dadka Qoovska	Kharaj Kale
*Carro-gedis	 H/J	 saac	Sh.	 qof	Sh	qof	Sh.
*Erbish	 H/J	 saac	Sh.	 qof	Sh	qof	Sh.
*Kawaawe	 H/J	 saac	Sh.	 qof	Sh	qof	Sh.
	<u>Haddii Yaambo tahay.</u>						
	b. Sheeg hawlaha Yaambada ku qabatay | iyo wixii kharaj ah ee kaaga baxay dhul diyaarinta:						
Nooca Shaqada	Tirada Dhulka	Tirada shaqaalaha ijaarka ah		Ijaarka Qoofkii	Meeqa Maalin	Tirada Dadka Qoovska	Meeqa Maalin
*Carro-gedis	 H/J	 qof		Sh	.....	.....qof	.....
*Kawaawe	 H/J	 qof		Sh	.....	.....qof	.....
	<u>A B U U R I T A A N K A</u>						
	55.Goormaad abuurta sisintada?			55)Makay taariikhda ahayd.....			
	56.Nooca abuurka sisinta aad Gugaan isticmaashay muxuu ahaa?			56)Waa kii Deyrta ii baxay... Suuqa ayaan ka soo gatay..			
	57.Saf saf ma u abuurta sisinta?			57)Haa... Maya...			

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	58.Waa maxay kharajka kaaga baxay abuuritaanka sisintada?	
	*Abuur : shood Hek/Jib, Shillin shoodii	
	*Shaqaaale:..... qof ijaar ah, Sh. qofkii, maalin	
	*Dadka qoyska: .....qof qoyska, maalin,.....jibaal	
	<u>F A L & K A L A - D H I M I D</u>	
	59.Meeqa jeer ayaad fashay sisinta?	59)..... jeer
	60.Falkii kowaad goormaad sameeysay?	60)Taariikhda markay ahayd.....
	61.Waa maxay kharajka kaaga baxay falkii kowaad iyo kala dhimiddii sisinta?	
	*Shaqaaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin fal ah	
	@2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal fal ah	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....jibaal	
	62.Waa maxay kharajka kaaga baxay falkii labaad?	
	*Shaqaaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin fal ah	
	@2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal fal ah	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....jibaal	
	<u>W A R A A B K A</u>	
	63.Dhaay ma ka dhigtay dhulka intaadan sisinta ku abuurin?	63)Haa... Maya...
	64.Ma daadooy misa matoor ayaad ku sisinta ku dhaaysay?	64)Daadooy..... Matoor Daadooy iyo matoor.....
	<u>Haddii ay Matoor tahay.</u>	
	a.Matoor ma ijaar uu ahaa misa adiga lahaa?	64a)Ijaar..... Aniga leh..... Tuulada leh....

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	65.Maxaa kharaja kaaga baxay dhaayga?	
	*Shaqaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin waraab	
	@2.Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal waraab	
	*Dad qoyska ah:..... qof,.....maalin waraab,.....jibaal waraab	
	*Shidaal :.....litir nafto,.....maalin,.....Sh./litirkii	
	*Ijaarka matoorka:.....Sh./maalintii,.....maalin	
	66.Dhaygi ka dib ma waraabisay sisinta xilligan Guga?	66)Haa... Maya...
	<u>Haddii ay Haa tahay.</u>	
	a.Meeqa jeer ayaad waraabisay sisinta Guga?	66a)..... jeer daadooy jeer matoor
	67.Kanaalada ma nadiifisay beer-abuur kii ka hor?	67)Haa... Maya...
	<u>Haddii ay Haa tahay.</u>	
	a.Maxaa kharaj ah kaaga baxay kanaal nadiifinta?	
	*Shaqaale ijaar ah:	
	@1.Joornati :..... qof,.....Sh. maalinti,.....maalin fal ah	
	@2.Kuntraad :..... qof,.....Tallaabo,.....Shilin	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....Tallaabo	
	68.Ma daadooy misa matoor ayaad ku waraabisay sisinta?	68)Daadooy..... Matoor Daadooy iyo matoor.....
	<u>Haddii ay Matoor tahay.</u>	
	a.Matoor ma ijaar uu ahaa misa adiga lahaa?	68a)Ijaar..... Aniga leh..... Tuulada leh....

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	69. Maxaa kharaja kaaga baxay waraabka?	
	<u>Waraabka kowaad</u>	
	*Shaqaale ijaar ah:	
	@1. Joornati :..... qof,.....Sh. maalinti,.....maalin waraab	
	@2. Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal waraab	
	*Dad qoyska ah:..... qof,.....maalin fal ah,.....jibaal	
	*Shidaal :.....litir nafto,.....maalin,.....Sh./litirkii	
	*Ijaarka matoorka:.....Sh./maalintii,.....maalin	
	<u>Waraabka labaad</u>	
	*Shaqaale ijaar ah:	
	@1. Joornati :..... qof,.....Sh. maalinti,.....maalin waraab	
	@2. Kuntraad :..... qof,.....Sh. jibaalki,.....jibaal waraab	
	*Dad qoyska ah:..... qof,.....maalin waraab,.....jibaal	
	*Shidaal :.....litir nafto,.....maalin,.....Sh./litirkii	
	*Ijaarka matoorka:.....Sh./maalintii,.....maalin	
	<u>B E E R - G A S H I (INPUTS)</u>	
	70. Ma siisay bacrin sisinta Guban?	70) Haa... Maya...
	<u>Haddii ay Haa tahay,</u>	
	a. Meeqa jeer ayaad bacrinta siisay?	70a).....jeer
	b. Waa maxay nooca bacrintaad siisay?	70b) Nooca.....
	c. Meeqa Kiilo ayaad Hek/Jib siisay?	70c).....Kiilo Hek/Jib
	d. Guud ahaan meeqa Kiilo ayaad beerta oo dhan siisay?	70d).....Kiilo
	e. Waa meeqa Hek/Jib oo sisintada ayaad bacrinta siisay?	70e).....Hek/Jib
	f. Muxuu yahay qiimaha 50 Kiilo?	70f).....Shilin/50 Kiilo
	g. Xaggee ka heshay bacrinta?	70g) Dayn Bankiga..... Lacag aan ku gatay....
	h. Haddii aad gadatay, ciddee ka gadatay?	70h) Ganacsade tuulada..... Ganacsade magaalada... Beeraley kale.....

S I S I N

Qaybta	Su'aalaha	Jawaabaha
	i. Maxaa kharaj ah ayaa kaaga baxay firdhinta bacrintaa? <u>Haddii Maya tahay.</u>	70i).....Shilin
	j. Maxaa u siin waysay bacrin sisinta?	70j).....
	71. Ma siisay sunta sisinta? <u>Haddii ay Haa tahay.</u>	71)Haa... Maya...
	a. Meeqa jeer ayaad sunta siisay?	71a).....jeer
	b. Waa maxay nooca suntaad siisay?	71b)Nooca.....
	c. Meeqa Kiilo ayaad Hek/Jib siisay?	71c).....Kiilo Hek/Jib
	d. Guud ahaan meeqa Kiilo ayaad beerta oo dhan siisay?	71d).....Kiilo
	e. Waa meeqa Hek/Jib oo sisinta ayaad suntaasi siisay?	71e).....Hek/Jib
	f. Muxuu yahay qiimaha Kiiladii?	71f).....Shilin/1 Kiilo
	g. Xaggee ka heshay suntaasi?	71g)Dayn Bankiga..... Lacag aan ku gatay....
	h. Haddii aad gadatay, ciddee ka gadatay?	71h)Ganacsade tuulada..... Ganacsade magaalada... Beeraley kale.....
	i. Maxaa kharaj ah ayaa kaaga baxay ku shubidda suntaasi? <u>Haddii Maya tahay.</u>	71i).....Shilin
	j. Maxaa u siin waysay bacrin sisinta?	71j).....

D H I B A T O O Y I N K A B E E R A L E Y G A

Qaybta	Su'aalaha	Jawaabahaha
XIII. Dhibaatada Beeraleyga	72. Maxay tahay affarta (4) dhibaato oo ugu weyn ee kaa haysta xagga wax-soo-saarka beeraha?	1)..... 2)..... 3)..... 4).....
	73. Maxay yihiin labada dhibaato ugu weyn ee hoos u dhiga wax-soo-saarka galleyda?	1)..... 2).....
	74. Ma gadan lahayd bacrin haddii aad heleysid oo tuulada ay taallo?	1. Haa, lacag baan ku gadan..... 2. Haa, haddii dayn laygu siiyo... 3. Maya, in igu filan waan isticmaala hadda..... 4. Maya, uma baahni

MASHRUUCA FOOD SECURITY
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)

Wareeysiga Beeralayda
Midka Afraad

Gobol:.....

Degmo:.....

Tuulo:.....

Magaca Beeralayga:.....

Lambarka Aqoonsiga:.....

Magaca Fidiyaha:.....

Taariikhda:.....

Hubiyay:.....

Taariikhda:.....

Qaybta	Su'aalaha	Jawaabaha
I. Goysmada Galleyda & Sisinta	1. Galley ma beertay xilligii Guga? <u>Haddi ay Haa tahay.</u> a. Meeqa Hektar/Jibaal ayaad beertay? b. Meeqa Hek/Jib oo galley ah ayaa kuu soo go'day? 2. Maxaa kharaj ah ayaa kaaga baxay shafid, tubis, uruurin, iyi fiiqida galleyda? 3. Ma finjishay galleyda? <u>Haddi ay Haa tahay.</u> a. Imisa Kiintaal oo sabuul ah ayaad finjishay? b. Ma makiinad misa gacan ayaad ku finjishay? <u>Haddi Makiinad tahay.</u> c. Makiinada finjilka xaggeed ka xaggeed ka heshay? d. Maxaa kharaj ah ayaa kaaga baxay finjilidda Kiintaalkii saafi ah? e. Imisa kiintaal oo saafi ah ayay noqdeen qaybtii aad finjishay? 4. Sisin ma beertay xilligii Guga? <u>Haddi ay Haa tahay.</u> a. Meeqa Hektar/Jibaal ayaad beertay? b. Meeqa Hek/Jib oo sisin ah ayaa kuu soo go'day? c. Meeqa Shilin oo kharaj ah ayaa guud ahaan kaaga baxay siibid, tubid, iyo ilaalinta sisinta? d. Maxaa kharaj ah ayaa kaaga baxay shubidda Kiintaalka sisinta ah? 5. Meeqa Loor oo galley habuuq ayaad qiyaastii hore beerta uga sii goosatay beer goysmada ka hor? 6. Imisa Kiintaal oo galley sabuul ah ayaad ku kaydsatay bakaar galleydii kuu soo go'day Guga?	1) Haa... Maya... a)..... Hek/Jib b)..... Hek/Jib 2)..... Shilin 3) Haa... Maya... a) 1)..... Kt. sabuul 2. Ma aqaan..... b) Makiinad... Gacan... c) -Aniga leh... -Beeralay kale ka ayaan ka soo ijaartay... -ADC ayaan ka ijaartay... d)..... Sh./Kt. saafi (100 Kiilo qaad ah) e)..... Kt. saafi <u>Nooca Kt.</u>..... 4) Haa... Maya... a)..... Hek/Jib b)..... Hek/Jib c)..... Sh. d)..... Sh./Kt. saafi (100 Kiilo qaad ah) 5)..... Loor habuuq 6)..... Kt. sabuul

Qaybta	Su'aalaha	Jawaabaha																												
	7. Intay la egyihiin guud ahaan mirahii Guban kuu soo go'ay (oo ay jiraan wixii aad Sako ku bixisay) iyo ballaca dhulka aad ka soo goosay ee dalagyada kala ah: 8. Tirada inta Kiintaal oo galley ah aad Hektarkii/Jibaalkii ka heshay Guban ma ka duwan yahay kii Gugii sano hore la soo dhaafay? <u>Haddii uu ka duwan yahay,</u> a.Maxay tahay sababaha uu kaga duwan yahay?	<table><tr><th></th><th>Kiintaal</th><th>Ballaca</th></tr><tr><th>7) Dalag</th><th>Saafi</th><th>Dhulka</th></tr><tr><td>*Galley</td><td>..... Kt.</td><td>....H/J</td></tr><tr><td>*Sisin</td><td>..... Kt.</td><td>....H/J</td></tr><tr><td>*Bariis</td><td>..... Kt.</td><td>....H/J</td></tr><tr><td>*Digir</td><td>..... Kt.</td><td>....H/J</td></tr></table> 8)Waa la mid..... Waa ka yaryahay..... Waa ka badan yahay... a)1..... 2.....		Kiintaal	Ballaca	7) Dalag	Saafi	Dhulka	*Galley	 Kt.	H/J	*Sisin	 Kt.	H/J	*Bariis	 Kt.	H/J	*Digir	 Kt.	H/J										
	Kiintaal	Ballaca																												
7) Dalag	Saafi	Dhulka																												
*Galley	 Kt.	H/J																												
*Sisin	 Kt.	H/J																												
*Bariis	 Kt.	H/J																												
*Digir	 Kt.	H/J																												
II. Gadistii Mirahii & Balka Guga	9. Meeqa Kiintaal ee dalagyada hoos ku xusan ayaad gaday, goormaad gaday, xagee ku gaday, sababtaad u gaday sheeg, ciddee ka gaday, meeqa Shilin ayaad Kintaalki ku gaday?																													
	<table><tr><th>Dalag</th><th>Kiintaal</th><th>Bishii la</th><th>Meesha lagu</th><th>Sababtaad</th><th>Cidda laga</th><th>Qiimaha</th></tr><tr><th></th><th>la Gaday</th><th>Gaday</th><th>Gaday</th><th>U Gaday</th><th>Gaday</th><th>Kiintalka</th></tr><tr><td></td><td>(100 Kiilo)</td><td></td><td></td><td></td><td></td><td></td></tr></table>	Dalag	Kiintaal	Bishii la	Meesha lagu	Sababtaad	Cidda laga	Qiimaha		la Gaday	Gaday	Gaday	U Gaday	Gaday	Kiintalka		(100 Kiilo)													
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4	 Kt.					Sh/Kt																								

Qaybta	Su'aalaha	Jawaabaha												
III. Sako Bixin & Qaadasho	10.Sicirka galleyda aad ku gadday Gugan ma la mid baa kii Gugii hore?	10)Waa la mid..... Waa ka badan yahy... Waa ka yaryahay.....												
	11.Ma gadday balka? <u>Haddii ay Haa tahay.</u> a.Meeqa Hek/Jib oo bal ah ayaad gadday? b.Ciddee ka gadday balkaasi? c.Meeqa Shilin ayaad Hek/Jib ee balka ku gadday?	11)Haa.... Maya... a)..... Hek/Jib b)..... c).....Sh. Hek/Jib												
	12.Ma jirta qayb dalagyada soo socda aad sako ama sadaqo ahaan aad ku siisay lacag la'aan waxyabihii Guga kuu soo go'ay?													
	<table><tr><td></td><td></td><td></td><td>Tirada</td><td></td><td></td></tr><tr><td>Dalag</td><td>Haa</td><td>Maya</td><td>Kt./Shood</td><td>Ciddaad siisay</td><td>Qofka maxaa Idiinka Dhexeeya</td></tr></table>				Tirada			Dalag	Haa	Maya	Kt./Shood	Ciddaad siisay	Qofka maxaa Idiinka Dhexeeya	
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13.Ma jirta qayb dalagyada soo socda aad sako ama sadaqo ahaan adiga laguu siiyay lacag la'aan xilligii Guga?														
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*Sisin			Kt/Shd Shilin											
*Bariis			Kt/Shd											
*Digir			Kt/Shd											
	14.Galley dayn ah oo lagugu lahaa aad dib u bixisay ma jirtaa? <u>Haddii ay Haa tahay,</u> a.Meeqa Kiintaal oo saafi ah ayaa daynta ku bixisay?	14)Haa... Maya... a).....Kt. saafi												
	15.Ma jirta qayb galleydii iyo sisintii Gugan kuu soo go'day aad cid wax uga beddelatay	15)Haa... Maya...												

Qaybta	Su'aalaha	Jawaabaha
IV. Haraaga Kaydkii Guga	16.Waqtigan hadda la joogo meeqa Kintaal ee dalagyada soo socda ayaa kuu kaydsan?	Tirada inta 16)Dalag|Kintaal ee kaydsan *Galley { Kintaal *Sisin { Kintaal *Bariis { Kintaal *Digir { Kintaal
	17.Maxay tahay sababta aad u kaydisay tirada intaasi Kiintaal ee dalagyadaa?	17)Dalag|Sabata loo kaydiyay *Galley | ..... *Sisin | ..... *Bariis | ..... *Digir | .....
	18.Ma ku tala jirtaa inaad gadid qayb ka mid ah kaydkaaga galleyda? <u>Haddii ay Haa tahay,</u> a.Maxay tahay sababta aad u gadaysid?	18)Haa... Maya... a) 1..... 2.....
	19.Meeqa Kintaal ee dalagyada soo socda ayaa Gugii sano hore beergoysmada waqtigan oo kale kuu kaydsanaa?	19)Dalag|Kintaal ee kaydsana *Galley { Kintaal *Sisin { Kintaal *Bariis { Kintaal *Digir { Kintaal
	20.Ma ku filan tahay reerka ilaa beergoysmada Guga sano dambe qaybta galleyda bakaarta kugu kaydsan hadda?	20)Haa... Maya...
	<u>Haddii ay Maya tahay,</u> a.Xaggeed badar uga keeneeysaa reerka markay kaa dhamaato inta bakaarta kuugu jirta?	a)-Deyrta ayaan beeran..... -Beeraha kale ayaan ka xoogsanayaa -Si kale(caddee).....
V. Sugnaanta Cuntada Reerka		

Qaybta		Su'aalaha		Jawaabaha	
		21.Ma jirtaa qayb ka mid ah dalagyada iyo cuntada soo socota aad suuqa ka soo iibsatay 30kii maalmood ee la soo dhaafay?			
Dalag & cunto	Tirada	Qiimaha	Suuqa ka	Ciddaad ka	Sababta aad
		Kt/Shd/Kg/litr	Kt/Kg/Ltr/Shd	soo Gaday	soo gadatay u soo Gadatay
Galley	1	Kt/Shood	Kt/Shod	.....	.....
	2	Kt/Shood	Kt/Shod	.....	.....
	3	Kt/Shhod	Kt/Shod	.....	.....
	4	Kt/Shood	Kt/Shod	.....	.....
Saliid sisin	1	litir	litirki	.....	.....
	2	litir	litirki	.....	.....
	3	litir	litirki	.....	.....
	4	litir	litirki	.....	.....
Saliid caddey	1	litir	litirki	.....	.....
	2	litir	litirki	.....	.....
	3	litir	litirki	.....	.....
	4	litir	litirki	.....	.....
Bariis	1	Kiilo	kiladii	.....	.....
	2	Kg.	kiladii	.....	.....
	3	Kg.	kiladii	.....	.....
	4	Kg.	kiladii	.....	.....
Baasto	1	Kg.	kiladii	.....	.....
	2	Kg.	kiladii	.....	.....
	3	Kg.	kiladii	.....	.....
	4	Kg.	kiladii	.....	.....
Digir	1	Shood	shoodii	.....	.....
	2	Shood	shoodii	.....	.....
	3	Shood	shoodii	.....	.....
	4	Shood	shoodii	.....	.....
Sonkor	1	Kg.	kiladii	.....	.....
	2	Kg.	kiladii	.....	.....
	3	Kg.	kiladii	.....	.....
	4	Kg.	kiladii	.....	.....
VI. Dakhliga Beeralyga ee Guban		22.Imisa lacag ah ayaa qiyaas ahaan kaa soo galay xilligii Guga ee la soo dhaafay ilahan soo soocda:			
		*Gadistii miraha ka soo baxay beerta:		Shilin	
		*Gadistii balka		Sh.	
		*Gadistii xoolaha		Sh.	
		*Ka xoogsashadii tacab beero kale		Sh.	
		*Lacag kuu soo direen caruurtada		Sh.	
		*Beecmushtar		Sh.	
		*Farsamo gacneed		Sh.	
		*Kalluumeysi		Sh.	
		*Gadista khudaarta		Sh.	
		*Gadista miro ka yimid geedmirood		Sh.	
		*Mushaar		Sh.	

Qaybta	Su'aalaha	Jawaabaha										
VII. Qorshaha Tacabka Deyrta	23.Maxaad ku sameysay lacagtii aad ka heshay ilahaas dakhliga ee kala duwan?	23) 1..... 2..... 3..... 4.....										
	24.Ma bilowday dhul diyaarinta ee Deyrta xilligeeda lagu jiro?	24)Haa... Maya...										
	25.Imisa Hek/Jib ayaad ku tala jirtaa inaad beertid Deyrta?	25)..... Hek/Jib										
	26.Maxay kala yihiin dalagyada iyo dhulka dalag walba aad ku tala jirtid in aad ku beertid Deyrta?	<table><tr><th><u>Dalaga</u></th><th><u>Dhulka</u></th></tr><tr><td>26) laad</td><td>.....Hek/Jib</td></tr><tr><td>2aad</td><td>.....H/J</td></tr><tr><td>3aad</td><td>.....H/J</td></tr><tr><td>4aad</td><td>.....H/J</td></tr></table>	<u>Dalaga</u>	<u>Dhulka</u>	26) laad	Hek/Jib	2aad	H/J	3aad	H/J	4aad	H/J
	<u>Dalaga</u>	<u>Dhulka</u>										
	26) laad	Hek/Jib										
	2aad	H/J										
3aad	H/J											
4aad	H/J											
27.Galley ma ka mid tahay dalagyada ku tala jirtid inaad beertid? <u>Haddii ay Haa tahay.</u>	27)Haa... Maya...											
a.Dhulka galleyda aad ku tala jirtid inaad Deyrta saartid ma ka badan yahay misa waa ka yaryahay kii Deyrtii sano hore?	a)-Waa ka badanyahay... -Waa ka yaryahay..... -Waa la mid.....											
28.Maxay tahay sababaha ballaca dhulka aad galleyda ku tabcaysid uga duwan yahay?	28) 1..... 2.....											
VIII. Dhibaataada Beeralayga	29.Ma jiraan dhibaatooyin kaa haysta xagga isu diyaarinta xilliga Deyrta? <u>Haddii ay Haa tahay.</u>	29)Haa... Maya...										
	a.Maxay yihiin dhibaatooyinkaasi?	a).....										
	b.Sideey kula tahay in lagu xallin karo dhibaatooyinkaasi?	b) 1..... 2.....										
	30.Maxay tahay affarta (4) dhibaato oo ugu weyn aad la kulantay guud ahaan xagga wax-soo-saarka beeraha Gugii sannadkan 1987?	30)1..... 2..... 3..... 4.....										
	31.Maxay yihiin afarta dhibaato ugu weyn aad kala kulantay galleyda Guga sannadkan 1987?	31)1.....										

W A R A A B K A

Qaybta	Su'aalaha	Jawaabaha																												
IX. Waraabka	32.Beertaada ma waraabisaa labada xilli ee kala ah Gu iyo Deyr? <u>Haddii aad waraabiso,</u> a.Ma matoor misa daadooy ayaad ku waraabisaa Guga iyo Deyrta? <u>Haddii ay Ma waraabiyo tahay,</u> b.Maxay tahay sababaha aad u waraabin beerta? 33.Maxay kala yihiin dalagyada aad waraabiso xilliyada kala duwan? 34.Dhibaatooyin xagga waraabka ah oo ku hortaagan ma jiraan? <u>Haddii ay Haa tahay,</u> a.Maxay yihiin dhibaatooyinkaasi? 35.Ma siisaa bacrin dalagyada aad beertid oo aad waraabisid? <u>Haddii ay Haa tahay,</u> a.Waa kuwee dalagyadaasi aad bacrinta siisid? 36.Ma jirtaa waqtiyada qaarkood oo isagoo webiga biyo leh aadan beerta waraabin cusbo ama dhiiqo darteed?	32)Guga keliya.... Deyrta kliya... Gu iyo Deyr.... Ma waraabiyo... a) <u>Nooca Waraabka</u> <u>Xilliga</u> <table><tr><td>- Matoor keliya</td><td>Gu.. Der..</td></tr><tr><td>- Daadooy kelia</td><td>Gu.. Der..</td></tr><tr><td>Matoor iyo daad</td><td>Gu.. Der..</td></tr></table> b)..... 33)<u>Dalag</u> <u>Xilliga</u> <table><tr><td>-Galley</td><td>Gu.. Der...</td></tr><tr><td>-Sisin</td><td>Gu.. Der.. Haga..</td></tr><tr><td>-Bariis</td><td>Gu.. Der...</td></tr><tr><td>-Yaanyo</td><td>Gu.. Der.. Haga..</td></tr><tr><td>-Khudaar</td><td>Gu.. Der..</td></tr><tr><td>-Geedmiro</td><td>Gu.. Der.. Haga..</td></tr><tr><td>-.....</td><td>Gu.. Der.. Haga..</td></tr><tr><td>-.....</td><td>Gu.. Der.. Haga..</td></tr></table> 34)Haa... Maya... a)..... 35)Haa... Maya... a) <u>Dalag</u> <table><tr><td>1.Galley.....</td><td>2.Yanyo....</td></tr><tr><td>3.Sisin.....</td><td>4.....</td></tr><tr><td>5.Bariis.....</td><td>6.....</td></tr></table> 36)Haa... Maya...	- Matoor keliya	Gu.. Der..	- Daadooy kelia	Gu.. Der..	Matoor iyo daad	Gu.. Der..	-Galley	Gu.. Der...	-Sisin	Gu.. Der.. Haga..	-Bariis	Gu.. Der...	-Yaanyo	Gu.. Der.. Haga..	-Khudaar	Gu.. Der..	-Geedmiro	Gu.. Der.. Haga..	-.....	Gu.. Der.. Haga..	-.....	Gu.. Der.. Haga..	1.Galley.....	2.Yanyo....	3.Sisin.....	4.....	5.Bariis.....	6.....
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Qaybta	Su'aalaha	Jawaabaha
	(WAXAA FIDIYAHA LAGA CODSANAA INUU HUBIYO SU'AASHA SOO SOCOTA)	
	37. Beertaada dhulkeeda waa sidee xagga sinaanta dhulka?	37) Aad buu u fiican yahay... Waa fiican yahay..... Waa dhexdhexaad..... Ma sinna.....
	38. Biyuhu ma wada gaaraan dhulka beertaada oo dhan? <u>Haddii ay Maya tahay,</u> a. Maxay tahay sababta biyaha u wada gaari waayeen?	38) Haa... Maya... - a).....
	39. Ma kordhin kartaa ballaca dhulka waraabka aad beeritid? <u>Hadii ay Haa tahay,</u> a. Xaggeed ka helayso dhulkaasi cusub?	39) Haa... Maya... a) Dhulkayga geedqaadi... Kanaal sameysan..... Beer baan gadan.....
	40. Ma jirtaa dhibaato biyo yari ah markaad xilliga wax-beeridda? <u>Haddii ay Haa tahay,</u> a. Maxaa u sabab ah dhibaataada biyo yaraanta ah?	40) Haa... Maya... a).....
	b. Haddii la xalliyo waxyaabaha keenaya biyo la'aanta aad hore u sheegtay, miyay wax iska beddeli doonaan dalagyada aad beertid?	b) Haa... Maya...
	c. Haddii ay Haa tahay, maxay yihiin dalagyada aad beeran doontid marka la hagaajiyo waraabka? <u>Dalagyada hore loo beeri jiray</u>	<u>Dalagyada cusub</u>
	41. Ma la qaybsataa beeraley kale kanaalka aad ka waraabto? <u>Haddii ay Haa tahay,</u> a. Ma leedihiin guddi waraab?	41) Haa... Maya... a) Haa... Maya...
	b. Maxay tahay shaqada awga iyo yirsinka, iyo sagaalka kanaalk: SHAQADA AWGA WAA:..... SHAQADA YIRSINKA:..... SHAQADA SAGAALKA:.....	..... ..... .....

Qaybta	Su'aalaha	Jawaabaha
	42.Marka makiinad (Boklen) kanaalka lagu hagaajinaayo, sidee lacagta kharajka makinadda loo qaybsadaa?	42).....
	43.Sidee beeraly walba loo saaraa inta tallaabo oo qodis ama hagaajin kanaalka ah fasal walba?	43).....
	44.Beeraly walba ma qayb qaataa hagaajinta Far Gumeedka iyo kanaalka aad ka waraabtaan?	44)Haa... Maya...
	45.Habkee ninka sagaalka u qaybiyaa tookada waraabka beeralyada kala duwan?	45).....
	46.Ma lagaa qaada lacag far furid ah marka adiga tookada lagu siiyo? <u>Haddii ay Haa tahay,</u> a.Maxaa lagu sameeya lacagtaasi far furidda ah?	46)Haa... Maya... a).....
	47.Ma jiraan iska horimaad iyo qilaaf ka yimaada qaybinta biyaha waraabka?	47)Haa... Maya...
	48.Ma jiraa xeer lagu maamulo qaybinta biyaha iyo wixii dacwo ah ee waraabka la xiriiro?	48)Haa... Maya...
	a.Haddii xeer jiro, maxay yihiin qoddobada xeerkaasi: WARAAB FASAX LA'AAN AH.....	
	DIIDIS LACAG BIXIN	
	DIIDIS QAYB TALLAABO	
	49.Guddigiina waraabka si wanaagsan oo caddaalad ah ma u maamulaa biyo qaybinta iyo lacag uruurinta kanaalka?	49)Haa... Maya...
	50.Maxay yihiin dhibaatooyinka ugu weyn ee kaa haystaa xagga waraabka?	50) 1..... 2..... 3.....
	a.Maxaa lagu xallin karaa dhibaatooyinka aad kor ku sheegtay?	a) 1..... 2..... 3.....

FOOD SECURITY PROJECT
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)

Trader Interview
(Assembler/Wholesaler & Store-Owner)
Questionnaire No. 1

Region:.....

District:.....

Market :.....

Trader's Name:.....

I.D. No. :.....

Enumerator:.....

Date :.....

Verified by:.....

Date:.....

Item	Specific Question	Answers
I. Background	1.What is your name?	1).....
	2.How old are you?	2).....
	3.Did you have: a)Koranic education? b)Formal education?	3a)Yes... No... 3b)Yes... No...
	4.What is your current business?	4)-Wholesaler... -Wholesaler/Assembler... -Assembler... -Store-Owner...
	a.How many years were you in this business? b.What was your business before 1984? c.What other business are you currently engaged in? d.Do you operate i) solely in this market (town) or ii)have bases in other markets (towns)?	a)..... b)..... c)..... di).... dii).....
II. Purchases	5.What commodities do you trade in?	5)-Loc.Maize... Imp.Maize... -Sesame... -Sorghum... -Other...
	6.From what sources do you buy these commodities?	6)-Farmers..... -Rural Assemblers.... -ADC..... -Refugees..... -Other.....
	7.Where do you usually buy maize/ sesame?	7).....
	8.From whom do you buy your maize/ sesame?	8).....
	9.Do you have any customary sellers you usually buy from? <u>If Yes.</u>	9)Yes... No...
	a.Who are these customary sellers?	a) <u>Type of seller</u> <u>Base</u> -Farmer..... -Rural assemb... -Other.....
	b.Are they i)just business associates or ii)related to you by kinship?	bi)... bii)...
	c.What percent of your purchases do you buy from them?	c).....
	d.Do you offer them any special services (e.g.credit, market info)?	d)Yes... No...

Item	Specific Question	Answers
(cont.)	e. Do you have contractual arrangements with the customary sellers? <u>If No,</u>	e) Yes... No...
	f. Who are your non-cusatomary sellers you buy maize/sesame from?	f) <u>Seller</u> <u>Location</u>
	10. Are you aware of the benefits of having contractual arrangements? <u>If Yes,</u>	10) Yes... No...
	a. What are the main constraints for not developing such a relationship?	a)
	11. Are there rural assemblers who buy from farmers and sell to traders from the towns? <u>If Yes,</u>	11) Yes... No...
	a. Do you buy from them ?	a) Yes... No...
	12. Do you buy maize/sesame during: a. certain periods of the year? or b. throughout the year?	12) a... b...
	13. During which periods of the year do you buy most of the maize/ sesame you handle? a. Why at those times?	13)
	14. How do you know what are maize/ sesame selling prices at the farmgate/village market? a. How do farmers know what are maize sesame prices at urban market?	a) 14) a)
	15. Are Bakaar and non-Bakaar maize available from farmers at different periods of the year? a. When is Bakaar maize most prevalent from the farmers?	15) Yes... No... a)
	16. If both Bakaar and non-Bakaar maize are available to you to buy, which sells for a higher price?	16)
	17. What units do you use in each area for buying maize/sesame? a. Do you use similar units in buying maize/sesame from different districts and regions? <u>If Yes,</u>	17) <u>Unit</u> <u>Area</u> a) Yes... No...
	b. What are these units?	b)
	18. How do you generally finance your buying?	18) -Own money... -By loan...

Item	Specific Question	Answers
III.Sales	19.When you need to borrow money, from whom do you borrow?	19).....
	a.How long do you have to pay back such a loan?	a).....
	b.Does the lender require you to pay interest on the loan or share in the profit?	b)Yes... No..
	20.Do you usually have sufficient capital to finance the quantities of maize/sesame you would like to purchase?	20)Yes... No...
	<u>If No.</u>	
	a.Would you have bought more maize/ sesame if enough capital was available?	a)Yes... No...
	21.Do you ever pay maize/sesame in kind?	21)Yes... No...
	<u>If Yes.</u>	
	a.What goods do you provide sellers?	a).....
	22.Do you supply consumer goods rural producing areas?	22)Yes... No...
	23.Do you buy maize/sesame from fixed or variable day rural markets?	23)Fixed.... Variable...
	24.What were the maximum and minimum quantities you purchased from the same seller during this year?	24)Max..... Min.....
	25.How much maize/sesame did you handle in the last 12 months?	25).....
	26.Do you own or rent truck to bring the commodities to town?	26)Own... Rent...
	<u>If rent.</u>	
	a.From whom do you rent?	a).....
	b.Where do you rent the trucks from?	b).....
	c.How much does it cost per sack from village to town?	c)..... Sh./Sack
	d.Are trucks available when you need them?	d)Yes... No...
	27.Do you usually sell maize/sesame on the spot after you bring it to town or store it for later sale?	27)Sell.... Store...
	<u>If Store.</u>	
	a.Where do you store the commodity?	a)-Rented store.... -Own store.... -At home....
	b.If store in different places, estimate breakdown of present stocks by commodity, quantity, and for how long the commodities were in store?	b) <u>Comm.</u> <u>Qt.</u> <u>Locat.</u> <u>Time</u> Maize Sesame

Item	Specific Question	Answers
IV. Constraints	28. Are your current stocks of maize/ sesame higher or lower than those held last year at this time?	28) Higher... Lower...
	a. What is the reason for the difference in stocks?	a).....
	29. For how long is it profitable to store maize/sesame?	29).....
	a. Under what conditions is it profitable to store maize/sesame?	a).....
	30. Does the store owner do the selling for you or you do it by yourself? <u>If by yourself.</u>	30) Store-owner... Myself...
	a. Do you have customary buyers? <u>If Yes.</u>	a) Yes... No... b) <u>Buyer</u> <u>Location</u>
	b. Who are they?	..... .....
	c. Are they related to you by kinship?	c) Yes... No...
	d. Do these customary buyers offer you credit, milling services, etc?	d) Yes... No...
	e. What proportion do you sell to them? <u>If No.</u>	e)..... %
	f. To whom do you sell your maize/ sesame?	f).....
	g. Where are these buyers based at?	g).....
	31. In what units do you sell maize/ sesame?	31) Maize.... Sesame....
	32. How do you know what are the maize /selling prices at other urban markets?	32).....
	33. Do you process any maize/sesame before you sell it?	33) Yes... No...
	a. If not, why not process it?	a).....
	34. What are the 3 most difficult problems do you face in your business?	34).....
	35. What do you suggest to overcome those problems?	35i)..... ii)..... iii).....
	36. Does the lack of standard weights and grading of maize/sesame pose difficulties in your business?	36) Yes... No...

Description of a recent transaction

Item	Specific Questions	Answers
V. Case Study	37. Describe your most recent buying: a. When was your last purchase? b. From what source did you buy the maize/sesame? c. Where did you buy from? d. How much maize/sesame did you buy? e. Was it a contractual purchase? f. Did you know maize/sesame selling price at farmgate/village market before you went there? g. If yes, how did you know the price beforehand? h. How many sellers did you buy from? i. In what units did you buy maize/sesame? j. What was the max and min you purchased from the sellers? k. How many days were you out buying? l. How did you finance the buying? m. If loan, who loaned you the money? n. If loan, did you had to i) pay interest or ii) lender share in the profit? o. Do you feel that you had enough capital in this last transaction? p. Did you take some consumer goods for sale to the village? q. How much did it cost you per unit: r. Did you rent a truck? s. If yes, what did it cost to transport from village to town? t. What was the loading and unloading cost per sack? u. Did you incur other cost/sack? v. Where did you store? w. How long was it stored? x. Did you pay storage charge per sack or sales commission?	a)..... b)-Farmer... -Rural Assembler... -ADC... -Other (<u>Specify</u>)... c)..... d)..... e)Yes... No... f)Yes... No... g)..... h)..... i)Maize.... Sesame.... j).... max min k)..... l)-Own money... -Loan... m)..... ni)Yes... No... nii)Yes... No... o)Yes... No... p)Yes... No... q)Empty sack No. Units/Sacks.... Type of sack..... (Kg./Sack.....) Price/sack..... Tax..... r)Yes... No... s)..... t)..... u)..... v)..... w)..... x)Charge... Commission...

Item	Specific Questions	Answers
	38. Did you sell any of the above? <u>If Yes,</u>	38) Yes... No...
	a. Who did the selling for you?	a) Myself... Store-owner...
	b. How much did you sell?	b)
	c. To whom did you/he sell per unit?	c) <u>Type of buyer</u> <u>Base</u>
	d. In what units did you/he sell?	d)
	e. How much was it sold per unit?	e)
	f. How was such price arrived at?	f)
	g. Did you know what maize/sesame was selling for at other towns?	g) Yes... No...
	h. If yes, how did you get such information?	h)
	i. How much did you pay on storage and/or commission?	i)
	j. How much in taxes did you pay per sack?	j) Sh./sack
	k. Did you incur other cost/sack?	k) Yes..... No...
	l. Can you estimate your net margin per unit?	l)
	m. Why didn't you keep the maize/sesame in storage longer to benefit from price increases?	m)

**Store-Owner Interview
(Assembler/Wholesaler & Store-Owner)
Questionnaire No. 1**

Region:.....

District:.....

Market :.....

Trader's Name:.....

I.D. No. :.....

Store-Owner Interview

Item	Specific Questions	Answers										
I. Background	1.What is your name?	1).....										
	2.How old are you?	2).....										
	3.Did you have: a)Koranic education? b)Formal education?	3a)Yes... No... 3b)Yes... No...										
	4.How many years have you been store-owner?	4).....										
	a.Do you engage in other trading activities besides runing the store?	a)Yes... No...										
II. Storage Cost	5.What commodities do you handle?	5)-Maize... -Sesame... -Sorghum... -Other...										
	6.Do you own the store or are you renting it? <u>If Renting,</u>	6)Own... Rent...										
	a.What is the rent per month?	a)..... So. Sh./Month										
	7.Can you tell us the stocks that are currently in the store broken down by commodity?	<table><tr><th>Commodity</th><th>Quantity</th></tr><tr><td>7)Maize</td><td>.....</td></tr><tr><td>Sesame</td><td>.....</td></tr><tr><td>Sorghum</td><td>.....</td></tr><tr><td>Other</td><td>.....</td></tr></table>	Commodity	Quantity	7)Maize		Sesame		Sorghum		Other	
	Commodity	Quantity										
	7)Maize											
	Sesame											
	Sorghum											
	Other											
	8.Do you own any of the stocks you now have in store?	8)Yes... No... Own Maize... .. Sesame.. ..										
	a.Who owns the rest of the stocks?	a).....										
	9.Do you charge others a)storage charges/sack or b)fixed commision per sack regardless of the length of time of storage?	9)a... b...										
	11.What is the usual lengnth of storage of maize/sesame?	10)Maize..... Sesame.....										
	12.How many sacks of maize/sesame have been stored here in the last 30 days?	12).....										
	13.How many sacks of maize/sesame were sold from the store in the last 30 days?	13).....										
	14.Can you estimate storage losses?	14).....										
15.Do you have pest control measures against post-harvest losses?	15).....											
a.If yes, what are these measures?	a).....											
16.Are current stocks of maize/sesame higher or lower than those of last year at this time?	16).....											
a.What is the reason for the difference?	a).....											
III.Post-Harvest Losses												

Item	Specific Questions	Answers
IV. Type of Buyers	17. Do have customary buyers of maize/ sesame? <u>If Yes.</u> a. Who are they? <u>If No.</u> b. To whom do you sell the maize/ sesame? c. Where are they located at? 18. In what units do you sell maize/ sesame? 19. How do you know what are the maize /sesame selling price at other urban markets? 20. Which other districts and regions is the maize shipped to?	17) Yes... No... a) <u>Type of buyer</u> <u>Location</u> b)..... c)..... 18) Maize..... Sesame..... 19)..... 20).....

FOOD SECURITY PROJECT
(MSU-PLANNING DEPT. FOOD SECURITY PROJECT)

Trader Interview
(Assembler/Wholesaler & Store-Owner)
Questionnaire No. 2

Region:.....

District:.....

Market :.....

Commodity:.....

Trader's Name:.....

I.D. No. :.....

Enumerator:.....

Date :.....

Verified by:.....

Date:.....

Item	Specific Questions	Answers
I. Background	1.How old are you?	1)..... years
	2.Do you have any formal education? <u>If Yes,</u> a.What level of formal education do you have?	2)Yes... No... a)Elementary..... Intermediate... Secondary..... University..... Other..... # yrs....
	3.Where do you live?	3).....
	4.What is your current business?	4)Wholesaler..... Wholesaler/Assembler.... Assembler..... Other (specify).....
	5.What commodities do you trade in?	5)Local maize..... Imported yellow maize... Sesame seed Sorghum Other
	6.In which market(s) do you sell?	6).....
II. Most Recent Purchase	Describe your most recent buying: 7.When was your last purchase?	7)date
	8.From what source did you buy the maize/sesame?	8)-Farmer... -Rural Assembler... -ADC... -Other (<u>Specify</u>)...
	9.Where did you buy from?	9).....
	10.What type of bags did you buy the maize/sesame?	10)Maize type of bag..... Sesame bag.....
	11.How many bags of maize/sesame did you buy in this recent purchase?	11)..... bags
	12.How many sellers did you buy from?	12).....
	13.What was the max and min # of bags you purchased from the same sellers?	13).... max min

Item	Specific Questions	Answers
	14. Was it a contractual purchase?	14) Yes... No...
	15. How much did you pay per bag?	15)..... Sh./bag
	16. Does that unit price include the cost of the empty bag?	16) Yes... No...
	<u>If No,</u>	
	a. How much did you pay for the empty bag?	a)..... Sh./bag
	17. How did you finance the buying?	17) -Own money... -Loan from relatives... -Loan from friends.... -Loan from the bank....
	18. If loan, did you had to i) pay interest or ii) lender share in the profit?	18i) Yes... No... ii) Yes... No...
	19. Do you feel that you had enough capital in this last transaction?	19) Yes... No...
	20. Did you knew maize/sesame selling price at farmgate/village market before you went out there?	20) Yes... No...
	21. If yes, how did you know the price beforehand ?	21).....
	22. Do you know the maize/sesame wholesale prices at this time in these markets:	22) <u>Maize(Sh)</u> <u>Sesame(Sh)</u> Jenale Qorioley Jowhar Mogadishu 23).....Sh./bag
	23. How much did you pay for storage charge per bag at the purchase site?	23).....Sh./bag
	24. Did you pay taxes at the purchase site?	24) Yes... No...
	<u>If Yes,</u>	
	a. How much tax per bag did you pay?	a)..... Sh./bag
	25. How much did you pay for transport, loading, and unloading?	25) Transport.....Sh./bag Loading .....Sh./bag Unloading .....Sh./bag
	26. What other expenses did you incur (e.g. personal travel, etc.)?	26)..... Sh.
	27. Where did you store?	27) Rented store..... Own store..... In the house.....
	28. How long was it stored?	28).....

Item	Specific Questions	Answers
III. Most Recent Sale	29.If store is rented, how much storage charge per bag did you pay?	|29)..... Sh./bag
	Describe your most recent sale:	
	30.Did you sell any of the above?	30)Yes... No...
	31.How many bags did you sell?	31).....
	32.To whom did you sell?	32) <u>Type of buyer</u> <u>Base</u>
	33.At what price did you sell per bag?	|33).....Sh./bag
	34.Can you estimate your net margin per unit?	34).....Sh./bag
	35.Did you know what maize/sesame was selling for at other towns?	35)Yes... No...
	36.If yes, how do you get such information?	36).....
	37.Could you have waited for a while and then sold the crop later at a better price?	37)Yes... No...
IV. General	38.If no, why couldn't you do that?	38).....
	39.Did you ever sell maize/sesame in processed form?	39)Yes... No...
	40.Over what period of the year do you buy and sell maize/sesame?	40)After Gu harvest.... After Der harvest.... All year.....
	41.If trade all year, how much maize/sesame did you handle during the past 12 months?	41)..... bags/year
	42.Is maize/sesame availability this year higher or lower than last year?	|42)Higher..... Lower..... Same Don't know...
	a.If different, why?	a).....
	43.Do you trade in other commodities when maize/sesame is in short supply, such as during pre-harvest?	|43)Yes... No...
	a.If yes, what other commodities?	a).....

Item	Specific Questions	Answers
	44. Do you supply farm inputs such as seeds, fertilizer, and/or insecticide to farmers?	44) Yes... No...
	<u>If No,</u> a. Why not provide inputs?	a)
	b. Under what conditions do you think you could become involved in input distribution?	b)
	45. Do you recall during the 1985 Gu harvest period when a large amount of food aid maize flooded the market?	45) Yes... No...
	<u>If Yes,</u> a. What was the price of local maize shortly before and after the arrival of food aid maize into the market?	a) <u>Before</u> <u>After</u> Sh/bag
	b. Did you handle yourself any food aid maize at that period?	b) Yes.... No...
	c. If yes, was your profit higher or lower in 1985 relative to 1986 due to the food aid maize at that time?	c) Higher..... Lower..... Same..... Can't remember...
	d. On the other hand, how did the food aid maize affected the prices received by farmers during 1985?	d) Positively..... Negatively..... No effect..... Don't know.....
	46. Do you buy maize from ADC?	46) Yes, frequently.... Yes, seldom..... No.....
	a. Do you sell maize to ADC?	a) Yes, frequently.... Yes, seldom No
	<u>If Yes,</u> b. If buy, when do you buy from ADC?	b)
	c. If sell, when do you sell to ADC?	c)

Item	Specific Questions	Answers
	d.Does ADC's competition with traders like you depress or increase farm price of maize?	d)Depress..... Increase..... No effect.... Don't know...
	e.If ADC's buying increases prices, is that something positive? <u>If Yes,</u> To the benefit of who?	e)Yes... No...
	47.What is the maximum time you keep maize/sesame in storage?	47).....
	48.Do you invest some of your earnings in improving your business (e.g. scales, storage facility, etc)?	48)Yes... No...
	49.Which is of better quality; farmers bakaar maize and ADC stored maize from the same year?	49)Bakaar maize.... ADC maize No difference...
	50.Are transport trucks for rent available when you need them most?	50)Yes... No...
	a.Do truck rates per sack vary considerably between seasons?	a)Yes... No...
	51.Do you have customary buyers you sell to? <u>If Yes,</u> a.Who are they?	51)Yes... No... a).....
	52.Do you agree that the government's liberalization policies have increased the output and market availability of maize/sesame? a.As a trader, did you personally benefit from the market liberalization	52)Yes... No... a)Yes... No...
	53.What major problems constrain the marketing of maize/sesame still remain that the government could help in solving them?	53).....
	54.What do suggest for solving these problems?	54).....

STORE-OWNER

Item	Specific Questions	Answers
V. Store-owner	55.Can you tell us the quantities of different commodities you know have in store:	<u>Commodity</u> <u>Quant.</u> <u>Kg.</u> 55)Gu 87 maize..... Bakaar maize..... Yellow maize..... White sorghum..... Red sorghum..... Sesame seed..... Rice Flour White oil..... <u>Other</u>
	56.Is your current stocks of maize/ sesame higher or lower than those of the same period last year?	56)Higher..... Lower..... Same..... Don't know...
	<u>If different,</u> a.What are the reasons for the difference?	a).....
	57.For how long can you keep maize/ sesame in store without significant quality reduction?	57).....
	58.Do you treat the store against pests?	58)Yes... No...
	59.Can you estimate storage losses of maize/sesame?	59)Maize.....% Sesame.....%
	60.What is the major problems that you face as a store-owner?	60).....

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