ECONOMIC ANALYSIS OF MEDIUM SCALE AGRICULTURAL ENTERPRISES IN A PREDOMINANTLY SMALLHOLDER AGRICULTURE SECTOR

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTERS OF SCIENCE IN AGRICULTURAL ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE, MOROGORO

2001

ABSTRACT

Sub Saharan African countries are faced with lagging food production and pervasive poverty. Most of these countries, including Tanzania, depend heavily on agriculture for their economic development and meet their food requirements from domestic production, imports and food aid. Increasing agriculture production is thus a high-priority topic in Sub Saharan Africa, including Tanzania. This study is motivated by the failure of the efforts, by the Tanzanian government and international and non-governmental organisations, to support smallholder farmers to achieve the expected targets and hence the need to seek for a more responsive alternative target for support that will lead to the achievement of the desired improved production in the Tanzanian agriculture sector. The study tests the hypothesis that there is an unexploited potential for modernizing the Tanzanian agriculture sector through promotion of medium scale farming. To test this hypothesis the study investigates the profitability of medium scale agricultural enterprises in Tanzania using 233 dairy and sugarcane farms located in Morogoro as a case study. In this study profitability was measured by Economic Farm Surplus (EFS) and Gross Margin Analysis (GMA) for the dairy and sugarcane/paddy farms respectively. Literature on previous studies in this area focused on small-scale enterprises and has highlighted the importance of the size of the agricultural enterprise on productivity of agro-based enterprises. Thus the present study aimed at observing the trend of profitability of agro-based enterprises with increasing farm size. In order to capture the effect of the changing farm size on profitability, the selected dairy and sugarcane/paddy enterprises were grouped into seven and nine categories for dairy and sugarcane respectively. Prior to the estimation of multiple regression models for the two types of enterprises *i.e.* dairy and sugarcane, a simple comparison of mean EFS

and GM analyses for the different size categories was conducted deploying the analysis of variance (ANOVA) technique. The ANOVA indicated the existence of significant differences in the levels of the EFS and GM for the different farm size categories. Three multiple regression models were estimated to establish the relationship between size and profitability. The results revealed that the productivity of an enterprise was positively influenced by the size, access to credit facilities, access to extension services and farmer's level of education. The results from this study suggest that Tanzanian medium scale agro-based enterprises have a very high potential for growth if supplied with a favourable environment. In order to stimulate the growth of medium scale enterprises in the country drastic policy changes that will make sure that the needs of medium scale farmers take a central part in the agriculture policy are required.

DECLARATION

I, **DAMAS PHILIP**, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is the result of my own original work and has neither been submitted nor being concurrently submitted for a degree award in any other university.

Signature .....D. Philip.....

Date .....15/11/2021.....

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ACKNOWLEDGEMENTS

This study would not have been accomplished without the help and encouragement of many people. Acknowledgements are extended to the following individuals and organisations:

My supervisor, Dr. A. E. Temu for his guidance, constructive advice and his overall encouragement and assistance at different times during the course of the study.

The author is thankful to the staff and colleagues in the Department of Agricultural Economics and Agribusiness for their constant encouragement throughout this graduate study. Furthermore, the author would like to extend his appreciation to Mr. E. Fabian of MOA, Mr. S. Mori of the outgrowers unit of the Mtibwa sugar estates; Drs P.J. Lema and B. Bahati of K.V. veterinary clinic for their assistance in the course of data collection.

The SUA-VLIR project is acknowledged for its generous financial support, which enabled the author to accomplish the study. I thank my employer, the Tanzanian Commission for Science and Technology for granting me a study leave.

Lastly, but not least, the author would like to extend his deep appreciation to the medium scale dairy, sugarcane and paddy farmers for their cooperation during the entire period of data collection. There is no doubt that without their cooperation this study would not have been as successful as it has happened to be.

It is obvious that a study of this nature cannot be successfully completed without the assistance of many individuals. Thus the above-mentioned individuals and institutions

constitute only a part of those who helped the author in undertaking the study. The author would therefore like to extend his appreciation to all individuals and institutions that have not been mentioned for their assistance in the course of this study. GOD bless you all.

DEDICATION

This dissertation is dedicated to my beloved parents Philip Cyprian and Anisia Fabian who lit the torch of my academic career.

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LIST OF ABBREVIATIONS AND SYMBOLS

AI	Artificial Insemination
ANOVA	Analysis of Variance
BUA	Balanced Utilisation Approach
ECF	East Coast Fever
EFS	Economic Farm Surplus
ERP	Economic Recovery Program
FAO	Food and Agriculture Organisation of the United Nations
FPA	Focal Point Approach
GDP	Gross Domestic Product
GM	Gross Margin
GMA	Gross Margin Analysis
GSS	Ghana Statistical Service
HPI	Heifer Project International
IFAD	International Fund for Agriculture Development
IRR	Internal Rate of Return
LIC	Low Income Countries
MOA	Mtibwa Out growers Association
MSE	Mtibwa Sugar Estates
NAEP	National Agriculture Extension Project
NALERP	National Agricultural and Livestock Extension Rehabilitation Project
NBC	National Bank of Commerce

NGO	Non Governmental Organisation(s)
SDC	Swiss Agency for Development and Co-operation
SHDDP	Southern Highlands Dairy Development Project
SG 2000	Sasakawa Global 2000
SMF	Small and Medium Sized Agricultural enterprises
SME	Small and Medium Enterprises
SHERFP	Southern Highlands Extension and Rural Financing Project
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TANSEED	Tanzania Seed Company Ltd.
TARP II	Tanzania Agriculture Research Project-II
TASGA	Tanzania Sugarcane Growers Association
TCCIA	Tanzania Chamber of Commerce Industries and Agriculture
Tshs	Tanzania Shilling
UNIDO	United Nations Industries Development Organisation
URT	United Republic of Tanzania
US$	United States of America Dollar
%	Percentage
°C	Degree Celsius

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Agriculture is the foundation of the Tanzanian economy. It accounts for about half of the national income, three quarters of merchandise exports and is a source of food and provides employment opportunities to about 80% of Tanzanians (URT, 1999). It has linkages with the non-farm sector through forward linkages to agro-processing, consumption and export; provides raw materials to industries and a market for manufactured goods.

Agriculture in Tanzania is dominated by smallholder farmers (peasants) cultivating an average farm size of between 0.9 and 3.0 hectares each. About 70% of Tanzania's crop area is cultivated by hand hoe, 20% by ox plough and 10% by tractor. It is mostly rain fed agriculture. Food crop production dominates the agriculture economy, where of the 5.1 million hectares cultivated annually, 85% is under food crops (URT, 2000).

Thus small sized agricultural enterprises have for a long time been considered to be one of the principal driving forces in Tanzania's economic development. Ideally they are expected to stimulate private ownership and entrepreneurial skills taking advantage of their flexibility in adapting quickly to changing market demand and supply situations; to generate employment, and help diversify economic activity and make a significant contribution to exports and trade. Although experience in other parts of the world has shown the effectiveness of this sector in channelling

entrepreneurial creativity, implementing new technologies, and often, in providing the most dynamic source of employment opportunities (Szabo, 1996; Rivas, 1998), medium scale agricultural based enterprises in Sub-Saharan African countries (SSA), including Tanzania, have been very ineffective due to lack of adequate access to inputs and markets, and a fertile environment to contribute to their growth.

Having noted the importance and problems affecting Tanzania small-scale farmers, the government of the United Republic of Tanzania (URT) initiated massive investment in the agricultural sector in the form of input subsidies and agricultural development projects (URT, 1989). These efforts were mainly aimed at supporting smallholder peasant farmers. The projects were aimed at providing various agriculture support services such as credit, input supply, extension and research services.

The decision to initiate these programmes was based on the fact that, like other developing countries in Sub-Saharan Africa (SSA), Tanzania's agricultural enterprises are at a disadvantage in comparison to their counterparts in other third word countries in terms of access to financial and other support services such as agriculture input supply and agricultural research and extension services. This is due to the poor state of the development of financial institutions, input supply, extension and research services in these countries.

Whereas developing economies in Latin America and Asia show bank density ratios of 8 to 30 thousand inhabitants per bank branch, SSA countries have a much wider ratio of up to 300 thousand inhabitants per bank branch (Cuevas, 1990). In Tanzania, the contraction of financial institutions and banks, under the aegis of financial

liberalisation and bank restructuring, means that more and more people can no longer get access to formal financial services and have instead to rely on informal and semi formal financial arrangements to access production and consumption credit and to store their savings (Kashuliza, 1986). The limitation is accentuated in rural areas by the urban bias of existing bank networks, and the usually poor conditions of communication and rural infrastructure (Ebenezer, 1995). The medium scale agricultural enterprises have been more affected by the inadequacy of financial services due to their systematic exclusion from the financial services support programmes, which targeted small-scale peasant farmers.

Just like in the case of financial services, the provision of extension, research and input supply services has for a long time focused small-scale farmers. There have been several programmes that were aimed at providing both technical information and various inputs to smallholder farmers. One of the most famous extension projects where smallholder farmers were provided with various agricultural inputs apart from the technical knowledge was Sasakawa Global 2000 (SG 2000). The evolution of extension services in Tanzania has a long history. During the 1960s to 1970s, the Government adopted several approaches of extension in delivering agricultural messages to the farming communities. These included targeting settlement schemes and progressive farmers; establishment of farmers training centres and setting up of demonstration plots. However, these methodologies and approaches failed to convert the extension services into an instrument of agricultural growth in the country (URT, 1997). The targeting of smallholder farmers for most of the agricultural support projects left medium scale farmers in a much worse situation than the smallholders in

terms of access and appropriateness of the services provided. This is because most of the services provided, including the technologies developed by the research system, were designed for the needs of small scale subsistence farmers whose priority requirements, especially the technical information needs are likely to be different from those of medium scale farmers who produce for the market.

In spite of the massive investment by the government and NGOs, the agricultural sector remains highly dominated by smallholder peasant farmers, who are dependent on nature, are barely exposed to modern technology and lack storage and preservation facilities (Mushi, 1993). About 50% of the Tanzanians have incomes under the poverty line of which 83% live in households where the main occupation is farming. By the year 2000, 13 regions had not been able to meet their food needs from rain fed production at existing low level of inputs and by 2025, 17 of the total of 20 regions will belong to this deficit category (URT, 2000). Agricultural GDP has grown at 3.3% per year since 1985, the main food crops at 3.5% and export crops at 5.4% per year. Considering that the overall GDP growth target for halving abject poverty by 2010 is in the range of 6-7%, this performance falls short of the needed growth (URT, 2000). This is a clear sign of the difficulty of achieving a turnaround in the countries' economy by solely and exceedingly directing massive support to only smallholder peasant farmers. Thus the argument behind this study is that, however weak the agricultural support services were they could have had a larger impact in agriculture if they targeted relatively larger farmers.

Having noted the problems of relying only on the smallholder farmers as a tool to

achieve a substantial turnaround in agriculture and hence Tanzania's economic growth, it is in order to look for other options to achieve the objective and rethink the major focus directed to smallholder agriculture. Therefore, this study is intended to examine the performance of medium scale farmers in order to see whether they provide a suitable alternative to smallholder peasant farmers as a target for assistance aimed at achieving the badly required improvement of the Tanzanian agriculture sector.

1.2 Small versus medium and large scale enterprises

Since this study is aimed at medium scale enterprises, in order to understand the focus of this study, a clear elaboration of what is meant by medium-scale farmers is important. This section reviews literature concerning the various criteria adopted by other researchers in classifying agricultural enterprises.

There is no single, uniformly acceptable, definition of a small agricultural enterprise (Storey, 1994). Agricultural enterprises differ in their levels of capitalisation, sales and employment. Hence, definitions which employ measures of size (number of employees, turnover, profitability and net worth) when applied to one sector could lead to all agricultural enterprises being classified as small, while the same size definition when applied to a different sector could lead to a different result. In defining the size of an enterprise, reference is usually made to quantitative and qualitative elements. The criteria differ from country to country, and there is no a universally accepted standard definition (Szabo, 1996). For example, in the European union, the definition basing on the number of employees is as follows: 1-9 employees (micro), 10-99 employees (small), and 100-499 (medium) (UNIDO, 1993). The definition

when considering specific enterprises like livestock also varies from country to country depending on the level of development of the country in question. Schwarzweller (1994) categorized livestock farms in terms of the number of milking cows as follows: <10 (small); 10 to 80 (medium); >= 80 (large). It is more difficult to define and categorize agricultural enterprises on the basis of the number of employees. In this respect the more appropriate way appeals to be the use of the size of land under cultivation.

The first attempt to overcome this definition problem was made by the Bolton Committee (1971) when they formulated an "economic" and a "statistical" definition. Under the economic definition, an agricultural enterprise is regarded as small if it meets the following three criteria: it has a relatively small share of the market place; managed by owners or part owners in a personalised way, and not through the medium of a formalised management structure and is independent, in the sense of not forming part of a large enterprise.

The Committee also devised a "statistical" definition to be used in the areas of quantifying the size of the small agricultural enterprise sector and its contribution to GDP, employment and exports; comparing the extent to which the small agricultural enterprise sector's economic contribution has changed over time and applying the statistical definition in a cross country comparison of the small agricultural enterprises' economic contribution.

Thus, the Bolton Committee employed different definitions of the small agricultural enterprise to different sectors. Table 1.1 indicates the various sectoral definitions:

Table 1.1: The Bolton Committee Definitions of a small agricultural enterprise

Sector	Definition
Manufacturing	200 employees or less
Construction	25 employees or less
Mining & Quarrying	25 employees or less
Retailing	Turnover of 50 000 pounds or less
Miscellaneous	Turnover of 50 000
Services	Turnover of 50 000
Motor Trades	Turnover of 100,000 pounds or less
Wholesale Trades	Turnover of 200 000 pounds or less
Road Transport	Five Vehicles or less
Catering	All excluding multiples and Brewery – managed houses

Source: The Bolton Committee (1971)

1.2.1 Criticism of the Bolton committee's definition

A number of weaknesses can be identified with the Bolton Committee's "economic" and 'statistical' definitions. First, the economic definition, which states that a small business is managed by its owners or part owners in a personalised way, and not through the medium of a formal management structure, is incompatible with its statistical definition of small manufacturing agricultural enterprises, which could have up to 200 employees. As agricultural enterprise size increases, owners no longer make principal decisions but devolve responsibility to a team of managers.

Another shortcoming of the Bolton Committee's economic definition is that it considers small agricultural enterprises to be operating in a perfectly competitive market. However, the idea of perfect competition may not apply here; many small agricultural enterprises occupy 'niches' and provide a highly specialised service or

product in a geographically isolated area and do not perceive any clear competition (Wynarczyk *et al.*, 1993; Storey, 1994; Mead, 1998).

1.2.2 Other definitions

Small-scale enterprises have been variously defined, but the most commonly used criterion is the number of employees of the enterprise. In applying this definition, confusion often arises in respect of the arbitrariness and cut off points used by the various official sources. For example, while The Ghana Statistical Service (GSS) considers agricultural enterprises with less than 10 employees as small-scale enterprises and their counterparts with more than 10 employees as medium and large-sized enterprises, Steel and Webster (1990), Osei *et al.*, (1993) in defining small-scale enterprises in Ghana used an employment cut off point of 30 people to indicate small-scale enterprises.

In Tanzania the most commonly used criteria for classifying agricultural enterprises are area under production and the number of animals for crop and livestock enterprises respectively. Using those criteria, the term small-scale farmer refers to farmers whose farm sizes do not exceed 3 hectares and large farms are those with more than 20 hectares of farming land or 50 or more animals for livestock enterprises (URT, 1994).

From the various definitions above, it can be concluded that there is no unique definition for a small and medium scale enterprise, thus an operational definition is required. In this study the term small-scale farmers refers to farmers cultivating below 2.5 ha and medium scale farmers refers to farmers with cultivated areas between 2.5

and 50 ha, whereas large-scale farms are those exceeding 50 hectares. In the livestock enterprises the categories given in the national agricultural statistics (URT, 1994) *i.e.* <5 (small); 6 to 50 (medium); >= 50 milking cows (large) were adopted.

1.3 Problem statement

The agriculture sector in Tanzanian, which has been dominated by smallholder peasant farmers for a very long time, accounts for about half of the national income, three quarters of merchandise exports and is a source of food and provides employment opportunities to about 80% of Tanzanians (URT, 1999).

Thus the economic development of Tanzania has for a long time relied heavily on the ability of small-scale agricultural enterprises to grow, and of recent, to overcome the challenge of globalisation. However, small-scale farmers in Tanzania often lack access to markets, and are constrained by the unavailability of support services such as extension, research and the timely supply of appropriate inputs. In response to these constraints the government of the United Republic of Tanzania in collaboration with multilateral organizations and NGOs initiated several programmes aimed at helping to get rid of the constraints that affect small scale peasant farmers and in implementing programs to foster their growth.

The large proportion of peasant farmers coupled with the importance of the agriculture sector has attracted support from both the government and non-governmental organizations. The support to smallholder farmers started during the colonial era where the colonial government initiated programmes such as the Balanced Utilisation Approach (BUA) and the Focal Point Approach (FPA), which

aimed at the prevention of famine and maintenance of soil fertility. The efforts to support peasant farmers continued after the independence in 1961 with programmes / approaches such as the Transformation and the Improvement Approaches, the National Agricultural and Livestock Extension Rehabilitation Project (NALERP), National Agriculture Extension Project (NAEP), Sasakawa Global 2000 (SG 2000), and Southern Highlands Extension and Rural Financing Project (SHERFP), other projects/programs aimed at supporting the small scale peasant farmers include the Southern Highlands Dairy Development Project (SHDDP), Swiss Agency for Development and Co-operation (SDC), Heifer Project International (HPI) and several projects under the Food and Agriculture Organisation (FAO) and the International Fund for Agriculture Development (IFAD). These programmes and/or projects sought to improve traditional peasant agriculture through extension services and credit programmes and were implemented in several regions (Sicilima, 1996). This purposeful, and systematic exclusion of medium-scale farmers from the programmes left them without a reliable, affordable source of credit and other support services. These programmes and/or projects used millions of dollars to support the smallholder farmers without achieving the anticipated increase in their productivity. For example the TARP II project alone, that was formulated as part of an overall governmental effort to revamp the agricultural sector within the framework of the economic recovery program (ERP), used US$ 24.33 million (URT, 1997). This study is thus based on the argument that such big sums of money would have had a bigger impact on the performance of the Tanzanian agriculture sector if the support was aimed at medium scale farmers who are more business oriented than the smallholders.

Due to the targeting of small-scale farmers, medium scale farmers were forced to search for the agriculture support services, such as inputs, via small-scale farmers who were eligible for the support offered by the government or donor funded projects. Thus the recent input markets liberalization and the removal of subsidies on agricultural inputs are likely to affect more negatively the small farmers. This is because medium scale farmers enjoyed least subsidies in the past and hence are likely to need smaller adjustments to adapt. Further to this, due to the large numbers of current and potential producers, the medium scale farmers have the greatest potential and thus provide the best basis for increasing national livestock and crop production. In general however, the unfavourable policy environment in which they have been operating for more than three decades has had profound deterring effects on this category of farmers. This study seeks to find out ways by which policy can be reoriented in their favour for the benefit of the Tanzanian agriculture sector.

Despite all the efforts by the government and non-governmental organizations to support peasant farmers still about 50% of the population have incomes under the poverty line and 83% of the Tanzanians who have their incomes below the poverty line live in households where the main occupation is farming (URT, 2000). According to the statistics of the Tanzanian ministry of agriculture (2000) by the year 2000, thirteen regions had not been able to meet their food requirements and it has been forecasted that, if the trend in the agriculture sector performance continues uninterrupted, by the year 2025, seventeen of the total of 20 regions will belong to this deficit category. It has been noted from the same statistics that since 1985 the agricultural GDP has grown at 3.3% per year, the main food crops at 3.5% and

export crops at 5.4% per year. Considering that the overall GDP growth target for halving abject poverty by 2010 is in the range of 6-7%, this performance falls short of the needed growth (URT, 2000). These are clear signs of the difficulty of achieving a turnaround in the country's economy through absolute dependence on smallholder peasant farmers. Thus it is in order to look for augmenting alternatives to achieve the objective. Therefore, this study seeks to examine the potential of medium scale farmers in the improvement of the Tanzanian agriculture sector basing on the assumption that the relatively wider capital bases on the side of medium scale farmers will make them more responsive to the support that is going to be provided than small scale farmers.

Furthermore, despite the importance of medium scale crop growing and dairying in both the macro and micro economies, past and current field research studies and intervention programmes have portrayed biases by favouring smallholder over medium scale agriculture. There also appears to be very little literature on the economic outlook of medium scale farming in Tanzania and the entire Sub-Saharan African region. Thus the present study was intended to fill this information gap.

1.4 Objectives of the study

1.4.1 General objective

The general objective of the study was to evaluate the performance of medium scale agricultural enterprises and identify constraints impairing their performance so as to assess the role medium scale farmers can play in agriculture and hence economic development of Tanzania.

1.4.2 Specific objectives

Implied in the overall objective were the following specific objectives:

1. To examine the profitability of medium scale agricultural enterprises.
2. To examine the influence of the size on the profitability of medium scale agricultural enterprises.
3. To examine the influence of agricultural support services on the profitability of medium scale agricultural enterprises.
4. To examine the influence of the education levels of the owners on the performance of agricultural enterprises.
5. To identify the constraints encountered by medium scale farmers in their day-to-day activities.

1.5 Hypotheses

The study was governed by the following hypotheses:

1.5.1 Overall hypothesis

There is an unexploited potential for modernizing the Tanzanian agriculture sector through promotion of medium scale farming.

1.5.2 Specific hypotheses

1. Medium scale agricultural enterprises are profitable.
2. The size of an enterprise has a significant influence on its profitability.
3. Agricultural support services influence significantly the profitability of medium scale farms.
4. The education levels of the owners have a significant influence on the profitability of their enterprises.
5. Social and policy factors influence the performance of medium scale farms.

1.6 Description of the study area

1.6.1 Location

The study was conducted in Morogoro urban and rural districts. The main focus in the Morogoro urban district was dairy farming whereas in the Morogoro rural district it was sugarcane and paddy growing. Given the size and diversity of the Morogoro rural district only one division was selected, *i.e.* Turiani division. On the other hand all relevant dairy enterprises in the Morogoro urban district were included in the study.

Turiani is one of the ten divisions that make Morogoro Rural district. The division is located about 130 kilometres north of Morogoro town, along the Kilosa – Handeni road. Morogoro rural district lies between longitudes $37^0$10' and 38^0 31' east of the Greenwich and between latitudes 5^0 5' and $7^0$4' south of the equator. The Turiani division is found at longitudes $37^0$36' east and latitudes 6^0 00' south. The division is divided into five administrative wards namely Diongoya, Kanga, Mhonda, Mtibwa and Sungaji. The division has a total area of 2,454 square kilometres.

1.6.2 Climate and topography

Turiani is found at medium altitude. It lies between 380 meters and 520 meters above sea level. The division experiences bimodal type of rainfall. Short rains fall between October and December and long rains come between March and June, with peaks in December and April respectively. The annual rainfall averages at 1270 mm. The temperature ranges between 22^0C in July and 27^0C in December. The average temperature is 24.5^0C. Nguu Mountains borders the division to the West and North. The remaining part of the division is a flatland.

1.6.3 Soils and vegetation

Loamy-sands are the most common soils in Turiani division. These soils are moderately drained and good for agriculture. Imperfectly drained black soils dominate the flatland qualifying the area to be an important paddy producer. Woodland and heavy forests on the mountain and scattered bushes on lowlands cover the division.

1.6.4 Demography

The total human population in the division is estimated at 54 816 people distributed into 10 874 households. Average size of household is 5-6 people (URT, 1988). Population growth rate is estimated at 2.6% and the population density is 23 people per square kilometre.

Table 1.2: Turiani division's population size by wards and sex.

Wards	Males	Females	Households	Average HH size	Total
Mtibwa	7703	5909	3003	4.5	13612
Kanga	4265	3926	1567	5.2	8191
Mhonda	4894	5874	2120	5.5	11768
Diongoya	5125	5269	2135	4.5	10394
Sungaji	5474	5377	2049	5.2	10851
Total	27461	26355	10874	5.04	54816

Source URT, (1988) Population census.

1.6.5 Economic activities

Agriculture is the major economic activity in Turiani. Although most of the farms are of small scale, there exist few medium-scale farms. Most of the medium-scale farmers in the division are growing sugarcane, which is used as a row material for sugar production by the Mtibwa sugar factory; the remaining medium scale farmers are growing paddy. The majority of smallholder farmers are engaged in subsistence

agriculture, though some surpluses are marketed to meet family financial needs. The majority of smallholder farmers own farms with sizes ranging between 0.25 to 2 hectares while medium-scale farms range from 10 to 150 hectares.

Major crops grown include sugarcane, paddy, maize, cassava, beans and vegetables. Yams, coffee and cocoa are also grown in small scale in highland areas. Livestock keeping is the next important economic activity. Livestock species kept are cattle, goats, pigs and poultry.

1.6.6 Justification for selection of the Turiani division

The choice of the division is based on the fact that it has several medium scale farms, which constitutes the main focus for this study. The large number of medium scale farms in this division, which is not common in most parts of Tanzania, is attributed to the existence of adequate market and relatively better, accessible support services for the medium scale sugarcane farmers.

1.7 Mtibwa Outgrowers Association (MOA)

Most of the interviewed sugarcane farmers are members of a non - governmental organisation known as Mtibwa Out growers Association (MOA). The organisation (MOA) was established in 1996 in order to have a strong representative organ that can safeguard and advocate effectively for the interest of the sugarcane farmers. Membership to the association is open to all commercial cane producers residing in the Turiani division.

The main objective of the organisation is to safeguard and advocate effectively for the interest of sugarcane farmers. Implied in the main objective are the following specific objectives: to be a spokesman and representative of its members in cane development, harvesting and pricing matters; to seek expert advice on crop husbandry and disseminate the right technical information to its members in order to promote sugarcane production; to formulate sugarcane development plans and mobilize its members in implementing them and to seek for investment funds and extend the same, as credit to its members for cane production.

1.8 Organisation of study

This study is organised into five chapters. The first chapter gives a general background to the study where among other things; it presents the problem statement, study objectives, hypotheses and a detailed description of the study area. The second chapter gives a critical review of literature relevant to the study while the third chapter gives a detailed description of the methodology employed for this study. The fourth chapter presents results and discussion while the last chapter provides the concluding remarks and recommendations of the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature concerning the importance of medium scale enterprises in the economic development of the least developed countries. Furthermore, the section reviews the factors that influence the performance of medium scale enterprises.

2.2 Medium scale farming in Tanzania

2.2.1 Crop production issues

Tanzania is predominantly an agricultural country with crop and livestock sub sectors playing an important role in the socio-economic development of its people. In the country's economic development policies, agriculture has been given a top priority.

The agricultural sector in Tanzania is predominantly based on small-scale peasant agriculture. It is estimated that smallholders' production under labour intensive farms with low production technology account for more than 75% of the total agricultural production in the country (Mushi, 1993). Tanzania's 3.5-million farm families work on smallholdings with area cultivated averaging 0.9 hectares with some 93% of all farmers cultivating less than 2.0 hectares (URT, 1999).

Smallholder peasant farmers on privately owned plots carry out about 85% of agricultural production. They account for about 90% of the marketed agricultural output that depend mainly on rain fed agriculture. Thus to a large extent weather is responsible for influencing the agricultural supply responses (Bagachwa and Maliyamkono, 1990). The irony remains that such large employment is deployed in an

inefficient way, failing agriculture to act as an engine for growth. Misleadingly, the above data instead of it being observed as a problem, often it is used as ground to justify interventions to augment peasant agriculture. The focus ought to be how to go out of the vicious cycle.

Only a few crops such as sisal, tea, and sugarcane are grown on large-scale commercial farms. According to World Bank (2000) agriculture supports about 90% of the population living in rural areas. As the Tanzania's urban population is increasing at the rate of 8% per annum, the agricultural sector is expected to increase marketed output of food crops in order to support the growing urban population (URT, 1999). The sector is also expected to produce raw materials for domestic agro-industries. If the incomes of smallholder farmers are increased, they can generate a substantial market for goods and services produced by other industries in the economy. Unfortunately however, more than three decades of supporting smallholder farmers has failed to achieve a reasonable increase in their productivity and incomes and hence limiting the expansion of the local market.

Furthermore, agriculture contributes to industrial production as modern industries in the country are heavily dependent on imported material inputs and spare parts payable in foreign currency largely generated by this sector (Maghimbi, 1992). Hence, agriculture should have a high priority in Tanzania's development plans and programmes. The difficulty is that Tanzania has spent 3 decades aiming at developing smallholder agriculture, all in vein. Transformation approach, Villagisation, Human Deployment Act, National Agriculture Extension Project (NAEP), National

Agriculture and Livestock Extension Rehabilitation Project (NARLEP) are all large and expensive strategies of the past that have not yield fruits. There are several studies that have been conducted to seek for the reason behind these failures, among these studies is the review conducted by the World bank (1994). Most of them targeted the supply side, *i.e.* design problems. Unlike the previous studies, this study seeks to examine the supply side so as to find out whether the characteristics of the targets of these projects, the small-scale farmers, are also to blame for their failures. Thus the findings of this study are expected to answer the question that what would be the results if similar efforts were directed to medium-scale farmers?

2.2.2 Livestock production

Tanzania is endowed with 60 million hectares of rangelands ideal for livestock grazing. However, of the total rangelands, 60% is tsetse infested, leaving a balance of only 40% available for livestock keeping. The carrying capacity of the rangelands is estimated at 20 million animal units but currently there are only 16 million animal units (URT, 1999). There is therefore, ample potential for expansion of the livestock industry. According to Luziga (1993), most of smallholder dairy farmers own 1-10 cows. About 70% of dairy animals in Tanzania are owned by smallholders which comprises of about 0.2 million heads. About 65% of dairy animals under smallholder farming are found in Kilimanjaro and Arusha regions along the slopes of Mts. Kilimanjaro and Meru. The rest (35%) are found in other places (URT, 1999).

The livestock sector can be categorized into two major production systems; *i.e.* extensive and intensive livestock production systems. Pastoralism is mainly practiced by nomadic and semi nomadic populations and is viewed as 'inefficient'. The

"inefficiency label" is based on the perceived weakness, *i.e.* poor animal husbandry, lack of modernisation, irrational behaviour to accumulate large stocks beyond the land carrying capacity, and lack of market orientation (URT, 1999).

As the majority of livestock products come from the traditional sub sector, small improvements in productivity per livestock unit on the side of the traditional livestock sub-sector has for a long time been viewed as a proper way of increasing production of livestock produce in Tanzania (URT, 1999). The long-term objective therefore, has been to bring about a change in traditional producers attitudes and practices thereby increasing productivity to the level where it evolves into the modern sub-sector. Unfortunately these objectives have not been achieved and it seems plausible to seek for an alternative target for assistance aimed at improving the productivity of the Tanzanian livestock sector. This study seeks to see whether medium scale dairy enterprises provide a better alternative to small-scale dairy enterprises.

2.2.2.1 Dairy industry issues

Milk production has not kept pace with population growth and the consequence is that, although total production has increased from roughly 300 million in 1970/71 to 600 million litres in 1994/95, per capita consumption has slightly declined from 22 to 20 litres over the same period. Tanzania's per capita milk consumption is below those of Africa (35 litres); Kenya (44 litres) and the world (105 litres) (URT, 1999).

Nearly 70% of the milk is produced by minimally supported traditional small producers in the rural areas where the bulk of the commodity is being consumed in the rural areas with small surpluses filtering into growing urban centres. Dairy farms

contribute only 30% to the total milk production, of which 140 million litres are produced by smallholder dairy farms while large-scale dairy farms deliver 30 million litres annually. Total cattle population under these two commercial systems is estimated at 212,299 of up-graded dairy cows. In the mean time the country has dairy products imports, which are estimated to be equivalent to 15 million litres annually (URT, 1999).

The dairy industry has the potential of creating employment at both rural and urban areas and of providing food and cash income to households involved in keeping dairy cattle throughout the year. However, for the dairy industry to realize its full potential, the following constraints will have to be removed or minimised; low production and productivity, non-availability of rural credit and extension services for smallholder dairy farmers, poor organisation of milk marketing, lack of milk collection and cooling facilities and poor feeder roads for milk transportation. It is unlikely that targeting smallholders can solve all these problems. Thus the question at hand is what is the role and potential of medium-scale farms in modernising the Tanzanian livestock sector?

2.2.2.2 Importance of livestock in the economy

The livestock sub-sector is an integral part of Tanzania's economy. According to 1994/95 agriculture census results, the sub-sector contributes about 18% of the national GDP, of which beef, dairy and other livestock provide 40%, 30% and 30% respectively. The sub-sector as a whole contributes about 30% to the agricultural GDP. However, there are other benefits obtained from the livestock sub-sector. It provides food, which is consumed in the form of meat, (246,000t); milk, (600m litres); milk products and eggs (320,000t) annually. Furthermore, 40% of the

3,871,277 agricultural households in Tanzania are involved in crop and livestock production whereas 0.4% are keeping livestock only. The animals are a source of manure, hides and skins. Livestock are a potential source of draught power (800,000 animals) for cultivation and transport (URT, 1999).

2.3 Agriculture support services and their implications for profitability

2.3.1 Policies and strategies

Although the number and nature of guidelines that constitute policy is vast and complex, the ultimate goal is the improvement of the well being of the people whose principal occupation and way of life is based on agriculture. In the medium term and long-term horizon, agriculture will continue to play a central role in Tanzania's economy. The Government ability to stimulate the growth of the agriculture sector has not been taken for granted. Thus several policies aimed at improving the agricultural sector and hence the living standards of Tanzanians have been implemented in the course of economic recovery programs. These policies have targeted, among other things, the improvement of the provision of agriculture support services.

To address the problems of the inefficiency of the extension delivery system since 1989 the government has taken major initiatives to rehabilitate and strengthen the extension services under the National Agriculture and Livestock Extension Rehabilitation Project (NALERP). Under NALERP the extension system continued to be integrated into a single delivery system using a methodology of training and visit system and by merging crop and livestock extension services. To improve the

agriculture extension services the government pledged to strengthen field extension services to enhance its effectiveness in direction and management and improve linkages and put in place an effective monitoring and evaluation system; promote the use of cost effective field-tested approaches and methods for extension programme delivery; liberalise the provision of extension services and lastly the government promised to use the extension service to support farm families especially women and youth groups in identifying viable income generating activities. The commitment of the government to support women and youth, who constitute a large portion of small-scale farmers essentially left medium scale farmers out of the extension programs.

The Tanzanian Ministry of Agriculture in its policy document of 1997 admitted that lack of clear research priorities and fragmentation of research had adversely affected the efficient use of both government and donor funds. Thus to improve the performance of the Tanzanian agriculture research system the government, through the Ministry of Agriculture re-organized it. The outcome of this exercise was the formulation of the National Agricultural and Livestock Research Master Plan (NALRM). The main policy strategies included the effective linking of research with extension, training, non-governmental organizations (NGOs) and other national institutions involved in agricultural and livestock technology development and transfer; establishment of a statutory National Agricultural Research Council (NARC); supporting the development of fundamental and applied research priorities given to disadvantaged and vulnerable groups, aimed at improving scientific and technological knowledge base against which food, agriculture and health problems can be analysed and solved. The last policy statement *i.e.* supporting the development

of fundamental and applied research priorities given to disadvantaged and vulnerable groups, which essentially entails small-scale farmers, has worked to the disadvantage of medium scale farmers whose technical information needs are different from those of the so called disadvantaged and vulnerable groups.

The performance of the agriculture input supply, especially the National seed industry, has been poor for many years. Less than 10% of the total national seed requirements per year have ever been made available to the farmers (URT, 1997). The poor performance of the seed industry is attributed to the fact that Tanzania Seed Company Ltd. (TANSEED), a parastatal that had a monopoly of local production and importation and sale of maize, wheat, and beans certified seeds could not perform these duties efficiently. Due to the above deficiencies of the seed industry and in recognition of the existence of a relatively large untapped market for improved seeds in Tanzania, the government liberalised the seed industry and the private sector was allowed entry into the production, distribution and marketing of seeds. The liberalisation of the supply of seeds and other inputs such as agrochemicals coupled with the removal of subsidies have made the inputs to be beyond the reach of most farmers. Having enjoyed little support in the past, medium and large-scale farmers will need little support, than the small ones, to settle in the new policy environment. Thus, in the current policy environment, agriculture support projects targeting medium scale farmers are likely to be more successful, in terms of increasing productivity, than those targeting smallholders.

2.3.2 Agricultural research

Agricultural research in Tanzania faces several constraints, which render it ineffective (URT, 1999). Inadequate funding is impairing the effectiveness of agricultural research in the country. Other factors affecting the Tanzanian agriculture research system include the poor link between agriculture research and extension services, fragmentation of research among several institutes and private programs and compartmentalization of research efforts into narrow disciplines. Thus development of appropriate and sustainable technologies aimed at increasing agriculture productivity in the different agro-ecological zones and farming systems is weak. Poor research - extension-farmer linkages have limited the diffusion of research results. Furthermore, the poor linkage has restricted researchers' ability to diagnose and respond to farmers' real problems and hence rendering the technology developed inconsistent with the farmers needs.

Although agriculture research initiatives in Tanzania have a long history they have made very little impact on the development of the agriculture sector. The lack of the expected impact of agriculture research on the Tanzanian agriculture sector cannot only be attributed to the "inappropriateness" of the technologies being developed but also and more importantly on the failure of the small-scale farmers to adopt these technologies.

Every farm, large or small, has a unique set of resources. Thus farms of different sizes need to capitalize on their unique attributes to be successful. These size specific attributes include the appropriate technology. There are several examples of size specific technologies. One example on the variations in suitability of technology with

varying farm size has been given by Buttel (1982) in his study on pig housing. In that study he found that at lower numbers of animals farmers usually opt for cheaper houses of relatively lower quality than those preferred by farmers with larger numbers of animals. Furthermore, in consistency with the use of technologies that are consistent with the size of an enterprise, Flora (1988) in her study on dairy farms found that the type of management employed by dairy farmers had a close association with the number of animals in the farm. In that study she noted that the increase in the number of animals was associated with increase in investments such as construction of paddocks to facilitate rotational grazing. The idea behind the intensification that is associated with the increase in the number of animals is to make optimal use of pasture resources. Advances in fencing allow quicker, more convenient separation and utilisation of pastures. Herding is much easier and the profitability has been demonstrated (Flora, 1988). Thus in general as farm size increases, farmers will look for technology (ies) that will increase farm productivity and hence profit.

Amerman (1997) in his study on the use of agriculture technologies found a close relationship between the use of herbicides for weed management and farm size. In that study the use of herbicides for weed management was found to increase with increasing farm size. Given the above evidence on the association between the size of an enterprise and technology preference, it is obvious that a research system focusing on small-scale farmers cannot meet the needs of medium scale farmers. There is no wonder that the lack of location specific studies on the appropriate herbicides and fertilizers coupled with inappropriate land policies to encourage long term investments such as construction of paddocks to facilitate rotational grazing have acted against the

performance of medium scale farmers in Tanzania.

Michael Duffy (1998) in his study entitled *How Small Farms Compete* found that the survival of small farms depends on their ability to make use of technologies that are consistent with the goals and resources that are available. Unfortunately however, he noted that in most cases technologies that are consistent with the settings of small-scale farms were more labour intensive than those, which were consistent with large-scale farms.

Given, the findings by Duffy (1998) there is very little possibility for small-scale farmers to adopt improved technologies that are being developed by the researchers however superior they are. Thus the poor performance of the Tanzanian agriculture sector can be attributed to the research we chose to fund. To give a face-lift to the Tanzanian agriculture sector research needs to be directed at evaluating and identifying options concentrating on the needs of medium scale farmers. We need to conduct research in the direction we want to be heading.

This study seeks to asses the potential of improving the productivity of medium scale farmers through redirecting research efforts to their needs. Unlike the previous research system that targeted small-scale farmers, the targeting of medium scale farmers this time around will lead to the development of technologies that will be consistent with the needs of medium scale farmers. The argument behind this study is that the uptake of appropriate research recommendations is likely to be higher amongst relatively large farmers than small ones.

2.3.3 Agricultural extension

Agricultural extension services in Tanzania have been influenced by the evolution of extension work in the rest of the world. Several approaches have been tried since colonial times to date (Lupanga *et al.*, 1989).

Agricultural extension during the colonial period started with what was known as the Balanced Utilisation Approach (BUA). This approach had its focus on the prevention of famine and maintenance of soil fertility. Due to the poor results of the BUA it was abandoned and the Focal Point Approach (FPA) was introduced. This approach concentrated in high agricultural potential areas. These two approaches were associated with the use of force and by-laws.

After independence in 1961 the use of force and by-laws was abandoned and more persuasive extension approaches were advocated. Among these approaches were the Transformation Approach and the Improvement Approach. The transformation approach was aimed at modernizing agriculture through planned village settlements schemes where extension services could be channelled (Wambura, 1988). The improvement approach sought to improve traditional agriculture through extension services and credit programmes. This approach encouraged cooperative production in villages. However, by mid sixties the failure of these approaches was apparent. Thus from 1967; as a result of the Arusha declaration, the frontal approach was adopted. This was aimed at developing Ujamaa. Under this approach farmers were encouraged to move into villages to facilitate self-reliance and development through application of Ujamaa principles. As a result of this approach, some spontaneous settlements were started all over the country. The use of extension officers in coercive acts, such as

moving people to Ujamaa villages by force created a negative attitude of farmers to extension officers (Keregero, 1987). Just like the previous approaches, this approach was a complete failure.

In the light of the above-mentioned problems; in the 1980_s, the government made some policy reforms in response to the continued decline in agricultural production. Towards implementation of the policy proposals the National Agricultural and Livestock Extension Rehabilitation Project (NALERP) was launched by the Tanzanian government in collaboration with the World Bank in 1988/89. Together with NALERP other extension projects like Sasakawa Global 2000 (SG 2000), and Southern Highlands Extension and Rural Financing Project (SHERFP) were implemented in several regions (Sicilima, 1996). All these projects have failed to improve the Tanzanian agriculture extension services.

Thus there is no wonder that the Tanzanian agriculture sector is still facing a problem of inadequate and weak extension services. Provision of agricultural extension services is generally frustrated by the shortage of necessary infrastructure, competent field staff, funding and poor research - extension-farmer linkages (URT, 1999). Furthermore the extension services in the country are suffering a problem of low staff morale, poor supervision and poor coordination of the services provided by the NGOs.

The poor extension services have rendered agriculture research initiatives in Tanzania ineffective as well. There has been over emphasis of advisory services to the very small farmers. This in a way has made the Tanzanian extension system useless to

medium and large scale farmers whose technical needs are quite different from those of small-scale farmers who have been the main target of the extension services.

Whereas small scale farmers are likely to go for labour intensive technologies that are consistent with their goals and resources at their disposal, medium and large scale farmers needs are quite different in that they are likely to go for capital intensive technologies that are consistent with their objectives and resource bases (Duffy, 1998). Thus the targeting of small-scale farmers has lead to an extension system that is consistent with their needs. The evidence to this argument is the nature of the current extension system which concentrates mainly on simple transmission of husbandry practices like planting in rows, use of fertilizers, pesticides, contour farming which has spent billions of US$ without being adopted by the small holder farmers.

The failure of the extension system of Tanzania to have the small scale farmers adopt these "simple" technologies is likely to be caused by the nature of the farmers who were expected to adopt them. While the adoption of technologies such as the use of fertilizers and other agrochemicals and improved husbandry practices like planting in rows using the recommended spacing seemed to be plausible on the side of the extension staff who had the increased production as their main objective, the small-scale farmers had other ideas. In the first place small-scale farmers have subsistence as their main objective and other things like producing for the market are secondary and in most cases they only sell what is left after meeting their primary objective (subsistence).

Having subsistence as their main objective coupled with poor resource endowments *i.e.* small pieces of land has militated against the adoption of improved technologies by small-scale farmers. Thus the argument at hand is that a switch of focus of the extension services to medium-scale farmers will yield the desired improved agricultural sector in a relatively shorter time period. This study seeks to examine the effect of the inefficient extension system on the performance of the medium scale farms. A question at hand is that what are the needs of the medium scale farmers?

2.3.4 Agricultural input supply

Several surveys on farming systems in Tanzania have observed that poor supply of inputs to farmers is the most limiting factor to agriculture productivity (Mlambiti, 1985). The supply of agricultural inputs is a private sector operation and the government has removed the subsidies on agricultural inputs. The removal of subsidies, coupled with high marketing costs has lead to a drastic increase in prices of important agricultural inputs such as fertilizers, agro-chemicals and improved seeds.

The increase in prices of inputs has lead to a decrease in their use by small and medium scale farmers. Although medium scale farmers have a greater potential to address effects of liberalization compared to smallholders, the unfavourable policy environment *i.e.* agriculture policy that focussed small scale farmers, in which they have been operating for more than three decades have limited their ability to compete in an increasingly liberalised economy.

The problem of access to agricultural inputs has been compounded by the collapse of cooperatives, which were supplying the inputs on credit. In the livestock sub sector,

essential -inputs such as veterinary drugs, vaccines, acaricides, land development equipments and implements, pasture seeds, fodder-planting materials, commercial feeds and improved livestock breeds have a limited supply (URT, 1999). Thus this study seeks to find out ways by which policy can be reoriented in the favour of medium-scale farmers for the benefit of the Tanzanian agriculture sector.

2.3.5 Rural finance

The present era of globalisation is accompanied by a high rate of technological innovations derived from science and engineering, aimed at increasing efficiency in production. The vast array of supplies, in terms of modern machines, agrochemicals, storage facilities and services that support modern-day farming require large sums of capital (Doll, 1984). In this regard, advanced farming is not different from other businesses in that it also depends on capital markets. Medium scale farmers, given their narrow capital base, need to have access to credit facilities. The survival of medium scale farmers will depend on their ability to expand by increasing their land holdings, capital investments particularly in technology and more efficient use of labour inputs.

Modernising agriculture requires the purchase of new inputs, which are produced off the farm. To buy these additional inputs the farmers must have accumulated savings or have ready access to a source of external capital such as credit. Credit has been considered necessary for farmers with little capital of their own as a means to access improved agricultural technology (Erhardt, 1999). Farmers and policy makers have often identified lack of access to credit as a significant constraint to agricultural production in developing countries (James, 1995).

As a way of supporting farmers, the government of the United Republic of Tanzania established a number of credit schemes to provide financial resources to the agricultural sector. Various non-governmental organisations (NGOs) initiated similar support schemes. These were thought to be sound policy strategies to the problem of capital deficiency on the side of smallholder farmers. Unfortunately however, most of the schemes proved to be inappropriate as far as the beneficiaries are concerned (James, 1995).

Sinha (1998) noted that even in countries where formal rural financial services are well established, like in Bangladesh, the agriculture sectors are still dominated by smallholder, low technology peasant farmers. This is also true in Tanzania where the government initiated several programs to improve the agricultural sector through supporting smallholder farmers. Just like the experience of other developing countries, despite all the efforts made, the Tanzanian agriculture sector is inefficient and fails to act as an engine for economic growth (URT, 1999).

Failures of such support programmes are normally and very simplistically attributed to the programme design, i.e. mainly faults on the supply side. This study is anchored on the belief that the demand side also possesses weaknesses. The likelihood is that the scales of production are a strong factor behind uptake of technology and financial feasibility of recommended technologies. The answer could be sought from medium and relatively larger agricultural enterprises.

2.3.5.1 Rural credit and agriculture

Rural credit is emphasized because of the importance of the agriculture sector in the Tanzanian economy. Agriculture contributes about 60% of the gross domestic product (GDP) in the country. It also contributes 60% of the national export earnings, and employs over 80% of the Tanzanian population (World Bank, 1996). It is estimated that smallholders' production under labour intensive farms with low production technology account for more than 75% of the total agricultural production in the country (Mushi, 1993).

2.3.5.2 Benefits of credit to medium scale farmers

The primary process by which credit is envisaged as means for reducing poverty is by enabling medium scale farmers to increase their incomes through increased productivity brought about by the use of improved technology that has been made possible by the assistance of access to credit (Hulme, 1996). Loans allow farmers to purchase large capital items sooner than they would otherwise do (Atieno, 1995). This potential gain in productivity resulting from credit use is the main motivation underlying many governments and non-governmental organisations' programmes seeking to provide credit to the farm sector. Unfortunately, most of it has clearly targeted the small-scale farmers who have the least potential for growth.

Credit programmes are expected to provide an impetus to agricultural innovation. Based on past failures, this may be more feasible and economically sound for medium-scale farmers. Unfortunately however, the bureaucratic nature and inflexible lending systems pursued by formal financial service providers have denied the medium scale

farmers access to credit (Braton, 1986). In some developing countries, like Tanzania, where special programmes were initiated to take care of this problem, they kept more emphasis on the support of small-scale peasant farmers. This left the medium scale farmers without any reliable source of financial services.

The bias to small-scale peasant farmers, has denied medium scale farmers loans and thus forcing them to seek for the services from informal and semi formal sources. It has also been seen as something wrong for medium-scale farmers to receive financial and other support services. Often growth in economies of scale has been impaired by distorted policy orientation and emphasis.

2.3.5.3 Impact of credit on technology

The justification generally given for credit schemes is that they will raise the borrowers' incomes in a way that would have been otherwise impossible (Hulme, 1996). The increase in incomes is expected basing on the argument that the provision of credit facilities alongside other support services enables farmers to adopt improved production technologies and thus enhance their productivity. Credit moves the budget constraint outwards by enabling them to purchase capital assets from which an income is expected.

This income, however, may materialise in either of two ways: as a result of additional purchases of equipment within the existing technology, so that returns per unit of capital remain constant, *i.e. capital widening*, or as a result of purchases of new technology so that not only is the capital stock expanded, but its productivity increases as well *i.e. capital deepening*. Thus generally, the provision of credit

facilities *ceteris paribus* is expected to increase the rate of adoption of improved technology (Mosley, 1996).

Peterson (1997) in his study on the economic efficiency of large farms argued that the performance and size of the farm depends on the initial capital investment, *i.e.* "*where one ends up depends a lot on where one starts*". An argument at hand is that baseline economies of scale is a determinant factor to achieve impacts of credit. This study is based on a challenging assumption that medium scale farmers bear greater chances of capital widening and technological advancement than small-scale farmers.

2.3.5.4 Informal finance

According to Adams (1992) the term informal finance refers to financial transactions lying along a continuum that ranges from casual loans among friends and relatives, through loans made by merchants and traders, through loans and deposits handled by various types of informal credit and saving groups, through pawnshops that may operate with government license, through finance companies that have a corporate charter but are not regulated, through credit unions that in some countries are regulated and in others are not, and to banks that are closely regulated by a central bank. Informal finance is ubiquitous in low-income countries and it is concentrated wherever there are substantial amounts of commercial transactions.

The great bulk of the low-income countries' populations, including the majority of urban dwellers, make little use of the few formal financial intermediaries (Aredo, 1995). These institutions, whose models are transplanted from industrialized countries, seem to be largely inappropriate to the developing countries' realities. Their

high costs of transaction, complex bureaucratic procedures of giving services and delays are among the factors that militate against an effective utilisation of the existing formal financial institutions. On the other hand, the informal financial sector, as revealed by studies undertaken in developing countries (*e.g.* Bouman, 1977; Chandavarkar, 1985; Miracle *et al.*, 1980) has certain advantages over the formal sector. In the former case, the average scale of operation and the cost of offering financial services is small, procedures are flexible, there is general freedom of entry and exit; there is freedom from *de jure* and *de facto* control by central authorities; information gathering is kept to the minimum and instead, trust and first hand knowledge of a participant are the only important requirements (Bouman, 1988).

Despite the popularity of informal finance, formal financing institutions are important. The question at hand is how the formal financial institutions can identify and incorporate the good characteristics of informal financial institutions in order to serve medium scale farmers properly.

2.4 Economies of size in agriculture

The dependence of labour intensive, small scale agriculture has a great contribution on the present economic status of the Tanzanian economy where, it ranks 4th from bottom in the world ranking, having a per capita income of US$ 240, social services are also inadequate. The net enrolment ratio for Tanzanian children of school age has decreased from 68% in the year 1980 to only 48% in the year 1996 (World Bank, 2000). With the introduction of cost sharing health services have been well beyond the reach of most Tanzanians (51.1% of Tanzanians have their daily incomes below one

US$). According to the World Bank development report (2000) the percentage of Tanzanian population with access to safe water has declined from 52% in the year 1982 to 49% in 1995.

It is evident that the agriculture sector fails to act as an engine for growth. The fate of the country's development has remained in the hands of the small-scale farmers. These farmers cannot acquire and use improved inputs necessary to increase production and hence put the development of the country on hold. In response to this fact the government of Tanzania initiated several programmes aimed at improving productivity in the agricultural sector. Most of these programmes were aimed at helping the small-scale farmers. This purposeful, systematic exclusion of medium-scale farmers in the programmes left them without a reliable, affordable source of credit and other support services.

Despite all the problems, there exist some medium scale farms that are struggling in a non-optimal policy environment. Medium scale agriculture, though in its infancy stage in the country and operating in a sub-optimal policy environment has a potential of contributing to the growth of the Tanzanian economic development. What is required is to gradually orient policy focus to this sub-sector. A crucial question is what economic incentive packages would gear–up medium-scale farmers in Tanzania. This study concentrates on financial services particularly credit.

The proposition that large agricultural enterprises are more efficient than small ones, namely that economies of scale exist in agriculture appears to be widely accepted both by the public and the professionals. The growth in size and decrease in number of

farms over the past half century in developed countries is consistent with this hypothesis. Moreover numerous emperical studies have reported scale economies in agriculture (Ahearn *et al.*, 1993; Hayami and Ruttan, 1985).

Economies of scale in any enterprise are said to originate from the distribution of fixed costs over an increasing number of units of output. Thus at a very small scale of operation, unit costs are usually higher but they keep on decreasing with increasing size of an enterprise.

Recently, questions have been raised about the validity of the scale economies hypothesis. Kislev and Peterson (1996) argued that scale economies must be a temporary, disequilibrium phenomenon since, according to Euler's theorem, payments to factors will exceed output leading to a decrease of returns to scale. Yet conventional estimates of returns to scale in most developed countries where large scale farms dominate have not decreased (Kislev, 1997).

A critical isssue in the discussion and debate concerning industrialisation of agriculture concerns the economies of size in agricultural production and the shape of the long run average cost curve. The conventional economic model infers a U-shaped long-run cost curve that initially declines as size or scale increases, reaches a minimum and then rises with further increases in size or scale.

The fundamental issue is: does this shape of the cost curve characterise agricultural production? To the favour of economies of scale hypothesis in agriculture emperical studies and farm records appear to verify that the cost curve of agricultural

production does decline with increasing size or scale of operation (Boehlje, *et al.*, 1999). The only existing problem is on how quickly that the cost curve declines *i.e.* what size is needed to capture most of the economies of size. Farm record data implies that very small farm businesses have relatively high total costs and that costs decline rapidly with modest increases in size with only slight or little decline in cost as farms increase in size from medium size operations.

Another question that has been at the centre of the debate on economies of scale in agricultural enterprises is whether costs eventually go up with further increases in size. *i.e.* whether the cost curve for agriculral enterprises exhibit a steep sided, flat bottom U-shaped, or is it instead L-shaped where costs are relatively constant after a particular point as size inceases (Boehlje, *et al.*, 1999).

Most studies of economies of size in agricultural production using farm records or other data measure the cost curve of the plant (the farm) and conclude that this cost curve also is the cost curve for the farm. But increasingly in agriculture, it is being recognised that the plant and the farm are not the same entity. Just like in the industrial sector, a farm may have many plants with each plant being of optimal size to have the minimum cost. If the plant cost curve did have the classic U-shape form, one strategy farmers might use is to determine the optimal, minimum cost plant size and expand the size of the farm by replicating this size plant. So one strategy to keep cost from rising as a farm expands is to use a replicate strategy where the farm is comprised of multiple minimum cost plants (Boehlje, *et al.*, 1999). This in fact appears to be the strategy where the farm is comprised of multiple minimum cost

plants. A practical use of this strategy has been observed in large scale integrated hog producers in the USA who have chosen plant sizes of 2 400 or 3 600 sows, and can then when they desire to increase the size of their farm do not add additional capacity to the current plant, but instead put in place new plants of 2 400 or 3 600 sow size (Boehlje, *et al.*, 1999).

The important questions concerning the trend to larger farm sizes are not whether costs decline as size increases. They are instead whether they rise after a particular size is attained. In fact, even if costs were invariant by size *i.e* constant cost industry with a flat cost curve, farm size would likely increase over time if the industry is profitable. Even for constant cost industries, managers who generate profits typically reinvest those profits back in the farm for the growth of the business. And if there are other barriers to entry such as access to capital or acceptable land rental arrangements as frequently characterizes small farm businesses, it is difficult for smaller operations to enter or be viable even if they have identical costs to those of larger units (Boehlje, *et al.*, 1999).

For the reasons noted above the cost curve for agricultural production probably exhibits an L-shape rather than a steep sided U-shape, and managers will likely reinvest earnings back in their core businesses, farm size is likely to continue to increase. Thus rising costs are not likely to constrain growth in farm size, and the rate at which farms will grow in size over time will be primarily determined by the profitability of the business and the amount of the net earnings that are retained and combined with debt capital to expand the business.

It has been noted that in the event of having barriers to entry such as access to capital or acceptable land rental arrangements as frequently characterizes small farm businesses, it is difficult for smaller operations to enter or be viable even if they have identical costs to those of larger units. This study is aimed at putting to light the potential that medium scale agricultural enterprises have in contibuting towards the improvement of the Tanzanian agriculture sector by exploiting the benefits of economies of size.

2.5 Measurement of agricultural enterprise viability

2.5.1 Introduction

The standard analytical approaches and methods of farm management economics ought to be simple, sensible and powerful (Ferris, 1999). In any case the appropriate analytical techniques need to evaluate farm performance and changes and distinguish between cash (financial feasibility) and profit (economic efficiency). Furthermore, such tools need to consider the time value of earning of capital invested. Measures of performance such as Economic Farm Surplus (EFS) are important when there is a need for comparing the performance of different farms (Ferris, 1999).

One of the most frequently asked questions that need to be answered when assessing an enterprise is whether it is making profit or not. Profit is what is left over after the variable and fixed costs have been accounted for and is the return to all the resources that have not been 'rewarded' in the calculation. This is called operating profit, and when expressed as a percentage of the total capital invested in the activity then it is a measure of the economic efficiency of the use of that capital.

More useful ways to assess the profitability and financial feasibility of farm businesses are well established in farm management economics. These methods include things like gross margin analysis (GMA), Economic Farm Surplus (EFS) and estimation of Internal Rate of Return (IRR) (The maximum interest that could be paid if all the capital was borrowed). Of the above-mentioned techniques, gross margin analysis has been widely used in economic analysis for both livestock and agricultural (crops) enterprises.

2.5.2 Gross margin analysis

Johnson (1985) defines the gross margin as the difference between the value of an enterprise's gross output and the marginal cost of that production. For a dairy enterprise, the value of the gross output (gross revenue) includes the value of sales of milk and dairy stock, as well as the value of milk consumed on the farm and products transferred to other farm enterprises. In case of crops, the gross output includes the amount of product *e.g.* maize being sold and that given away to relatives or transferred to other enterprises like maize being fed to cattle. Variable costs consists primarily of seed, fertilizer, pesticides and hired labour used specifically for crops and concentrated feeds, cut-fodder, veterinary drugs, minerals and hired casual labour for dairy enterprises.

Enterprise variable costs such as bought-in feed costs need to be calculated on the basis of financial prices, while non-priced particulars such as the use of farm-produced grain for feeding cattle are calculated using economic prices and opportunity cost principle (Hill, 1990). A unit of calculation for cash crops is one hectare of sown area, the calculation is based on an actual technology of growing a crop and on the

assumption that there exists a commodity market on this kind of produce; the gross revenues are estimated at market prices.

In a study on economic analysis of smallholder dairy farms in Zimbabwe, Sibanda (1998) made use of gross margin analysis to evaluate the economic performance of smallholder dairy enterprises. In that study the author was interested in the relationship between the size of the herds and gross margin as a proxy for profit. He found that, the optimal size for small-scale dairy farming was 6-10 milking cows; below and above this range the gross margin was found to decrease. This technique has also been used in a similar study conducted by Mlay (1987) in Morogoro where the researcher found that all gross margins for the enterprises under study were positive, though some of them were too low. On the other hand a study by Nyiti (1998), using the same technique, found that 24% of the dairy farmers in Morogoro were operating under negative profit.

Easy understanding, logical interrelation of economic and technological parameters, forecast of rational variants for the operational structure of an enterprise are the key advantages of gross margin as an economic analytical tool. Despite the above-mentioned advantages, the technique has several disadvantages; these include the inability to take into account variations in fixed cost structure within and / or among enterprises and failure to make allowance for complementary and supplementary relationships between enterprises.

2.5.3 Economic Farm Surplus

This is a measure of farm financial performance. Economic Farm Surplus is described variously as 'measuring farm cash profit' and as 'a simple measure of farm profit'.

Economic Farm Surplus is defined as follows:

Cash Income (Milk + dairy stock)

- Farm Working Expenses
- Depreciation
- Runoff Adjustment (If runoff is owned and not leased)

+/- Stock Adjustment (For changes in opening and closing stock numbers)

- Labour Adjustment (Managers Wage, additional unpaid staff)

= EFS.

Economic Farm Surplus has been developed mainly to facilitate comparisons of financial performance among dairy farms.

Ferris (1999), having noted the deficit of gross margin analysis in making comparisons of enterprises with different overhead cost structures, caused by the inability of the technique to consider fixed costs in the analysis, suggested and made use of economic farm surplus which takes care of the variation in fixed costs among enterprises to enable a just comparison of the economic performance of enterprises with different structures of fixed costs. He made use of the technique in a project to analyse the economic performance of three dairy farms.

Despite the setbacks of the technique (GMA), it is a good indicator of economic performance of an enterprise, especially where there are little variations in fixed cost, and it was employed alongside EFS for this study.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter presents the methodology used in the study. It covers the sampling techniques, questionnaire design, data sources and collection methods, and data analysis techniques used in the study. First we present the conceptual framework governing the study followed by statistical analysis used to test hypotheses. Both qualitative, non-parametric descriptive and causal factor empirical models are estimated.

3.2 Conceptual framework

Conceptual or analytical framework on the performance of medium scale farms and the way in which farmers strive to maximize profit is essential as a guideline in identifying important variables and for effective and efficient data collection. Scarborough and Kydd (1992) stress that such frameworks should help to indicate the most useful area(s) on which to focus limited research resources, and ensure that data collected is relevant to the objectives of the research. This section presents a brief outline of the conceptual framework used for information generation through the field work (primary) and through literature search (secondary) data collection. In general, the choice of variables for information generation depended very much on the objectives of the study.

As stated in chapter one the general objective of the study was to evaluate the performance of medium scale farms and identify constraints impairing their

performance. The specific objectives were: to examine the profitability of medium scale agricultural enterprises; to examine the influence of size on the profitability of medium scale agricultural enterprises; to examine the influence of agricultural support services on the profitability of medium scale farms; and to identify the constraints encountered by medium scale farmers in their day to day activities. The ultimate aim is to assess the potential contribution of medium scale farms to economic growth and make appropriate recommendations on the best way to improve the performance of medium scale agricultural enterprises in Tanzania.

To meet the information needs of these objectives and identify the variables for data collection, a conceptual framework for selecting variables and respondents in sugarcane and rice production was developed. At the centre of this study was the profitability of medium scale farms. This is to a great extent, influenced by the farmers' endowments of the factors of production, mainly land, labour and capital that jointly play a central role in any production process. For the purpose of this study more emphasis was kept on the influence of capital on the performance of medium scale farms. The concentration on capital was based on the fact that unlike other countries, medium scale farmers in Tanzania are not constrained by land and labour resources. Access to agricultural support services, such as extension services, appropriate inputs, such as improved seeds and pesticides; access to credit services and access to modern agricultural machines and implements have a great influence on the productivity of farm enterprises. Access to credit facilities may also ease off farmers' capital constraints and hence facilitate both *capital widening* and *deepening* which are key issues in increasing agricultural enterprises' productivity.

In this study, it is assumed that medium scale farmers make production decisions independent of their consumption and time - allocation decisions. This assumption stems from three main reasons. First, sugarcane is mainly a commercial crop in the study area; all farmers in the sample produce sugarcane for sale to a nearby sugar factory. Secondly, all farmers in the sample produce rice for sale, although some rice is used for home consumption; also the dairy enterprises produce milk for sale although some small amounts are consumed at home. Thirdly, medium scale farmers in the sample participated actively in the local labour markets. Therefore, medium scale farmers can reasonably be assumed to make sugarcane, rice and milk production decisions as if they are maximizing profit.

In this study it is assumed that the cost curve for agricultural production exhibits an L-shape rather than a steep sided U-shape, and farmers will likely reinvest earnings back in their core businesses, leading to a continuous increase in farm size. Thus rising costs are not likely to constrain growth in farm size, and the rate at which farms will grow in size over time will be primarily determined by the profitability of the business and the amount of the net earnings that are retained and combined with debt capital to expand the farms.

It is assumed that factors such as total farm size, access to credit services and access to extension services influence the variation in profit among medium scale dairy, sugarcane and rice farms. It was also assumed that all the above-mentioned factors are influenced by the prevailing government policies (Fig 3.1). Thus the factors influencing the profitability of sugarcane, rice and dairy enterprises can be summarised

as:

$$\pi_i = f\ (S, X, C, E)$$

Where,

π = Profit margin;

S = Agricultural enterprises' size;

X = Access to extension services;

E = Education levels of enterprises' owners

C = Access to credit services

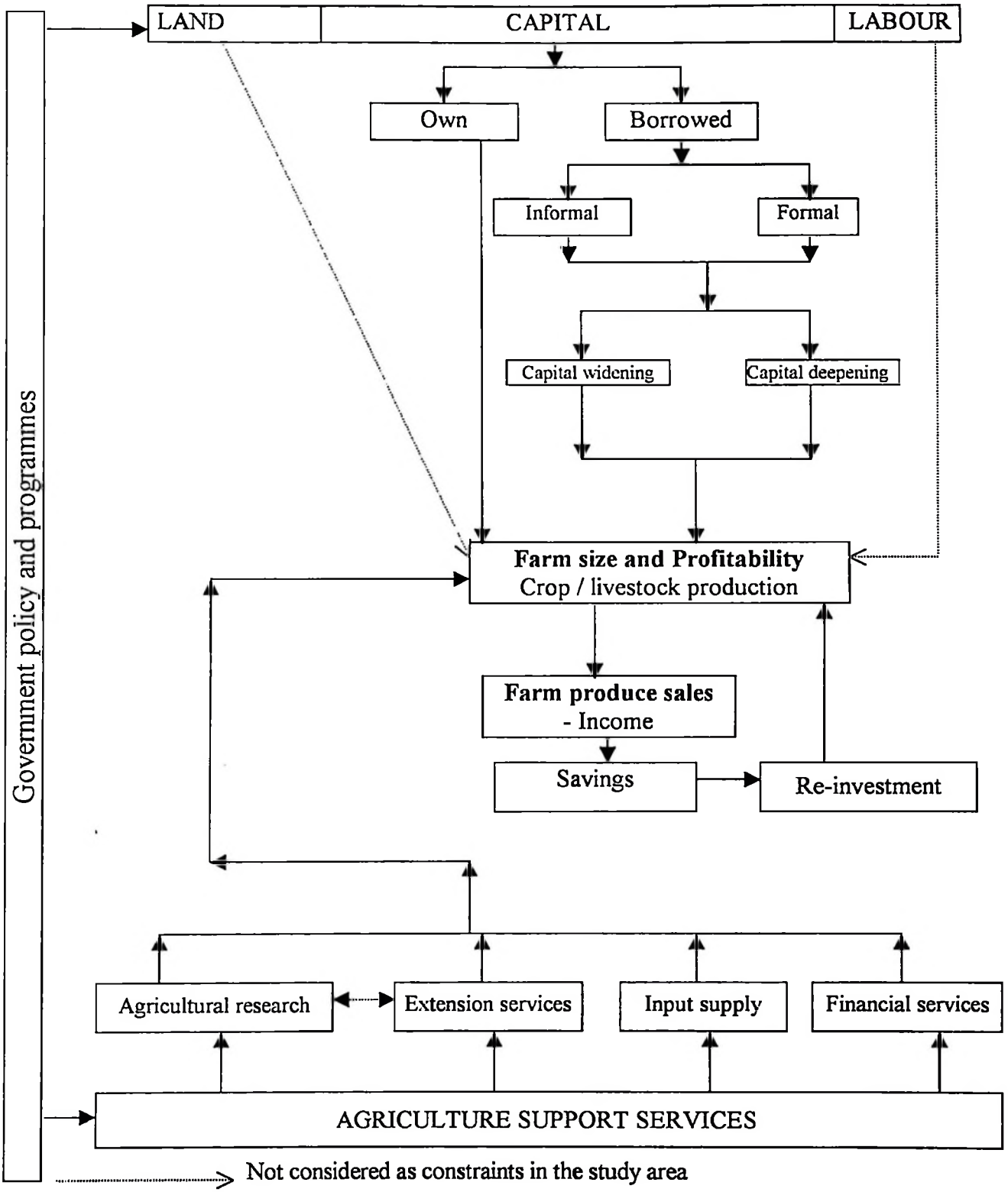


Figure 3.1: Factors determining the profitability of medium scale farms

3.3 Enterprises selected for analysis

This study made use of the performance of medium-scale farms dealing with the production of sugarcane, paddy and milk (dairy farms) in Morogoro to shed light on the performance of medium scale farms in Tanzania. The selection of the enterprises was based on their availability and distribution in the study area.

3.3.1 Data Source

This study dealt with the economic analysis of sugarcane, paddy and dairy farming in Morogoro. The focus for this study was on medium-scale farms *i.e.* area cultivated of 10 or more hectares for sugarcane and rice farms and 10 or more milking cows for dairy farms. Both primary and secondary data were collected. Primary data were obtained from the farms via a structured questionnaire. The information collected comprised mainly of output and input data. Secondary data were extracted from reports and other documentary materials from the relevant bodies/institutions; such as Tanganyika Farmers Association (TFA), Tanzania Chamber of Commerce Industries and Agriculture (TCCIA), Mtibwa Outgrowers Association (MOA) and Mtibwa sugar estates Ltd (MSE). Secondary data collection focused on records that were expected to assist in the establishment of the status of medium and large scale farming in Tanzania. Information sought include, location of the farms, crops grown, input use, output and areas cultivated.

3.4 Questionnaire design and sampling techniques

A structured questionnaire was designed to collect primary data from farmers. Given the inadequacy of official records on medium scale farms, a sampling frame was established by gathering information from points such as animal clinics for dairy farming information and

crop sales points and farmers associations for sugarcane and paddy farms. The agricultural sector in Tanzania is predominantly based on small-scale peasant agriculture. Only a few crops such as sisal, tea, and sugarcane are grown on medium and large-scale commercial farms. The small-scale operation is also very common in dairy farming where very few farmers own more than five milking cows. Thus for the purpose of this study data were collected from all dairy enterprises with more than 5 milking cows.

In case of field crops the sugarcane and paddy farms information was gathered from growers associations, such as Mtibwa Out growers Association; the Morogoro District Saving and Credit Banks; crop sales points, such as the Mtibwa sugar factory for sugarcane and rice traders for paddy and the Tanzania Chamber of Commerce Industry and Agriculture (Morogoro branch). The farms were divided into 9 different categories *i.e.*5-9; 10-15; 16-20; 21-25; 26-30; 31-35; 36-40; 41-45; and above 45 hectares. In the first size category, where there were many farmers, only 48 farms were randomly selected for inclusion in the sample. For the other size categories, which had very few farmers, all farms were included in the study.

3.5 Data collection

Both primary and secondary data were collected. Primary data were obtained from the farms via a structured questionnaire. The information collected comprised mainly of output and input data. Secondary data were extracted from reports and other documentary materials from the relevant bodies / institutions, such as TFA, TCCIA, MOA and MSE. Secondary data collection focused on records that were expected to assist in the establishment of the status of medium scale farming in Tanzania.

3. 6 Methods for data analysis

3. 6. 1 Descriptive and qualitative analyses

For the descriptive analysis, means, ranges, frequencies and related statistics were used to test whether access to credit, size of enterprises and socio-economic factors such as education had significant impact on the profitability of medium scale farms. Furthermore the descriptive analysis was used to identify the problems that are encountered by medium scale farms in their daily activities. To supplement the descriptive analysis, some of the information collected was assessed qualitatively based on sound judgments and economic rationale.

3.6.2 Quantitative analysis

The key quantitative analytical techniques that were used in this study are Gross Margin, Economic Farm Surplus, Analysis of Variance (ANOVA) and Regression analyses. These techniques were used to test the hypotheses that medium scale farming is profitable and the size of an enterprise has a significant influence on its profitability. Furthermore these analytical tools were used to test the hypothesis that agriculture support services influence the profitability of medium scale farms.

3.6.2.1 Gross margin analysis

Gross margin analysis was used to assess the profitability of the medium scale farms under study. The data used in gross margin analysis were obtained from farms records. Gross margin for an enterprise is its output less the variable costs attributable to it.

$GM = TR_i - TVC_i$

Where;

GM = average gross margin (T shs/ha)

TR_i = average total revenue (Tshs/ha)

TVC_i = average total variable costs (Tshs/ha)

It is important to note here that Gross Margin Analysis was used for sugarcane and paddy farms only where the variations in fixed costs were not significant. This is because the calculation of GM does not take fixed costs into account and thus its use in comparisons of enterprises with varying fixed costs is inevitably misleading. Thus Economic Farm Surplus, which takes into account fixed costs, was employed in the comparison of dairy enterprises since they displayed significant variations in fixed costs. The low variations in fixed costs among the sugarcane and paddy farmers can be attributed to the fact that most of the operations, which call for long-term investments and hence fixed costs are taken care of by Mtibwa Sugar Estates (MSE) and Mtibwa Outgrowers Association (MOA). The services that are provided by MOA and MSE, in most cases on credit, are land preparation, harvesting and cane transport.

3.6.2.1.1 A consideration of the components of the formula

TR_i = average total revenue (Tshs/ha)

These were calculated by dividing the total revenue by the total yield for the case of sugarcane farms. The revenues and yields for the sugarcane farmers under study were obtained from the records of the Mtibwa Sugar Estates, the sole buyer of the crop in the study area. In the case of paddy farmers, the calculation involved multiplying the average yield by the average market price for the season being considered.

TVC_i = average total variable costs (Tshs/ha)

These were obtained directly from the sugarcane and paddy farmers. The cost

involved here included the land preparation charges (ploughing, harrowing and ridging for sugarcane; ploughing and harrowing for rice), seed cane cost for sugarcane and seed cost for rice, planting cost, weeding, crop protection and harvesting and transport charges. These costs were calculated on per hectare basis. It is important to note here that some activities for sugarcane, such as planting and hence land preparation are performed only once in every three years and thus the costs for these items have been distributed to cover the entire period of three years.

Land preparation cost

Land preparation in the study area is mainly done by using tractors. Most sugarcane farmers obtain tractor services from the Mtibwa Sugar Estates. The tractor services are provided both in cash and credit. Farmers who get the services on credit terms are required to pay back all the cost plus a 10% interest within the same growing season. As pointed out earlier, land preparation *i.e.* ploughing, harrowing and ridging is done only once in every three years. Thus the average annual land preparation costs were obtained by distributing the reported costs to the three-year growing period. Rice farmers have no access to the tractor services that are provided on credit and thus the only option to them is to pay in cash. The average tractor services' costs per hectare are presented in table 3.1.

Table 3.1 Tractor services costs

Operation	Payment terms	Cost per hectare (Tshs)
Ploughing	Loan	43312
	Cash	39375
Harrowing	Loan	40425
	Cash	36750
Furrowing	Loan	28875
	Cash	26250

Source: Mtibwa Sugar Estates Ltd (2000)

Seed cane cost

Just like the tractor services, sugarcane farmers can get the seed cane from the Mtibwa Sugar Estates (MSE) in either cash or on credit terms. Some farmers use their own seed cane. Farmers who get their seed cane from the MSE on credit need to pay back the entire cost, including a 10% interest, within the same growing season. Most rice farmers use their own seeds. The estimation of seed cane costs for farmers who make use of their own seeds was based on the prevailing market price for the seeds. The average seed cane costs per ton were Tshs 15,617 and 17,250 for cash and credit payments respectively. With a planting rate of eight tons per hectare the average seed cane cost per hectare was 124,936 and 138,000 for cash and credit payments respectively. Farmers who get their seeds from the MSE need to pay transport charges or make their own transport arrangements for the seed cane. The average transport charges per ton for the year 1999/2000 was Tshs 2,885. The amount of seeds obtained via cash and/or credit payments and the cost for transport of the seed cane from the source to the farms were obtained form the farmers. Just

like the case of land preparation cost, the cost for seed cane is incurred only once in every three years and thus the same procedure was used to get the average annual seed cane cost.

Other inputs cost

The term other inputs in this study has been used for inputs such as fertilizers and herbicides. These inputs are used by very few farmers in the study area and their costs were obtained directly form the farmers.

Hired labour cost

Most farmers use hired labour for planting/sowing, weeding and harvesting. These costs were obtained directly from the farmers. It is important to note here that most sugarcane farmers leave the harvesting activity to the sugar factory, which charges Tshs 950 for every ton harvested. For such farmers, information for these costs were obtained at the factory and added to the other hired labour costs obtained from the respective farmers.

Transport cost

The farmer can do transporting of the cane himself or herself or leave it to the sugar factory, which buys the cane. In the event where the factory transports the cane, it charges Tshs 2,990 for every ton. The transport cost was computed basing on the information obtained from both the farmers and the Mtibwa Sugar Estates.

The Gross Margin Approach has also been used in the past by Sibanda (1998) and Nyiti (1998) in their studies on profitability of small-scale dairy enterprises in Zimbabwe and Tanzania respectively. Both researchers obtained positive values for the gross margin although they were very small. Limbu (1998) and O'Neill (1999)

used the method in their studies on the profitability of maize and potato farming respectively. Thippawal and Molle (1998) used gross margin analysis to analyse the profitability of sugarcane farms in their study on the profitability and yield gap of sugarcane cultivation in the Mae Klong region. Furthermore, Alvarez and Schueneman (1990) used the technique in their study on Costs and Returns for Sugarcane Production on Muck Soils in Florida where they found the average gross margin per acre to be US$363.

The gross margins were calculated for the different categories of paddy and sugarcane farms. The Gross Margin (GM) was used as the basic unit of analysis in evaluating enterprise viability. The Gross Margin Analysis of enterprise viability was based on only one indicator *i.e.* gross margin per hectare. This was used to take care of the additional need to compare the profitability for the different farm size categories. One way ANOVA was used to compare, separate and rank the means for the different size groups. This was done to test the hypothesis that the size of the farm influences its productivity.

3.6.2.1.2 Advantages and disadvantages of the GM technique

Easy understanding, logical interrelation of economic and technological parameters, forecast of rational variants for the operational structure of an enterprise are the key advantages of gross margin as an economic analytical tool. Despite the above-mentioned advantages, the technique has several disadvantages; these include the inability to take into account variations in fixed cost structure within and / or among enterprises and failure to make allowance for complementary and supplementary relationships between enterprises. Economic Farm Surplus was used alongside gross

margin analysis in order to take care of the inability of the gross margin technique to take into account the variations of fixed cost for the different farms.

3.6.2.2 Economic Farm Surplus

This is a measure of farm financial performance. Economic Farm Surplus is described variously as 'measuring farm cash profit' and as 'a simple measure of farm profit'. This technique was used to take care of the variation in overhead costs among enterprises of different sizes, which was not taken into account in computing the gross margins. Economic Farm Surplus (EFS) is defined as follows:

Cash Income (Milk + dairy stock)
- Farm Working Expenses
- Depreciation
- Runoff Adjustment (If runoff is owned and not leased)
+/- Stock Adjustment (For changes in opening and closing stock numbers)
- Labour Adjustment (Managers wage, additional unpaid staff)
= EFS.

3.6.2.2.1 Consideration of the components of the formula

Cash Income (Milk + dairy stock)

Milk was valued basing on the prevailing average market price. The average milk produced per cow per annum was calculated from the production data obtained from the dairy farmers. The total value of the sales of the dairy stock, from which the average values per cow were computed, were also obtained directly from the dairy farmers using structured questionnaire.

Farm Working Expenses

These were obtained directly from the dairy farmers, and they included, feed costs, veterinary services charges, marketing costs and labour charges. Most costs were

recorded on monthly basis meaning that computations had to be made to get the annual costs per cow.

Depreciation

This was calculated for all fixed assets using the straight-line method. The total annual depreciation costs were divided by the total number of cows to get the average depreciation charge per cow.

Runoff Adjustment (If runoff is owned and not leased)

This was not calculated since farmers in the study area do not own runoffs.

Stock Adjustment

This entails changes in opening and closing stock numbers. Its computation was based on the changes in stock numbers between two seasons. In all dairy enterprises included in this study stock numbers went up meaning that a small number of animals were being sold. This has led to a situation whereby the stock income per cow was very low, and in such a situation, the adjustment of the Economic Farm Surplus was done upwards. The increases in the stock numbers for all the dairy farmers can be attributed to the fact that most of the studied dairy farms have only entered the industry in the past ten years. Thus the shorter time in business, coupled with small numbers of animals in the starting herds, means that newborn calves will be kept to expand the herd sizes. Most farmers reported to have sold male calves and only few farmers reported selling of old age cows.

The information used to compute the stock adjustment was obtained from the dairy farmers by administering a structured questionnaire. Stock valuation was based on the average market price for the different age categories.

Labour Adjustment

This takes account of managers wage and additional unpaid staff. All unpaid labour is valued when calculating the EFS. This is important because people who receive rather indirect payments for their work manage some farms. Other farms employ a manager and/or staff to run the farm, whose wages do appear in the financial accounts. This can result in a significant difference in expense for otherwise very similar farms. Labour adjustment is given by the summation of the wage for management and the value of unpaid labour. Information on whether the farmers employed paid managers and other unpaid persons who work in the farms were obtained directly from the farmers. Just like other costs the estimated annual labour adjustment values were divided by the number of cows to get the average cost per cow.

Wage for Management

Most of the surveyed dairy farms do not employ managers or hire management firms. If the principal farm managers were employed, then the wage cost of the managers would have already been in the accounts and thus no wage for management would have been needed. But if the farm manager is also the farm owner, as it has been found in most farms, we need to include a wage for management in the calculation of Economic Farm Surplus to value the labour of that person. Wages for management were estimated using the average wages for managers of similar enterprises in the study area, *i.e.* Tshs 1,800,000 per annum.

Value of Unpaid Labour

Additional unpaid labour was estimated using the prevailing wages for hired labour. The information on the number of people who work in the farms without direct payments were obtained from the dairy farms. The annual costs for the unpaid labour

were divided by the number of animals to get the average cost per cow to facilitate the comparisons of farms with different number of animals.

Ferris (1999) and Anon (1997) have also used the Economic Farm Surplus (EFS) in their studies on the evaluation of the performance of dairy enterprises in Australia where they found a positive relationship between EFS values and the number of milking cows. In the study by Ferris (1999) he categorised dairy farms into three groups whereby the first group comprised of farmers with up to 136 cows, the second one had between 136 and 242 cows and the last group comprised of farmers with between 242 and 427 cows. The respective annual EFS values per cow for the three size categories were U$875, U$947 and U$1,158 respectively. In this study the EFS were calculated for the different size categories for livestock, paddy and sugarcane farms. One way ANOVA was used to compare, separate and rank the means for the different size groups. This was done to test the hypothesis that the size of the farm influences its productivity.

3.6.2.2.2 Advantages and Disadvantages of EFS

The key advantage of this method is its inclusion of overhead costs in the analysis. This makes it very appropriate in making comparisons of the economic performance of enterprises with different overhead cost structures. Despite the above-mentioned advantage the EFS technique has the difficulty of obtaining and valuing costs such as depreciation, runoff adjustment and labour adjustment, and this stand as its main disadvantage.

3.6.2.3 Regression analysis

Regression analysis was employed to determine factors, which affect the profitability of the farms. The key factors that were examined are: size of the enterprise, education level of the farmers and access to credit and extension services.

$EFS / GM = B_0 + B_iX_i + \mu i$

Where;

B_o = an intercept.

EFS = average economic farm surplus

GM = average gross margin.

b_i-b_n = parameters attached to the explanatory variables X_i-X_n

X_i-X_n = variables assumed to be linearly related to GM/EFS.

μ_i = disturbance term.

A similar model was used by Parikh and Shah (1994) in their study on the relationship between size, structure and efficiency in agricultural enterprises where they found a positive relationship between the size and efficiency of the studied enterprises. Atieno (1995) used a similar model in her study on institutional credit and the efficiency of resource use among small-scale farmers in Kenya in which she found that there exists a positive relationship between access to credit and amount of inputs used and farm productivity. O'Neill and Matthews (1999) and Mwakalobo and Kashuliza (1999) used a similar model in their studies on the rate of return to public expenditure on agricultural extension in Ireland and impact of structural adjustment policies on smallholder farming systems in Tanzania. In the first study it was found that the levels of technical efficiency on farms are influenced by contact with extension service. The other study on the impact of structural adjustment concluded that the quantity of fertiliser used was positively related to the revenue obtained from the crop.

Since the selected explanatory variables, especially the GM/EFS values for agricultural enterprises belonging to different size categories, are likely to have a problem of heteroscedasticity, a natural logarithm transformation was made to take care of the heteroscedasticity problem. A similar procedure was used by Parikh and Shah (1994), Atieno (1995), O'Neill and Matthews (1999) and Mwakalobo and Kashuliza (1999).

Table 3.2: Summary of independent variables used in regression analysis

Variable Estimated	Description
FSIZE	Average size of the farm (ha/number of cows)
EDUCAT	Farmer's level of education (1 = no education, 2 = adult education, 3 = primary education, 4 = secondary education, 5 = tertiary education
CRED	Access to credit facilities (dummy variable) (1 = Yes, No = 0)
EXT	Access to extension services (dummy variable) (1 = Yes, 2 = No)

Source: Survey data 2001

3.6.2.3.1 Expected signs from the variables' coefficients

FSIZE: Average size of the farm

The increase in size of the farm was expected to reduce the unit production cost. Therefore, as the size of the farm increases, profitability is expected to increase. A positive sign was expected for the parameter attached to this variable.

EDUCAT: Farmer's level of education

Farmers with relatively higher levels of education are expected to have a better chance of understanding and hence using improved crop husbandry practices than those with lower levels of education. Thus a positive sign was expected for the parameter attached to this variable.

CRED: Access to credit facilities

It was expected that agricultural enterprises with access to credit services were likely to exploit the benefits of capital expansion than those with no access to credit facilities. A positive sign was expected for this coefficient.

EXT: Access to extension services

It was expected that agricultural enterprises with access to extension services were likely to use improved husbandry practices than those with no access to extension services. Thus a positive sign was expected for this coefficient.

Regression equations generated by ordinary least square are associated with a number of problems depending on the type of data used and the nature and form of the regression model employed in the analysis. The common problems encountered in the regression analyses include multicollinearity, heteroscedasticity, and autocorrelation (Gujarati, 1988; Maddala, 1988).

Pooled cross-sectional data and production data that have been used in this study are likely to have problems of heteroscedasticity and multicollinearity. On one hand, the presence of heteroscedasticity leads to one main problem. The problem is that the

ordinary least squares estimators while still linear and unbiased, can no longer provide minimum variance. This makes the ordinary least squares estimators unreliable, *i.e.* the variance will be large leading to small t-values. The small t-values associated with large variance leads to a situation whereby the explanatory variables' parameters are rejected more frequently than necessary.

To contend with this situation in the study, a natural logarithm transformation of the data was adopted. Furthermore, relevant tests were performed to ascertain that the basic assumptions governing linear regression procedure were not seriously violated. It is important to note that changing the functional form of the model can take care of the heteroscedasticity problem. That is why the transformation of the data was employed in this study to take care of the problem of heteroscedasticity.

On the other hand, in multiple regression analyses, the existence of linear relationships among the explanatory variables is very common. This situation poses a problem known as multicollinearity. Although there are several tests for diagnosing the presence of multicollinearity, the most frequently used symptom suggesting the presence of multicollinearity has been related to the existence of very high coefficients of determination (R^2), illogical signs of the parameters of the variables included in the model and F-ratios being highly significant but most of the individual t-ratios insignificant.

Since multicollinearity arises from sampling problems, *i.e.* it is a problem of a sample and not the entire population then the remedy of the problem entails the selection of a different sample or reconstituting the objectives of the study. Because

multicollinearity is a sample problem then increasing sample size is known to reduce the likelihood of encountering this problem. Thus in this study the multicollinearity problem has been addressed by increasing the sample size. The increase of sample size seems to have worked as expected since there exist no strong evidence in favour of the presence of multicollinearity. This is because the coefficients of determination (R^2) are quite high but also most of the parameter estimates carry logical signs and their individual t-values are significant.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the study. It is divided into five sections. First it presents and discusses the social economic characteristics of the owners of the sampled medium scale agricultural enterprises. Only major characteristics are considered. This is followed by an analysis of farm resources availability and allocation among the sampled dairy, paddy and sugarcane farmers. The third section, deals with dairy, paddy and sugarcane production issues in Morogoro urban and rural districts, included in this section is a critical analysis and discussion of issues and problems facing agriculture and availability of agriculture support services. The third section comprises of farm budget analyses for the various enterprises studied. The last section presents results of regression analysis and the comparisons of the mean gross margin / Economic Farm Surplus for the different farm size categories with the aim of testing the study hypotheses.

4.2 Socio-economic characteristics of household heads

Socio-economic characteristics bear essential attribute to socio-economic and farming practices adopted by farmers and hence the productivity of farm enterprises. Studying these characteristics is thus important in order to understand the general behaviour and attitude of the people who own the enterprises that are of interest to the study.

In the Morogoro urban and rural districts males head most of the households practicing dairy, paddy and sugarcane farming. Survey findings (Table 4.1) indicate that male owned medium scale agricultural enterprises constituted 85% and only 15%

of the sampled medium scale agricultural enterprises were owned by females. This is a common phenomenon in African tradition where marriage plays an important role in the society and a husband is in most cases a household head. Since it is uncommon for women to own production resources like land and capital, their proportion in farm ownership is inevitably small. Only females who had never got married and those who were widowed had access to resources (land and capital) since they were household heads and thus owned farms. Bruce (1989) noted that widowhood is probably the most significant event in the life cycle in terms of security of property right to women.

Regarding respondents marital status, it was found that the majority of them were married. Survey results (Table 4.1) indicate that 89.3% of the respondents were married and only 10.3% were not married. In Morogoro rural district similar results were reported by Makauki (2000) and Swai (1998).

The age composition shows that respondents aged between 18-35 years constituted only 4.7% while those aged between 36-45 years accounted for 44.2%. Furthermore, results reveal that respondents aged between 46-55 and 56-60 years were 36.5% and 9% respectively. On the other hand, survey findings show that only 5.6% of the respondents were of the age of above 60 years (Table 4.1). These results reveal that dairy, paddy and sugarcane farming is mostly practiced by middle-aged individuals of between 31 and 60 years.

Table 4.1: Socio-economic characteristics of household heads

Variable estimated	Sugarcane and / or Paddy farmers		Dairy farmers		Total sample	
Age distribution:	Number	Percent	Number	Percent	Number	Percent
18-35	8	6.2	3	2.9	11	4.7
36-45	57	43.8	46	44.7	103	44.2
46-55	48	36.9	37	35.9	85	36.5
56-60	10	7.7	11	10.7	21	9.0
Above 60	7	5.4	6	5.8	13	5.6
Total	130	100.0	103	100.0	233	100.0
Level of education:						
No formal education	7	5.4	N/A	N/A	7	3
Adult education	7	5.4	N/A	N/A	7	3
Primary education	30	23.1	15	14.6	45	19.3
Secondary education	50	38.5	55	53.4	105	45.1
Tertiary education	36	27.7	33	32.0	69	29.6
Total	130	100.0	103	100.0	233	100.0
Gender of the respondent:						
Male	114	87.7	84	81.6	198	85.0
Female	16	12.3	19	18.4	35	15.0
Total	130	100.0	103	100.0	233	100.0
Marital status						
Single	9	6.9	5	4.9	14	6
Married	115	88.5	93	90.3	208	89.3
Divorced	2	1.5	1	1.0	3	1.3
Widowed	4	3.1	4	3.9	8	3.4
Total	130	100.0	103	100.0	233	100.0
Average household size	6.8		7		7	
Average farm size	32		36		N/A	
Farm/herd size categories						
Below 10 Ha / 10 cows	48	36.9	24	23.3	72	30.9
11-15 Ha / 11-15 cows	29	22.3	28	27.2	57	24.5
16-20 Ha / 16-20 cows	10	7.7	21	20.4	31	13.3
21-25 Ha / 21-25 cows	12	9.2	4	3.9	16	6.9
26-30 Ha / 26-30 cows	10	7.7	5	4.9	15	6.4
31-35 Ha / 31-40 cows	2	1.5	8	7.8	10	4.3
36-40 Ha / 41-60 cows	4	3.1	13	12.6	17	7.3
41-45 Ha	3	2.3	N/A	N/A	3	1.3
Above 45 Ha	12	9.2	N/A	N/A	12	5.1
Total	130	100.0	103	100.0	233	100.0

N/A=Not applicable

Source: Survey data, 2001.

Survey results shown in Table 4.1 reveal that 3% of the respondents had no formal education and 3% had attained adult education. Furthermore, results indicate that 19.3% and 45.1% of the respondents had attained primary and secondary education respectively. Furthermore, 29.6% of the respondents were found to have attended

tertiary education. Tertiary education involves post secondary education up to university level. This indicates that most of the medium scale farmers are knowledgeable, thus can adopt and implement new innovations easily. The abnormally high proportion of the respondents (29.6%) with tertiary education is likely to be caused by the fact that most of the medium scale sugarcane farmers in the study area are employees of the Mtibwa sugar estates. This was also the case for medium scale dairy farmers in the Morogoro urban district where most of them were either employees of various government and private organizations or retired employees of the same.

Regarding the size of the agricultural enterprises selected for analysis, there were nine different size categories for sugarcane and paddy farms. The smallest size category comprised of farms with less than ten hectares while the largest category comprised of farms with more than 45 hectares of harvestable area under sugarcane. Due to the larger proportion of medium scale farms with around 10 hectares in the study area the selected medium scale farms comprised of a large proportion of the first two categories, *i.e.* below 15 hectares (59.2%). On the other hand the dairy enterprises comprised of seven categories with the lowest being made of farms with around ten milking cows and the largest with more than 40 milking cows. Just like the case of the sugarcane farms, the first two categories constituted a large proportion of the farms selected for the study *i.e.*50.6% (Table 4.1).

4.3 Dairy, Paddy and Sugarcane Production Issues

4.3.1 Sources of capital invested

Survey results presented in table 4.2 show that the capital invested by the respondents was obtained from two major sources *i.e.* credit and own saving. Based on the assessment of frequency of the source, it is apparent that most of the respondents' investments were made from their own savings *i.e.*75.7% and only 17.5% of the respondents made their initial investments through credit from various sources. 6.8% of the respondents reported to have made use of both credit and own savings for their initial investment.

In this study a source was only considered to have been useful in the investment process if it had a contribution of at least 10% of the total initial capital outlay. These results imply that the existing credit facilities have not contributed much to the dairy farming industry in the study area.

Table 4.2: Distribution of Dairy farmers by source of capital invested

Source of capital invested	Number	Percent
Own savings	78	75.7
Credit	18	17.5
Both	7	6.8
Total	103	100.0

Source: Survey data, 2001.

4.3.2 Mode of land acquisition and use

Land acquisition mechanism in Morogoro urban and rural districts, just like in other places varies widely. Results (Table 4.3) show that only a minority of the farmers (24.6%) got land through inheritance. Parents provide parts of their land to their sons as part of inheritance. Majority of the farmers got land through purchasing (48.5%) and (12.3%) were allocated land by the local government. Other (14.6%) acquired

land through accessing 'free' land. It is obvious from these results that purchasing of land is a common practice in Morogoro rural district. Because land is not a private good in Tanzania, what is purchased is the right to use rather than to own the land.

Table 4.3: Distribution of respondents by land acquisition methods

Mode of land acquisition	Number	Percent
Inherited	32	24.6
Bought	63	48.5
Given by village government	16	12.3
Accessed free land	19	14.6
Total	130	100

Source: Survey data, 2001

4.3.3 Means for land preparation

Means for land preparation have a very important influence on the performance of any crop-producing farm. Research results (Table 4.4) show that 96.2% of the interviewed sugarcane and paddy farmers make use of tractors as their main means for preparing land. The abnormally high proportion of farmers who use tractors for land preparation (The national average is 10%, URT, 1997) can be attributed to the fact that sugarcane farmers can get the services on credit from the sugar factory to which they sell their cane. Furthermore, most of the interviewed rice farmers were also growing sugarcane and thus the higher usage of tractors for land preparation among rice farmers can be associated with the financial influence of cane farming. Only 3.9% of the interviewed farmers used the hand hoe as their main means for preparing land. The use of hand hoes for land preparation can be attributed to the poor irrigation water management that causes some fields to be water logged for most part of the year and thus making the use of tractors impossible. The MSE is the main source of tractor services and it is preferred by most sugarcane farmers because of its policy of

rendering its services on credit.

Table 4.4: Distribution of respondents by means of preparing land

Means of land preparation	Number	Percentage
Hand hoe	5	3.9
Tractor	112	86.2
Both	13	10
Total	130	100

Source: Survey data, 2001.

4.3.4 Comparative dairy herd distribution and composition

Table 4.5 presents the average herd size and composition for all the seven dairy farm size categories. Most of the surveyed farms keep grade/crossbred cattle. These are recommended by tropical animal scientists due to their relatively high resistance to tropical diseases as compared to exotic pure breeds. Furthermore crossbred cattle have a high milk production potential as an advantage over indigenous cattle breeds. The surveyed dairy farms were found to contain all categories of animals *i.e.* milking cows, heifers, bulls, and calves. On average the number of cows was found to vary from about 5 in the first category (below 10 cows) to around 56 cows in the last category (41-60 cows). Proportion of cows in a herd is of paramount importance in dairying than other groups as it contributes a large proportion of the revenue obtained in any dairy enterprise. A similar study in Zimbabwe (Sibanda, 1998) reported similar variations in dairy herd size and composition. In most cases, cows, occupied large portion (> 50%) of the herd.

Table 4.5: Comparative dairy herd distribution and composition

	Average Numbers per Category of Dairy farmers						
Category (No of cows)	<10	11-15	16-20	21-25	26-30	31-40	41-60
Cows	4.6	5.9	11.1	14.3	18.4	28.3	56.5
Heifers	1.2	2.5	2.9	5.8	4.0	5.9	11.0
Calves	2.9	3.6	3.5	3.8	3.4	7.5	13.3
Bulls / steers	0.4	0.6	0.4	0.6	0.8	0.6	1.6
Total	0.5	0.5	0.6	0.6	0.7	0.7	0.7

Source: Survey data, 2001.

4.3.5 Breeding practices

Breeding options open to dairy farmers are either natural methods using improved bulls or use of artificial insemination (AI) method using artificially preserved semen. The AI method is not popular to Tanzania farmers due to scarcity of semen and cost of equipment associated to it. Availability of improved bulls also presents another problem to medium-scale farmers who consider direct purchase of bull services expensive. Sometimes these farmers need to drive their cows very far in order to get the service since some of them do not own bulls.

Only 8.7% of dairy farmers interviewed in the study area were found to be using artificial breeding methods alone, on the other hand 71.8% of the dairy farms were found to practice natural breeding methods only. Furthermore, 19.4% of the dairy farmers were found to practice both natural and artificial insemination methods (Table.4.6).

High cost of AI compared to natural breeding methods makes it unpopular to medium-scale dairy farmers. Urassa (1999) reported that the cost of AI was almost twice that of natural breeding in Tanga region. Although the cost of artificial insemination was found to be less than twice that of improved bull service in the case

of Morogoro rural and urban districts, still it was relatively high enough to scare most of the medium scale dairy farmers.

Table 4.6: Distribution of dairy farmers by breeding method

Breeding method	Number	Percent
Artificial Insemination (AI)	9	8.7
Natural breeding	74	71.8
Both	20	19.4
Total	103	100.0

Source: Survey data 2001.

4.3.6 Breed preference

Table 4.7 shows that dairy farmers in Morogoro prefer improved dairy cattle over local cattle. The farmers were asked whether they prefer pure, cross or local breeds of cattle. Among the medium scale dairy farmers interviewed only 8.7% were found to prefer local cattle breeds. This is contrary to the national average where improved cattle breeds account for 1.4% and 0.6% of dairy and beef cattle respectively (URT, 1999). The high percentage of farmers keeping improved cattle breeds can be attributed to the fact that medium scale farmers have relatively wider capital bases which enable them to access expensive improved cattle breeds. On the other hand, 22.3 and 68.9% were found to prefer pure and cross breeds respectively.

Table 4.7: Distribution of dairy farmers by breed preference

Breed preferred	Number	Percent
Pure	23	22.3
Cross	71	68.9
Local	9	8.7
Total	103	100.0

Source: Survey data, 2001.

4.3.7 Problems facing medium scale farming in Morogoro

Respondents mentioned various factors that constrain their agricultural activities. Many farmers mentioned more than one problem (Table.4.8). Basing on the number

of times a factor was mentioned by the sampled farmers as an indicator of importance, high input prices, lack of capital to purchase inputs, shortage of extension services and unreliable input supply ranked as major constraints for medium scale farms. Other constraints mentioned were insect pest problems, shortage of land, soil fertility problems, harvest transport problems, lack of market, and shortage of hired labour.

Table 4.8: Problems encountered by medium scale farmers

Problem	Number	Percent
Shortage of land	48	36.9
Soil fertility problems	39	30.0
Shortage of extension services	84	64.6
Shortage of hired labour	15	11.5
Lack of market	22	16.9
High input prices	90	69.2
Unreliable input supply	83	63.8
Harvest transport problems	22	16.9
Insect pest problems	73	56.2
Lack of capital to purchase inputs	87	66.9

Source: Survey data 2001.

4.4. Availability of support services

4.4.1 Availability of agricultural inputs

In respect to whether there was any problem in obtaining inputs, 46.4% of the respondents reported to have been encountering some problems in getting agricultural inputs while the rest (53.6%) indicated that they did not face any problem (Table 4.9).

Table 4.9: Distribution of respondents by problems in obtaining inputs

Encountered Input problems	Dairy farmers		Sugarcane farmers		Total sample	
	Number	Percent	Number	Percent	Number	Percent
Yes	22	21.4	86	66.2	108	46.4
No	81	78.6	44	33.8	125	53.6
Total	103	100.0	130	100.0	233	100.0

Source: Survey data, 2001.

Access to the various agricultural inputs was reported to be a problem by 21.4 and 66.2% for dairy and sugarcane farmers respectively. Inputs referred to here include animal feeds, concentrates, veterinary drugs, fertilizers and other agro-chemicals. The

results in table 4.8 reveal that unavailability of inputs was more serious for sugarcane farmers (66.2%) than the case of dairy farmers (21.4%).

4.4.2 Credit services

Credit service to medium scale farmers is needed for them to be able to purchase inputs and pay for additional labour requirements that are associated with the use of agrochemicals such as fertilisers and herbicides. Currently access to formal rural finance facilities is limited in Tanzania. Even the few existing ones rarely do extend services for purely agricultural enterprises. There are more organisations that are willing to support non-agriculture micro enterprises than medium scale agriculture enterprises. However, there are few rural based credit providing institutions, which give credit in cash and/or in kind in Morogoro district.

Among the 233 interviewed dairy, sugarcane and paddy farmers 54.3% had access to credit facilities and the rest (46.7%) had no access. The proportion of respondents who had access to credit facilities was relatively higher in the case of sugarcane farmers whereby 72.3% of the respondents reported to have access to credit facilities (Table 4.10). The relatively higher proportion of sugarcane farmers who receive credit can be attributed to the fact that sugarcane farmers have reliable sources of credit obtainable from Mtibwa outgrowers association (MOA) and Mtibwa Sugar Estates (MSE). These two sources provide credit in both forms *i.e.* in kind and cash. MOA mainly provides credit in the form of cash while on the other hand MSE provide credit in kind. The MSE provide support in land preparation, provision of seed cane and harvesting and transport services. The sugarcane farmers are obliged to pay the entire loan with an interest of 10% in a single growing season.

The small proportion of dairy farmers who had access to credit facilities can be attributed to the absence and / or inaccessibility of credit facilities in the study area. This lead to a situation whereby farmers have to use their own savings to start the farms. This implies that although credit sources exist in Morogoro, securing the services is difficult on the side of medium scale dairy farmers.

Table 4.10: Distribution of respondents by access to credit services

Have access to credit	Dairy farmers		Paddy/sugarcane farmers		Total sample	
	Number	Percent	Number	Percent	Number	Percent
Yes	34	33.0	94	72.3	128	54.9
No	69	67.0	36	27.7	105	45.1
Total	103	100.0	130	100.0	233	100.0

Source: Survey data, 2001.

4.4.2.1 Sources of credit

As far as sources of credit are concerned, it was found that most of the respondents obtained credit from informal sources. The sources of credit that were found to be important in the study area are Mtibwa Sugar Estates (MSE), Mtibwa Outgrowers Association (MOA), relatives and friends and Banks. Among the three sources of credit MSE and MOA were the most important. Among the 99 sugarcane farmers who obtained credit, 85.9% obtained credit from either MOA or MSE. Only 14.1% claimed to have received credit from banks.

In the case of dairy farmers the important sources of credit were relatives, friends and Banks. Among the 34 dairy farmers who reported to have received credit, 88.2% obtained that credit from relatives and friends. Only 11.8 % obtained credit from banks (Table 4.11).

Table 4.11: Distribution of credit recipients by source of credit

Source of credit	Dairy farmers		Sugarcane farmers		Total sample	
	Number	Percent	Number	Percent	Number	Percent
Bank	4	11.8	14	14.1	18	13.5
MSE / MOA	N/A	N/A	85	85.9	85	63.9
Relatives / friends	30	88.2	N/A	N/A	30	22.6
Total	34	100.0	99	100.0	133	100.0

Note: N/A = Not applicable.
Source: Survey data, 2001.

It can be concluded from the findings of this study that informal sources of credit play a very big role in both dairy and sugarcane production. This is in line with studies by Aredo, 1995; Bouman, 1977; Chandavarkar, 1985; and Miracle *et al.*, 1980 all of which found informal sources of credit to be important to both agriculture and non-agricultural enterprises.

4.4.3 Extension services

Extension services are important as far as productivity of agricultural enterprises are concerned. Survey results indicate that 47.2% of the respondents interviewed had access to extension services and the remaining 52.8% claimed to have difficulties in getting extension services. The problem of difficulties in accessing extension services seems to be more serious in the case of sugarcane and paddy farmers than dairy farmers. The number of respondents who claimed to have no access to extension services constituted 64.6% and 37.9% for sugarcane/paddy farmers and dairy farmers respectively (Table 4.12). The relatively lower percentage of respondents who had no access to extension services on the side of dairy farmers can be attributed to the fact that there exists several animal health clinics in the study area which apart from providing medical services to their clients they also provide advice on proper management practices to avoid high recurrence of ill health to the animals.

On the side of sugarcane and paddy farmers the lower proportion of respondents with access to extension services can be attributed to the fact that there exists no elaborate extension services in the study area. The Tanzanian sugarcane research institute have noted the problem and it has just started to persuade the farmers to adopt practices such as use of fertilizers, herbicides and improved planting materials by establishing demonstration plots in the study area. Unfortunately, however these efforts are facing several problems, the most important problem is the inaccessibility of the inputs they promote to farmers. It is interesting to note that both the Mtibwa Outgrowers Association (MOA) and the Mtibwa Sugar Estates (MSE) have also noted the problem of inadequate extension services. In response to the problem of inadequate extension services, the MSE has started an outgrowers unit, which apart from other duties is charged with the responsibility of providing extension services to cane growers. Unlike the Tanzania sugarcane research institute, the outgrowers unit of the MSE provides inputs such as improved planting materials and agrochemicals on credit. This is likely to be more effective than only providing the technical information. It is appealing to note further that efforts are underway for the MOA to start a similar initiative.

Table 4.12: Distribution of respondents by access to extension services

Have access	Dairy farmers		Sugarcane and paddy farmers		Total sample	
	Number	Percent	Number	Percent	Number	Percent
Yes	64	62.1	46	35.4	110	47.2
No	39	37.9	84	64.6	123	52.8
Total	103	100.0	130	100.0	233	100.0

Source: Survey data, 2001

4.5 Association of some selected variables

Table 4.13 gives cross tabulation results for some selected variables. The results reveal that access to credit services is highly associated with means of preparing land, enterprise productivity and use of fertilizers and other agrochemicals. It can be noted further that access to credit facilities is also associated with the farmer's level of education.

The high association between access to credit facilities and the means for preparing land, enterprise productivity and use of fertilizers and other agrochemicals can be attributed to the fact that access to credit facilities eases off the capital constraint. This puts the farmer at a better position to buy or hire modern land preparation machines, purchase fertilizers and other agrochemicals, which have a positive relationship with yield and hence farm productivity.

It can also be noted that the access to extension services has a weak association with all the selected variables *i.e.* farmers level of education, means for preparing land and the breeding method employed. The weak association between the access to extension services and the selected variables can be attributed to the fact that extension services in the study area are inefficient. The inefficiency of the extension services can be attributed to the shortage of necessary infrastructure, competent field staff, funding and poor research-extension-farmer linkages that has also been reported in URT, 1999.

Table 4.13: Cross tabulation results for some selected variables

Cross tabulated variables	Chi-square	df	Significance level
Means of preparing land * Access to credit facilities	25.814	2	0.045*
Farmer's level of education * Shortage of extension services	4.086	3	0.252
Categories for average productivity * Access to extension services	11.542	6	0.073
Categories for average productivity * Access to credit facilities	21.814	5	0.001**
Use of fertilizers and other Agrochemicals * Access to credit facilities	14.397	2	0.035*
Access to extension services * Breeding method in use	3.666	2	0.16
Access to credit services * Breeding method in use	3.714	2	0.156
Farmer's Level of Education * Breeding method in use	5.337	4	0.254

Note: * significant at 5%; ** significant at 1%
Source: Survey data 2001.

4.6 Dairy, Sugarcane and Paddy enterprises budget analysis

4.6.1 Dairy enterprises budget analysis

For all categories of dairy farms, enterprise budgets were prepared and analysed. The budgets were based on the average production costs and return per cow per year for the 1999/2000-production season. Non-marketed outputs and inputs such as milk consumed at the family level and family labour respectively were evaluated at their market equivalent values. Average annual depreciation costs for the fixed inputs were calculated using the straight-line method as described by Barnard and Nix (1979). Average cots of variable inputs such as veterinary services, feeds, hired labour and transport was based on prices reported by farmers.

Table 4.14 presents average dairy enterprise budgets for the different size categories. All costs are presented on per milking cow basis. The variable costs varied widely among the different size categories with the lowest cost per animal being obtained in

the category of farmers with between 31 and 40 milking cows where the average variable cost per cow was found to be Tshs 8,181. Fixed costs were found to decrease continuously with increasing numbers of milking cows whereby the value for the category of farmers with the lowest and highest numbers of milking cows were found to be Tshs 165,173 and 74,773 respectively.

Just like the various costs, gross returns varied widely among the different categories of dairy farmers. Farmers in the first category received the lowest average annual income per milking cow (536,778/=) while on the other hand the highest average annual income per milking cow (877,269/=) was obtained in the last category *i.e.* 41-60 milking cows. In all categories milk was the main source of revenue. It represented over 80% of the total cash income for all size categories.

It is interesting to note that the Economic Farm Surplus (EFS) values were positive for all size categories. The positive EFS values for all the size categories imply that medium scale dairy enterprises in Morogoro are profitable. The highest EFS value was obtained in the category of farmers with between 41 and 60 milking cows. The most fascinating observation as far as the present study is concerned is the rapid increase in the EFS values with increases in the number of milking cows, which suggests that the size of an enterprise has a positive influence on its profitability. The continuously increasing EFS values with increasing number of milking cows can be attributed to the continuously decreasing average cost with increasing number of milking cows. Furthermore, the increase in EFS values can be attributed to the increase in average annual incomes with increasing number of animals. This increase

in average annual incomes can be attributed to the fact that increases in number of animals is likely to be associated with improved husbandry practices (which is common with widening capital bases) leading to increased herd productivity and hence increases in incomes obtained from milk sales. In addition to the increased productivity the increasing EFS values can be attributed to the increase of herd adjustment and income from sales of animals, which tend to increase faster than the average cost.

Similar findings have been reported by Sibanda (1998) in his study of dairy enterprises in Zimbabwe and Limbu (1998) in his study on the profitability of dairy enterprises where he reported gross margin values ranging from Tshs 70,000 per cow per year for indigenous small scale farmers to Tshs 600,000 per cow per year for medium scale farmers located around the Dar es Salaam city in Tanzania.

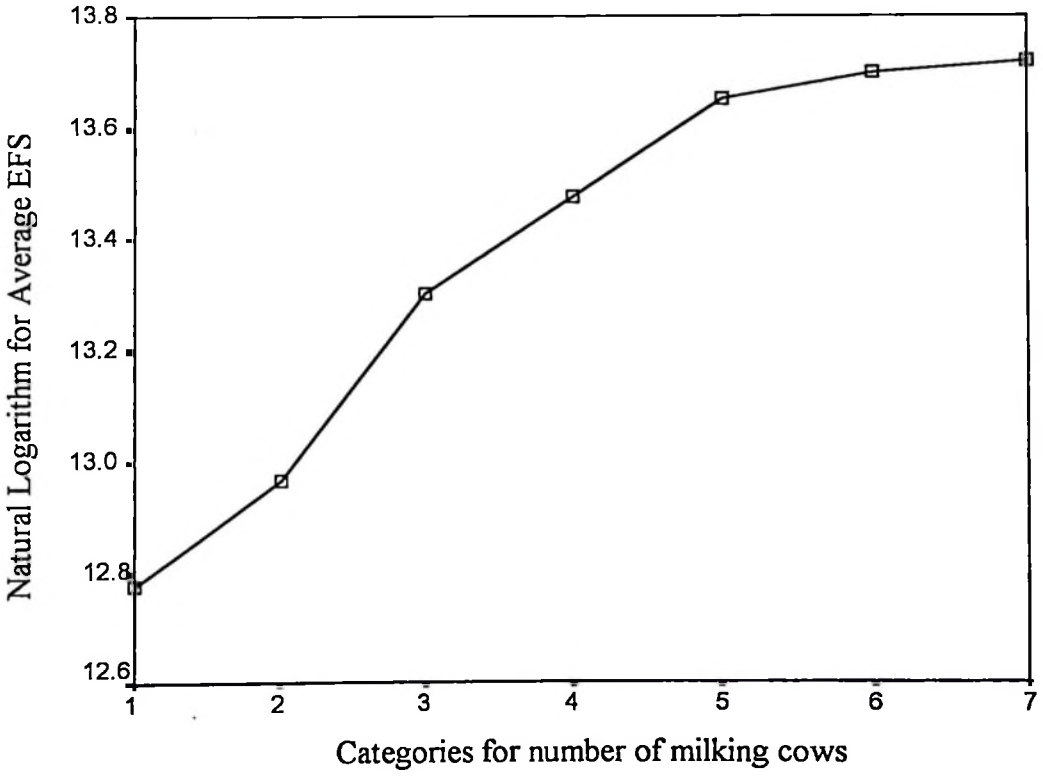
It is important to note here that the gross margin calculation does not take into account the overhead costs and thus the corresponding EFS values for farmers with a gross margin value of Tshs 70,000 per cow per year, as reported by Limbu (1998), is definitely lower than Tshs 70,000 and it might be negative. It can be concluded from the findings of this study that the profitability of medium scale dairy enterprises increases with increasing numbers of milking cows meaning that operating at very small scale (few animals) denies the farmer the increased 'profit' that is associated with the increase in the number of animals. The budget analysis findings are comparable to those of cross tabulation, which also suggested the existence of a close relationship between the size and productivity of the livestock enterprises.

Table 4.14: Average dairy enterprise budget (Tshs)

Category (Number of cows)	<10	%	11-15	%	15-20	%	21-25	%	26-30	%	31-40	%	41-60	%
Revenue														
Value of milk	459294	85.6	559140	84.4	692028	91.0	727158	90.5	747777	90.5	760430	80.9	764901	87.3
Sales of culled animals	22942	4.3	28918	5.3	22331	2.9	20568	2.6	25279	3.2	35915	3.8	56875	6.4
Total cash income	482236	89.9	588058	89.7	734359	93.9	747726	93.0	773056	94.9	796345	84.7	821776	93.8
Stock adjustment	54542	10.1	56002	10.3	48156	6.1	40318	5.1	40378	5.1	64062	6.8	55494	6.3
Total revenue	536778	100.0	644060	100.0	762515	100.0	788044	100.0	813434	100.0	860407	100.0	877269	100.0
Variable costs														
Labour:														
Casual labour	6904	58.5	7083	52.3	12372	64.5	8350	54.6	4400	44.6	3087	37.7	3546	34.2
Other variable costs	4907	41.5	6467	47.7	6821	35.5	6950	45.4	5472	55.4	5093	62.3	6823	65.8
Sub total	11812	100.0	13551	100.0	19194	100.0	15300	100.0	9872	100.0	8181	100.0	10370	100.0
Total Working Expenses														
Fixed cost:														
Permanent labour	17333	10.5	18428	12.2	18819	14.7	21250	23.7	19400	24.4	20625	23.1	19461	26.0
Labour Adjustment	33854	20.5	35993	23.9	36755	28.7	41503	46.3	37890	47.6	40283	45.1	38588	51.6
Dairy shed	63526	38.5	54450	36.1	29588	23.1	10542	11.8	10962	13.8	13819	15.5	6761	9.0
Spray Pump	11105	6.7	8610	5.7	4639	3.6	3047	3.4	2462	3.1	3901	4.4	2830	3.8
Cow purchase	11657	7.1	9200	6.1	2674	2.1	2471	2.8	1086	1.4	1304	1.5	487	0.7
Milk equipment/containers	2292	1.4	2369	1.6	899	0.7	868	1.0	722	0.9	1407	1.6	1820	2.4
Depreciation on equipment / structures	25403	15.4	21770	14.4	15430	12.1	9876	11.0	7054	8.9	7928	8.9	4823	6.5
Total fixed costs	165173	100.0	150823	100.0	108808	100.0	89561	100.0	79579	100.0	89269	100.0	74773	100.0
Total cost	176985		164374		128002		104861		89451		97450		85143	
EFS / cow/year	359793		479686		634513		683183		723983		762957		792126	

Source: Survey data, 2001.

In order to give a clear picture of the trend of Economic Farm Surplus (EFS) values with increasing number of cows as denoted by the seven size categories, a graphical presentation of that trend is given in figure 4.1. It can be noted from the figure that there is a rapid increase in the EFS values in the first five categories. This is important because it sheds light on the potential benefits that are lost by the farmers who operate on a very small scale. Although the EFS values continue to increase beyond the fifth category, the decrease in the gradient suggests a decline in the rate at which it increases with increasing herd size. It can be noted from the figure that despite the large increase in the number of milking cows from a range of 31-40 in the sixth category to 41-60 in the last size category the corresponding further decrease in the gradient makes the sixth category to be the best size for the medium scale dairy farmers.



1 = Below 10 cows; 2 = 11-15 cows; 3 = 16-20 cows; 4 = 21-25 cows;
5 = 26-30 cows; 6 = 31-40 cows; 7 = 41-60 cows

Figure 4.1: Graphical illustration of the variation of Average EFS

4.6.2 Sugarcane and Paddy enterprises budget analysis

For all categories of sugarcane and paddy farms, enterprise budgets were prepared and analysed. The budgets were based on the average production costs and return per hectare for the 1997/98, 1998/1999 and 1999/2000-production seasons. Non-marketed outputs and inputs such as rice consumed at the family level and family labour respectively were evaluated at their market equivalent values. The estimation of average cots for variable inputs such as fertilizers, seed cane, paddy seeds, land preparation charges, hired labour and transport was based on prices as reported by farmers.

Table 4.15 presents average sugarcane and paddy enterprise budgets for the different size categories. It is interesting to note that the gross margin values for all size categories were found to be positive. More important to the interest of this study the average gross margin for the different size categories were found to increase with increasing size for both sugarcane and paddy farmers. The minimum gross margin values were found in the first categories for both sugarcane and paddy farmers. The values in the first categories were Tshs 266,600 and 216,275 for sugarcane and paddy respectively. On the other hand the highest values were found in the last categories where the gross margin values per hectare were found to be Tshs 568,028 and 304,736 for sugarcane and paddy respectively.

The increase in the average gross margin per hectare with increasing farm size was found to be more conspicuous in the case of sugarcane than paddy farmers. This can be attributed to the fact that the price of sugarcane varied widely with cane quality while the price of paddy was almost uniform. The variation of cane price was

expected to benefit relatively large farms, which had access to important inputs such as fertilizers and herbicides. The use of improved husbandry practices that is associated with increases in farm sizes is likely to lead to a relatively higher cane quality and hence high prices.

Furthermore the differences that exist in values of GM per hectare for the different size categories can be attributed to the decrease in unit transport cost with increase in volume of produce, as the transport costs are likely to be lower for relatively larger farmers who have their own means of transport. Since transport costs constitute one of the important costs included in the computation of the gross margins then there is no wonder that the gross margins obtained had a close positive relationship with the volume of produce, which in turn have a positive relationship with the farm size. Similar variations in productivity have been reported by Peterson (1997) in his study entitled *Are large-scale farms more efficient?* It can be concluded from the finding of this study that the profitability of medium scale sugarcane and paddy production in Morogoro increase with increasing farm size meaning that operating at a small scale denies the farmer the increased profit that is associated with increases in farm size. Thus it can be concluded that although a very large farm size is not a prerequisite for optimality, the policy advocated levels of 0.5 to 2.5 hectares for field crops and from 1 to 5 cows for livestock enterprises are just too small and economically unjustifiable.

It is worthwhile noting here that the close association between the size and profitability of the enterprises suggested by the budget analysis confirms a similar proposition by the cross tabulation findings.

Table 4.15: Average sugarcane and paddy enterprise budgets (Tshs)

Category (ha)	<10	%	11-15	%	15-20	%	21-25	%	26-30	%	31-35	%	36-40	%	41-45	%	>45	%
Gross revenue/ha																		
Sugarcane	610277		731587		774981		809807		884128		890484		900089		937525		962018	
Paddy	378665		411145		411145		441833		441833		435205		435205		454606		493296	
Variable costs																		
Harvest & transport																		
Sugarcane	181240	52.7	197000	54.3	204880	55.3	2127604	56.3	220640	57.3	224580	58.0	226550	58.3	228520	58.4	232460	59.0
Paddy	40180	24.7	42140	25.8	42140	25.8	0700	23.6	40700	23.6	39200	24.6	39200	24.6	41522	23.6	43610	23.1
Land preparation																		
Sugarcane	35750	10.5	35750	9.8	35000	9.4	34721	9.2	34500	9.0	34500	9.0	33950	8.7	33500	8.6	32800	8.3
Paddy	36786	22.7	40083	24.5	40083	24.5	40937	23.7	40937	23.7	41416	25.9	40416	25.9	39404	22.4	41250	21.9
Other inputs																		
Sugarcane	37187	10.8	40836	11.3	41200	11.1	41194	10.9	42118	10.9	42988	11.0	43500	11.3	45923	11.7	46218	11.7
Paddy	36962	22.8	32300	19.7	32300	19.7	41025	23.8	41025	23.8	33000	20.7	33000	20.7	43428	24.7	48250	25.6
Hired labour cost																		
Sugarcane	89500	26.0	89500	24.7	89768	24.2	89000	23.6	87587	22.8	85525	22.1	84427	21.7	83503	21.3	82512	20.9
Paddy	48462	29.8	49100	30.0	49100	30.0	50050	29.0	50050	29.0	46000	28.8	46000	28.8	51742	29.4	55450	29.4
Total Variable costs																		
Sugarcane	343677	100.0	363086	100.0	370848	100.0	377675	100.0	384845	100.0	387593	100.0	388427	100.0	391446	100.0	393990	100.0
Paddy	162390	100.0	163623	100.0	163623	100.0	172712	100.0	172712	100.0	159616	100.0	159616	100.0	176096	100.0	188560	100.0
GM /ha																		
Sugarcane	266600		368501		404133		432132		499283		502891		511662		546079		568028	
Paddy	216275		247522		247522		269121		269121		275589		275589		278510		304736	

Source: Survey data, 2001.

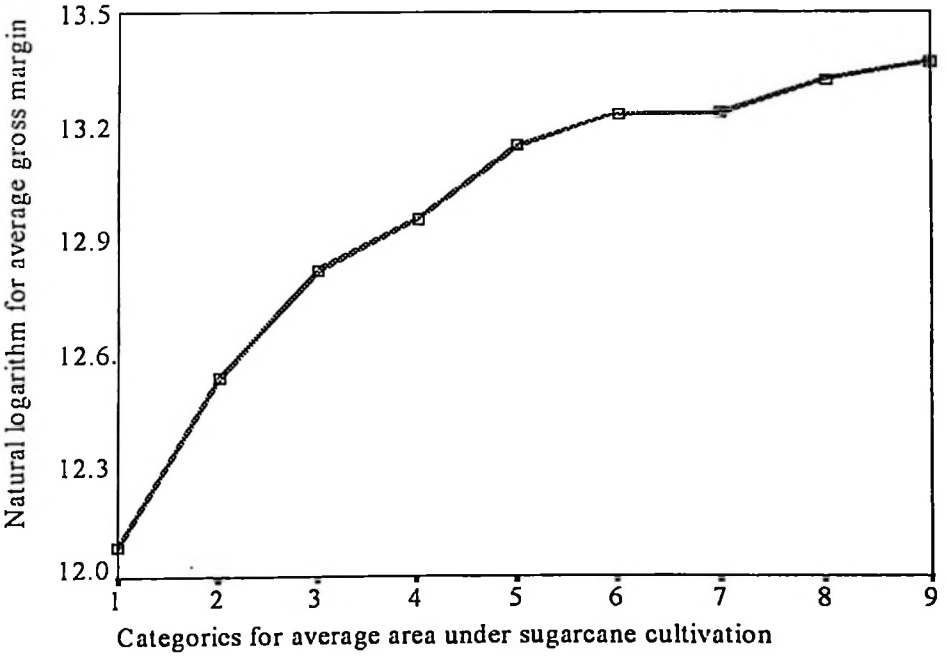
Figure 4.2 & 4.3 gives graphical presentation of the movement of the gross margin values with changes in farm sizes for sugarcane and rice farms respectively. It can be easily noted from the two figures that there is a rapid increase in the gross margin values from the first to the fourth and sixth categories for rice and sugarcane farms respectively. It can be noted further that the rate of increase of the average gross margin decreases rapidly beyond those categories *i.e.* the fourth category for rice farms and the sixth category for sugarcane farms. This rapid increase in gross margin values as one moves from small to relatively larger farm size is very striking as far as this study is concerned. This is because it confirms the argument that operating at very small scale denies the farmer the benefits associated with increased farm size meaning that an agriculture sector that is dominated by small-scale farmers is likely to be inefficient in the quest of spearheading economic development.

The rapid increase in the value of the average gross margin in the first six categories can be attributed to the fact that the increase in farm size is associated with widening of capital bases which is usually associated with improved crop husbandry. The improved crop husbandry is likely to result into production of large amounts of high quality cane per hectare. This is because just like any other crop the quality of cane produced depends on the quality of the propagules used *i.e.* the seed cane used, and the quality of management given to the crop while in the field both of which are likely to be enhanced by the widened capital bases. Consequently farmers with relatively wider capital bases are likely to produce relatively larger quantities of high quality sugarcane and/or rice.

The quality of sugarcane is measured by the percentage of sugar in the cane. Since the price of sugarcane varies widely with quality, farmers with higher quality cane are likely to

get more money per hectare than those with low quality cane. The cane price per tone for the 2000/2001 growing season ranges from Tshs 3,867 for the least quality cane to 16,888 for the highest quality cane. A full picture of the variation of cane price with varying sugar content is given in appendix three.

It can be noted further from the two figures that despite the fact that the last category, for the case of sugarcane included all farms with harvestable areas under sugarcane of more than 45 hectares, the increase in the gross margin values was very diminutive. The small increase in gross margin values accompanied by the large increase in farm size beyond the eighth category makes it plausible to recommend that the optimum size for medium scale sugarcane farmers lies in the eighth category *i.e.* 40-45 hectares. In the case of rice farms the very little increase in gross margin values beyond the 30-hectare mark means that the data suggests a cut-off point of 30 hectares.



1 = Below 10 ha; 2 = 11-15 ha; 3 = 16-20 ha; 4 = 21-25 ha; 5 = 26-30 ha; 6 = 31-35 ha; 7 = 36-40 ha; 8 = 41-45 ha and 9 = Above 45 ha

Figure 4.2: Graphical illustration of the variation of Average GM

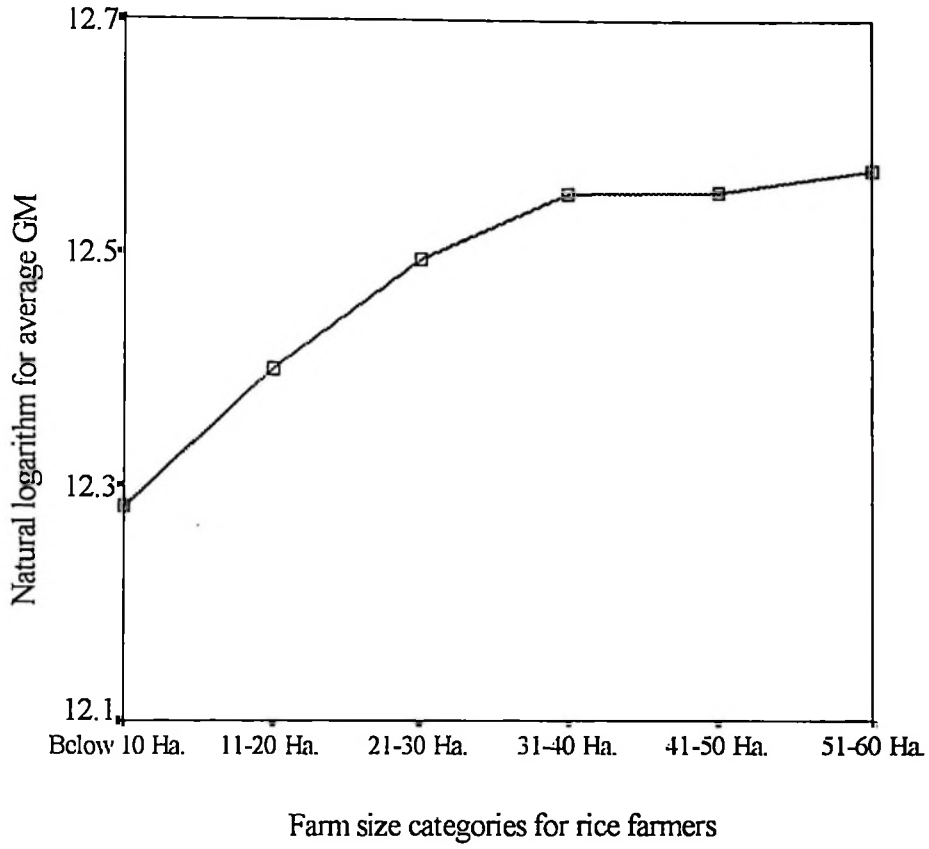


Figure 4.3: Graphical illustration of the variation of Average GM

4.7 Means separation and regression analysis results

4.7.1 Means separation results

To test the effect of the size of an enterprise on its profitability one-way analysis of variance (ANOVA) was employed. The ANOVA was aimed at comparing the gross margins for the different farm size categories for the case of sugarcane and paddy farms. In the case of dairy enterprises a similar procedure was used to compare the EFS values for the different dairy enterprises size categories.

Results, tables 4.16, 4.17 and 4.18 shows that the variations in mean EFS and GM values for the different dairy sugarcane and paddy enterprises size categories were statistically

significant ($p < 0.05$) for most of the mean pairs compared. A close examination of the results shows that the differences in the EFS and GM values were not significant for the means of close size categories *i.e.* the far apart the categories were the higher the possibility of their means being statistically significantly different at the five percent level of significance. This implies that there is a continuous increase in the EFS and GM values with increase in the size of the studied agricultural enterprises *i.e.* the number of cows for dairy enterprises and areas under cultivation for sugarcane and paddy farms.

The differences in the Gross margin and Economic Farm Surplus values can be attributed to the variations in the average yields for the sugarcane, paddy and dairy enterprises. Increases in yields with increasing sizes of the enterprises were observed for all enterprises studied. Furthermore there were variations in cane quality that are thought to have contributed to the observed variations in gross margin values for sugarcane enterprises. In case of the dairy enterprises, apart from the observed increases in yields with increasing numbers of milking cows, the variations in the EFS values can be attributed to the large variations in the average fixed cost among the different size categories.

The differences in yields suggested by the means separation procedure reiterate the importance of the size of an enterprise on its profitability, which was previously suggested by the budget analysis and cross tabulation exercise.

Table 4.16: Multiple comparisons of EFS values for different size categories

(I) Size categories	(J) Size categories	Mean difference (I-J)	Significance Level
Below10 cows	11-15 cows	-74524.95	0.756
	16-20 cows	-33977.80	0.200
	21-25 cows	-58045.10	0.276
	26-30 cows	-95625.00*	0.026
	31-40 cows	-90973.70*	0.011
	41-60 cows	-168919.00*	0.000
11-15 cows	Below10 cows	74524.95	0.756
	16-20 cows	-25645.80	0.303
	21-25 cows	-43350.10	0.347
	26-30 cows	-88170.00*	0.037
	31-40 cows	-148795.20*	0.025
	41-60 cows	-156394.00*	0.000
16-20	Below10 cows	33977.80	0.200
	11-15 cows	25645.80	0.303
	21-25 cows	-17067.30	0.706
	26-30 cows	-65257.20	0.146
	31-40 cows	-57875.20	0.108
	41-60 cows	-130794.00*	0.000
21-25	Below10 cows	58045.05	0.276
	11-15 cows	43350.10	0.347
	16-20 cows	17067.30	0.706
	26-30 cows	-44889.90	0.438
	31-40 cows	-41727.90	0.446
	41-60 cows	-113874.00*	0.023
26-30	Below10 cows	95625.00*	0.026
	11-15 cows	88170.00*	0.037
	16-20 cows	65257.20	0.146
	21-25 cows	44889.90	0.438
	31-40 cows	-6462.00	0.925
	41-60 cows	-68684.20	0.134
31-40	Below10 cows	90973.70*	0.11
	11-15 cows	148795.20*	0.017
	16-20 cows	57875.20	0.108
	21-25 cows	41727.90	0.446
	26-30 cows	-6462.00	0.925
	41-60 cows	-72146.20	0.062
41-60	Below10 cows	168919.00*	0.000
	11-15 cows	156394.00*	0.000
	16-20 cows	130794.00*	0.000
	21-25 cows	113874.00	0.23
	26-30 cows	68684.25	0.134
	31-40 cows	729146.25	0.062

Source: Survey data, 2001

Table 4.17: Multiple comparisons of GM values for different size categories

(I) Size categories	(J) Size categories	Mean difference (I-J)	Significance Level
	11-15 ha	-2.1683*	0.000
	16-20 ha	-3.8011*	0.000
	21-25 ha	-5.1414*	0.000
Below 10 ha	26-30 ha	-6.1730*	0.000
	31-35 ha	-6.6188*	0.000
	36-40 ha	-7.7000*	0.000
	41-45 ha	-9.7644*	0.000
	Above 45 ha	-12.2984*	0.000
	Below 10 ha	2.1683*	0.000
	16-20 ha	-1.6328	0.055
	21-25 ha	-2.9730*	0.000
11-15 ha	26-30 ha	-4.0047*	0.000
	31-35 ha	-4.4505*	0.009
	36-40 ha	-5.5316*	0.000
	41-45 ha	-7.5960*	0.000
	Above 45 ha	-10.1301*	0.000
	Below 10 ha	3.8011*	0.000
	11-15 ha	1.6328	0.055
	21-25 ha	-1.3403	0.177
15-20 ha	26-30 ha	-2.3719*	0.023
	31-35 ha	-2.8177	0.117
	36-40 ha	-3.8988*	0.005
	41-45 ha	-5.9632*	0.000
	Above 45 ha	-8.4973*	0.000
	Below 10 ha	5.1414*	0.000
	11-15 ha	2.9730*	0.000
	16-20 ha	1.3403	0.177
21-25 ha	26-30 ha	-1.0316	0.297
	31-35 ha	-1.4775	0.402
	36-40 ha	-2.5586	0.057
	41-45 ha	-4.6230*	0.002
	Above 45 ha	-7.1570*	0.000
	Below 10 ha	6.1730*	0.000
	11- 15 ha	4.0047*	0.000
	16-20 ha	2.3719*	0.023
26-30 ha	21-25 ha	1.0316	0.297
	31-35 ha	-0.4458	0.803
	36-40 ha	-1.5270	0.265
	41-45 ha	-3.5914*	0.019
	Above 45 ha	-6.1254*	0.000
	Below 10 ha	6.6188*	0.000
	11-15 ha	4.4505*	0.009
	16-20 ha	2.8177	0.117
31-35 ha	21-25 ha	1.4775	0.402
	26-30 ha	0.4458	0.803
	36-40 ha	-1.0811	0.589
	41-45 ha	-3.1455	0.137
	Above 45 ha	-5.6796*	0.002
	Below 10 ha	7.7000*	0.000
	11-15 ha	5.5316*	0.000
	16-20 ha	3.8988*	0.005
36-40 ha	21-25 ha	2.5586	0.057
	26-30 ha	1.5270	0.265
	31-35 ha	1.0811	0.589
	41-45 ha	-2.0644	0.243
	Above 45 ha	-4.5984*	0.001
	Below 10 ha	9.7644*	0.000
	11-15 ha	7.5960*	0.000
	16-20 ha	5.9632*	0.000
41-45 ha	21-25 ha	4.6230*	0.002
	26-30 ha	3.5914*	0.019
	31-35 ha	3.1455	0.137
	36-40 ha	2.0644	0.243
	Above 45 ha	-2.5341	0.094
	Below 10 ha	12.2984*	0.000
	11-15 ha	10.1301*	0.000
	16-20 ha	8.4973*	0.000
Above 45 ha	21-25 ha	7.1570*	0.000
	26-30 ha	6.1254*	0.000
	31-35 ha	5.6796*	0.002
	36-40 ha	4.5904*	0.001
	41-45 ha	2.5341	0.094

Note: Gross margins were transformed by using natural logarithm

Source: Survey data, 2001

Table 4.18: Multiple comparisons of GM values for different size categories

(I) Size categories	(J) Size categories	Mean difference (I-J)	Significance Level
Below 10 ha	11-20 ha	-10248.79	0.837
	21-30 ha	-31847.41	0.330
	31-40 ha	-38315.54	0.442
	41-50 ha	-41236.16	0.233
	51-60 ha	-67462.25*	0.042
11-20 ha	Below 10 ha	10248.78	0.837
	21-30 ha	-21598.62	0.699
	31-40 ha	-28066.75	0.677
	41-50 ha	-30987.37	0.586
	51-60 ha	-57213.47	0.307
21-30 ha	Below 10 ha	31847.41	0.330
	11-20 ha	21598.62	0.699
	31-40 ha	-6468.12	0.908
	41-50 ha	-9388.75	0.826
	51-60 ha	-35614.84	0.389
31-40 ha	Below 10 ha	38315.54	0.442
	11-20 ha	28066.75	0.677
	21-30 ha	6468.12	0.908
	41-50 ha	-2920.62	0.959
	51-60 ha	-29146.72	0.602
41-50 ha	Below 10 ha	41236.16	0.233
	11-20 ha	30897.37	0.586
	21-30 ha	9388.75	0.826
	31-40 ha	2920.62	0.959
	51-60 ha	-26226.09	0.539
51-60 ha	Below 10 ha	67462.25*	0.042
	11-20 ha	57213.46	0.307
	21-30 ha	35614.84	0.389
	31-40 ha	29146.72	0.602
	41-50 ha	26226.09	0.539

Source: Survey data, 2001

4.7.2 Regression analysis results

To test the effect of the various factors, which were hypothesized to influence the profitability of medium scale agricultural enterprises, three different regression equations were estimated. The first equation was aimed at examining the influence of farm size, access to credit facilities, access to extension services, and the education level of the owner of the farm on the productivity of dairy enterprises. The second and third models were aimed at examining the influence of the same variables on the profitability of sugarcane and paddy farms respectively.

Results for the estimation of the three regression equations are presented in tables 4.19 and 4.20. The results show that all coefficients, as expected, were positively related to the profitability of dairy, sugarcane and paddy enterprises. Although all parameters were found to be positive, only those parameters attached to access to credit facilities and farm size were found to be statistically significant ($p<0.05$).

The positive relationship between the size and profitability of the dairy enterprises can be attributed to the fact that the average fixed cost varies inversely with the number of milking cows *i.e.* the average fixed cost decreases with increasing numbers of cows. The decrease in average fixed cost means increase in the EFS values since the average fixed costs constitutes one of the important variables subtracted from the total revenue in the process of computing the EFS. Furthermore the increasing Economic Farm Surplus (EFS) can be attributed to the fact that increase in numbers of animals was found to be closely associated with increases in the values of herd adjustment, average milk production and sales of live animals which have a positive effect on the average annual revenue and hence the EFS values.

In the case of sugarcane and paddy farms the observed positive relationship between the size and profitability can be attributed to the fact that the increase in farm size has been found to be associated with widening of capital bases which are known to have positive influence on farm productivity. The positive influence of widening capital bases on profitability are thought to originate from the fact that relatively wider capital bases enable farmers to access inputs such as fertilizers and herbicides with little difficult and also to carry out the different agronomic practices in the appropriate time. This leads to an increase in both the production per unit hectare and the quality of the cane and rice produced. Since cane price is very sensitive to cane quality an increase in quality is likely to increase the income obtained. Furthermore the increased yield for cane and/or rice, regardless of the price differences, means a further increase in revenue. The observed positive relationship between the size of an enterprise and the GM/EFS values is in line with the cross tabulation, enterprises budget and means separation analyses results which suggested the existence of a close association between the GM/EFS values and the enterprise size.

The positive relationship between access to credit facilities and the profitability of the examined medium scale dairy, sugarcane and rice enterprises can be attributed to the fact that farmers with access to credit facilities had advantage over their counterparts without access in terms of the ability to manage properly their farms. This is because access to credit facilities eases off farmers' capital constraints and hence facilitate both capital widening and deepening. In the case of dairy enterprises access to credit enables the farmers to expand their herd sizes and access improved inputs such as industrial feed supplements and superior veterinary services which in turn have a

direct positive influence on the productivity of the herds and hence their profitability.

The positive effect of the access to credit on the profitability of the examined medium scale sugarcane and paddy farms can be attributed to the fact that farmers with access to credit facilities have an advantage over their counterparts who have no access in terms of ability to expand their farms and access to improved inputs such as agrochemicals and high quality planting materials which influences the profitability of the farms. The positive relationship between the access to credit facilities and the enterprise size suggested by the regression analysis reiterates the cross tabulation results from which a similar conclusion was made.

The insignificance of the parameter attached to the levels of education of the owners of the farms can be attributed to the fact that most of the interviewed farmers had reasonable levels of education which enable them to make sense of plausible innovations in animal, sugarcane and rice production. Comparable findings were obtained with cross tabulation where the levels of education of the owners were found to be weakly associated with the productivity of their enterprises.

The insignificance of the parameter attached to the variable of access to extension services can be attributed to the fact that the measurement of access to extension services was based on farmers response and it is speculated that even those who claimed to have no access to extension services had access to alternative sources of technical information such as other farmers, private veterinary medics or paramedics and private input dealers. This leads to a situation whereby the productivity of farmers without access to extension services is as good or bad as that of those who had access

to the services. Furthermore as pointed earlier in chapter two the Tanzanian extension and research systems have for a long time targeted small scale farmers meaning that given the differences in technical information requirements between small and medium scale farmers there is a high possibility that the technical information that is being provided by the extension system is inappropriate to medium scale farmers. These are expected to be the reasons behind the insignificance of the parameter attached to the access to extension services. Since cross tabulation aimed at testing the association between the access to extension services and the productivities of the enterprises under study suggested a weak relationship between those variables then the regression analysis results are in total conformity with the cross tabulation results.

It can be noted from the results (table 4.19 & 4.20) that the coefficients of determination (R^2) are 73%, 63.5% and 77.7% for sugarcane, paddy and dairy farms respectively. This means that the independent variables altogether account for 73% and 63.5% of the total variations in the Gross Margin (GM) values for sugarcane and paddy respectively. It can be noted from table 4.19 that the coefficient of determination for the model having the Economic Farm Surplus (EFS) values as its dependent variable is 77.7% meaning that only 22.3% of the variations in EFS values is attributed to other factors that are not included in the model.

Table 4.19: Regression analysis results for dairy enterprises

Dependent variable: Natural logarithm for average EFS value

Variable	B	Std Error	T	Significance level
(Constant)	11.292	0.422	26.768**	0.000
FSIZE	0.129	0.037	3.470**	0.001
EDUCAT	0.104	0.080	1.304	0.197
CRED	0.200	0.098	2.040*	0.046
EXT	0.094	0.137	0.685	0.496

R^2 = 79.2% F – Value = 54.110**
$\overline{R}^2$ = 77.7% SE = 0.439
Note: **Significant at 1%
*Significant at 5%

Table 4.20: Regression analysis results for sugarcane and rice farmers

Dependent variable: Natural logarithm for average gross margin

	Sugarcane farms			Paddy farms		
Variable	B	Std Error	T-ratio	B	Std Error	T-ratio
(Constant)	18.525	0.817	22.657	B	Std Error	T
FSIZE	1.227	0.079	15.346**	10.801	11.639	0.928
EDUCAT	0.092	0.184	0.500	6.708	2.951	2.273*
CRED	1.48	0.557	2.658**	8.348	11.281	0.74
EXT	0.411	0.295	1.393	9.731	1.073	9.067**
	R^2 = 73.8%	F – Value = 87.514**		R^2 = 66.6%	F – Value = 21.532**	
	$\overline{R}^2$ = 73.0%	SE = 2.230		$\overline{R}^2$ = 63.5%	SE = 49737.31	

Note: ** = significant at 1%
* significant at 5%

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Several principal findings emerged from the analyses in relation to the hypotheses formulated to address the study objectives.

The first objective of this study was to examine the profitability of medium scale agricultural enterprises. To address this objective the study hypothesized that medium scale agricultural enterprises are profitable. The testing of this hypothesis was based on profitability estimation for medium scale dairy, sugarcane and paddy farmers. The profitability was measured through computation of Gross Margin (GM) and Economic Farm Surplus (EFS). The results revealed that medium scale sugarcane and paddy farms in Morogoro rural district had Gross Margin values ranging from Tshs 266,600 to 568,028 and 216,275 to 304,736 per hectare for sugarcane and paddy farms respectively. On the other hand the EFS values for the surveyed dairy enterprises ranged from Tshs 359,793 to 792,126 per cow per year. Since both, the Gross Margin and Economic Farm Surplus values were positive for all sugarcane, paddy and dairy enterprises, it can be concluded that medium scale paddy, sugarcane and dairy enterprises are profitable.

The second objective of the study was to examine the influence of size on profitability of medium scale agricultural enterprises. To address this objective it was hypothesized that the size of an enterprise has a significant influence on its profitability. Several methods were used to test this hypothesis. The test started with the analysis of the

variation of the Economic Farm Surplus (EFS) and Gross Margin (GM) values among the different size categories for the studied enterprises *i.e.* dairy, sugarcane and paddy enterprises. The dairy enterprises were grouped into seven size categories; on the other hand the sugarcane and paddy enterprises were grouped into nine and six size categories respectively. The running of multiple comparisons using the One Way Analysis of Variance (ANOVA) - Post Hoc Test separated the mean EFS and GM values for the different size categories. The ANOVA results suggested the existence of significant differences in the EFS and GM values among the different dairy, sugarcane and paddy size categories. Graphical presentations of the variation of the EFS and GM values with changing sizes of the enterprises depicted a continuous increase in profitability with increasing enterprise sizes. It was noted further, from the graphical presentations, that the increase was very rapid at lower size categories. The rate of increase in profitability with increasing sizes of the studied enterprises was found to decrease as the sizes of enterprises increased further. The last tool used was regression analysis. The regression analysis results revealed that the sizes of the enterprises had a significant positive influence ($p < 0.05$) on the profitability of all enterprises *i.e.* dairy, paddy and sugarcane enterprises. Thus it can be concluded that the sizes of the enterprises have a positive effect on their profitability. The positive EFS and GM values coupled with a decline in the rate of increase in profitability as the sizes increased within the range of medium scale enterprises made it reasonable to conclude that an enterprise does not need to be very large to be profitable. Also the rapid increase in profitability at lower size categories means that the very small enterprise sizes that are advocated by the Tanzanian agriculture policy *i.e.* 0.5 to 2.5

hectares and 1 to 5 animals for field crops and dairy enterprises respectively are too small and economically unjustifiable.

The positive relationship between the size and profitability that was marked by a rapid profit increase at lower size categories made it plausible to conclude that farmers operating at very small sizes are loosing the potential profit increase that is associated with increase in farm size. Furthermore the rapid increase in profitability at lower size categories means that the current poor performance of the Tanzanian agriculture sector can, beyond reasonable doubt, be linked to the dependency on small scale farmers whose sizes of operation deny them the increased profitability that is associated with relatively larger sizes of operation. It is therefore appealing to argue a case that in order for Tanzania's agriculture to develop fast, there is a need for policy and advocacy to eye on medium scale commercial oriented farmers who stand a better chance to benefit from the increase in profitability that is associated with increase in enterprise size.

Furthermore, the study focused on the examination of the influence of agricultural support services and education levels of the owners on the profitability of medium scale agricultural enterprises. To address these objectives, the study hypothesized that agricultural support services influence significantly the profitability of medium scale farms. In addition, the study hypothesized that the education levels of the owners of the medium scale enterprises have a significant influence on the profitability of their enterprises. The testing of these two hypotheses involved the estimation of three regression models, which had the levels of education and the access to credit and

extension services as their independent variables. The first model had the Economic Farm Surplus (EFS) as its dependent variable; on the other hand the second and third models had the Gross Margin (GM) values as their dependent variable. The regression analysis results revealed that access to credit facilities have a strong positive influence on the profitability of all enterprises studied. Thus it can be concluded that access to credit facilities have a positive effect on profitability. On the other hand, it was found that the profitability of an enterprise was weakly related to access to extension services and farmer's level of education. Thus it is reasonable to conclude that the current extension system has a little impact on the performance of medium scale agricultural enterprises. This can be attributed to the fact that the Tanzanian extension system is mainly designed to cater for smallholder farmers whose technical information needs are quite different from those of medium scale, relatively more commercial oriented, farmers. The differences in technical information needs arise from the fact that there are clear differences in production motives between smallholders and medium scale farmers. Whereas medium scale farmers produce for the market, smallholders have subsistence as their main concern. Since the technical information required to achieve subsistence is likely to be different from that required to maximise profit then there is no wonder that the Tanzanian extension system that focused smallholder farmers made very little impact on the performance of medium scale farming. Thus unless the extension system is refocused to include the needs of medium scale farmers in its agenda its usefulness to medium scale farmers will continue to be questionable.

Lastly, the study was aimed at the identification of the constraints encountered by

medium scale farmers in their day-to-day activities. To address this objective, it was hypothesized that social and policy factors influence the performance of medium scale farms. The testing of this hypothesis was based on descriptive statistics and tabular analysis. The results of descriptive statistics suggested that, dairy; sugarcane and paddy production in Morogoro district faces impediments that lower the productivity of these enterprises. Among the mentioned problems, high input prices, lack of capital to purchase inputs and shortage of extension services were found to be more important than other mentioned factors. The results of tabular analyses suggested the existence of a very close association between access to credit facilities and the use of improved technologies. Although it was not one of the objectives of the study, tabular analysis has shown that farmers with access to credit facilities, expectedly, made more use of improved inputs than their counterparts who had no access to credit facilities. Also access to credit facilities was found to be closely related to the profitability of the enterprises.

5.2 Recommendations

It should be borne in mind that policy recommendation in developing countries is not an easy task, and requires some practical down to earth experience in the field. This is because economic theory itself is not sufficient to cope with some problems specific to these countries. However, an attempt has been made to develop some recommendations toward policy changes in Tanzania. Basing on the findings of this study the following recommendations are put forward.

Having noted the influence of size on farm productivity it seems reasonable to recommend a policy reorientation in favour of medium-scale farming. More emphasis

should be directed to creating favourable environment for undertaking medium-scale farming. This can be done by redirecting the efforts, which were formerly concentrating on small-scale farming. This time around the efforts should be directed to medium-scale farmers. Medium scale farmers' needs should rank high in the agenda of developing the Tanzanian agriculture sector. Furthermore farmers should be encouraged and supported to shift from subsistence to commercial production, which seems to be a prerequisite for improving the Tanzanian agriculture sector.

The observed profitability among medium scale agricultural enterprises makes it plausible to recommend that together with the current efforts to attract large-scale foreign investors, the government should put more efforts in the promotion of local medium scale enterprises.

Since high input prices ranked high in the list of problems mentioned by farmers then the government should make deliberate efforts to tackle the problem of high input prices. Waiving the tax on important inputs such as fertilizers and other agrochemicals is one way of solving the problem. Furthermore the government should promote the establishment of farmers associations which seem to reduce the unit input cost to the farmers by exploiting economies of scale accrued through reduced purchase prices through discounts and lower unit transport charges.

The government should enhance the efficiency of the Tanzanian extension services by promoting the linkage between farmers, researchers and extension personnel. This will facilitate the flow of information from the researchers to the farmers and vice versa which is important for the development of 'relevant' technologies. An efficient

extension system will ensure proper communication between farmers and researchers, which is important for the developed technologies to reach the end users and for the researchers to have a clear knowledge of farmers' needs. Furthermore, the observed ineffectiveness of the Tanzanian extension system, which targeted small holder subsistence farmers, in the performance of medium scale farmers calls for a refocus in its goals and targeted beneficiaries from smallholder, subsistence farmers to medium scale commercial oriented farmers.

The observed positive influence of credit on profitability makes it plausible to recommend that the government should support medium scale farmers by ensuring that they have access to credit. Credit can be provided in kind *i.e.* by providing important farm inputs, such as machinery, grade animals, fertilizers and other agrochemicals on credit. Also credit can be provided in cash by promoting the efforts of lending institutions such as the National Microfinance Bank and more importantly to encourage the lending institutions to give special priority to medium scale farmers. The lending institutions should be encouraged to revisit the conditionalities that are associated with the provision of loans so as to make medium scale farmers eligible to those loans.

In the present era of globalisation, producers need to be very efficient for their commodities to be competitive in the world market. Thus the very low profitabilities that are accompanied with very small sizes of operation means that an economy that is dominated by small scale enterprises is not likely to benefit from globalisation. Thus since the Tanzanian agriculture sector is dominated by smallholder subsistence

farmers then there should be deliberate efforts to shift from very small scale to at least medium scale farming, if the country is to be an active participant in the global economy. The large numbers of smallholder subsistence farmers has for a long time been used as a justification for the Tanzanian agriculture policy to target them. Therefore, a shift from small to medium scale farming will need drastic policy changes that will make sure that the needs of medium scale farmers take a central part in the agriculture policy.

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APPENDICES

APPENDIX 1: FARMERS (SUGARCANE / PADDY) QUESTIONNAIRE

A. BASIC INFORMATION

Questionnaire number: _____

1. Date: _____ Interviewer's Name _____
2. District _____ Division _____
   Village _____
3. Farmer's name _____ Age: _____
4. Gender: 1 = Male ( )
   2 = Female ( )
5. Marital status: 1=Single ( )
   2 = Married ( )
   3 = Divorced ( )
   4 = Widow ( )
   5 = Temporary separated ( )
6. Household size _____
7. Farmer's years in farming: _____
8. Farmer's Level of education:
   1 = No education ( )
   2 = Adult education ( )
   3 = Primary education ( )
   4 = Secondary education ( )
   5 = Other (specify) ( ) _____
9. Household composition

Age group	Males	Females
Below 17 years		
17 - 50 years		
above 50 years		

B. CROP PRODUCTION INFORMATION

10. Do you own the entire land you are currently using for crop farming activities?
    1 = Yes ( ) 2 = No ( )
11. If yes, how was the land obtained?
    1 = Inherited ( ) 2 = Bought ( ) 3 = Given by village government ( )
    4 = Accessed a free land ( ) 5 = Rented ( )
12. If you do not own land, then whose land do you use for crop farming activities?
    1 = Father's land (free use) ( ) 2 = Other relatives / friends (free use) ( )
    3 = Hired (monetary payments) ( )
    4 = Hired (payments in produce form) ( ) 5 = Inherited ( )
13. What is the total farm size of the land (in acres) is used for crop farming activities to the household _____
14. Have you ever-hired land for crop production? 1 = Yes ( ) 2 = No ( )
15. If yes, what was the rent for hiring one acre of land? value in Tshs. _____

16. What were the major food and cash crops grown by the household? And in average what was the volume of each crop obtained after harvest in the last two seasons?

Cash crops	1998 Acreage	Yield (Kg/ Bags)	1999 Acreage	Yield (Kgs/Bags)	2000 Acreage	Yield (Kgs/Bags)
Sugarcane						

Food crops	1999 Acreage	Total Yield Kgs/Bags	2000 Acreage	Total Yield Kgs/Bags
Paddy				
Maize				

17. What problems other than weather, is your household/farm facing as far as crop production is concerned? (Answer: 1 = Yes 2 = No 3 = Do not know)

Shortage of land ( )
Soil fertility ( )
Shortage of hired labour ( )
Shortage of extension services ( )
Unreliable input supply ( )
Lack of market ( )
High input prices ( )
Transporting crops ( )
Damages caused by crop pests ( )
Lack of capital to purchase inputs ( )
Other (specify) _____

C. HOUSEHOLD INCOME

18. Out of crop produce, which ones did you sell, amount and at what price in the last two seasons

Crop	1998 Sacks/Kgs	Price per Sack/Kg	1999 Sacks/Kgs	Price per Sack/Kg	2000 Sacks/Kgs	Price per sack/Kg
Sugarcane						
Paddy						
Maize						

18. Are you satisfied with the amount of money you obtain from the sell of crop produce?

1 = Yes ( ) 2 = No ( )

Reason:_____

_____

D. OFF-FARM ACTIVITIES

19. Apart from crop farming activities, what other activities bring income into your household? and how much did you get in the last three years?

Source of income	1998 (Tshs)	1999 (Tshs)	2000 Amount in Tshs
Formal employment			
Brewing and selling local brew			
Carpentry			
Selling charcoal /firewood			
Small business			
Brick making			
Masonry			
Lumbering			
Others (specify)			
Total			

E. LABOUR AND OTHER INPUT USE INFORMATION

20. If hired labour was used, indicate cost per operation per acre

Operation/activity	Sugarcane	Paddy (Tshs)	Maize (Tshs)
Land Preparation			
Cultivation			
Planting			
Weeding			
Fertilization and Spraying			
Harvesting			
Transporting			
Marketing			
Other			
Total			

21 (a) Did you purchase any inputs in farming? 1 = Yes ( ) 2 = No ( )

22. If No Why? 1 = Not available 2 = Expensive ( ) 3 = Not necessary ( )

23. (b) If yes, indicate the inputs , costs and the respective major crops

Sugarcane

Year	1998			1999			2000		
Operation/activity	Amount /ha	Unit price	Cost	Amount /ha	Unit price	cost	Amount /ha	Unit price	cost
Fertilizer									
Seeds									
Tractor									
Hand hoes									
Herbicides									
Insecticides									
Other									
Total									

Paddy

Year	1998			1999			2000		
Inputs	Amount	Unit price	Costs	Amount	Unit price	costs	Amount	Unit price	costs
Fertilizer									
Seeds									
Herbicides									
Insecticides									
Other									
Total									

Maize

Year	1998			1999			2000		
Inputs	Amount	Unit price	costs	Amount	Unit price	costs	Amount	Unit price	costs
Fertilizer									
Seeds									
Herbicides									
Insecticides									
Other									
Total									

INVESTMENT

23. Indicate the number, acquisition price, and year of acquisition and expected life span of the following items:

Item	Number	Year	Economic life	Acquisition price	Cost
Hoe					
Panga					
Wheelbarrow					
Sprayer					
Bicycle					
Car					
Tractor					
Others					

24. Do you remember on average how much money did you use in 1998/99-crop season for buying various inputs including hired labour

Hired labour Tshs. _____ Inputs Tshs. _____

G: ACCESS TO CREDIT SERVICES

25. Do you have access to credit facilities? 1= Yes ( ) 2 = No ( )

26. If yes, what are the sources of credit?

1= Bank ( )
2=Traders ( )
3=Others farmers ( )
4 = Others (Specify) _____

_____

27. Have you applied for a credit from any agency in recent Years?

1=Yes ( ) 2 = No ( )

28 In what form did you receive the credit? 1 = in kind ( ) 2 = Cash ( )

29. If in kind what inputs/services did you obtained?

Input/service	1998		1999		2000	
	Amount	Value	Amount	Value	Amount	Value
Land preparation						
Fertilizers						
Herbicides						
Insecticides						
Harvesting						
Transport						
Other						
Total						

20. If in cash, what was the amount (in Tshs) received _____
31. What was the interest rate to the credit? _____
32. What was the repayment procedure for the credit: 1= Cash ( ) 2 = In kind ( )
    3 = Both cash and in kind ( ) 4 = Other (specify) _____
33. If in cash, what is the amount per year or month and repayment period? _____
34. If in kind, what is the amount (in Kgs)? _____
35. From question 24 above, if no why?
    1 = Not available (lack of credit facilities) ( )
    2 = High interest rates ( )
    3 = Not interested ( )
    4 = The income obtained from crop sales is sufficient ( )
    5 = High risk ( )
36. Has credit restriction affected your sugarcane / rice production in any way?
    1= yes ( ) 2 = No ( )
37. If yes, How?
    1= Use less amount of input ( )
    2 = Restrict expansion of farm size ( )
    3 = Prevent adoption of improved animal breeds ( )
    4 = Reduced availability of capital for input purchases ( )
    5 = Others (Specify) _____
    _____
    _____

THANK YOU VERY MUCH FOR YOUR COOPERATION

APPENDIX 2: DAIRY FARMERS QUESTIONNAIRE

A. BASIC INFORMATION

Questionnaire number: _____

1. Date:_____ Interviewer's Name _____
2. District_____ Division _____
   Village_____
3. Farmer's name _____ Age:_____
4. Gender: 1=Male ( )
   2=Female ( )
5. Marital status: 1 = Single ( )
   2 = Married ( )
   3 = Divorced ( )
   4 = Widow ( )
   5 = Temporary separated ( )
6. Household size _____
7. Farmer's years in livestock keeping _____
8. Farmer's Level of education:
   1 = No education ( )
   2 = Adult education ( )
   3 = Primary education ( )
   4 = Secondary education ( )
   5 = Other (specify) ( ) _____

9. Household composition

Age group	Males	Females
Below 17 years		
17 - 50 years		
Above 50 years		

B. LIVESTOCK PRODUCTION INFORMATION

10. For how long have you been keeping these animals (years)?_____
11. How many animals do you have in the farm? _____

Class	Local breed	Friesian	Jersey	Ayrshire	Cross	Other	Total
Milking cows							
Heifers							
Bulls							
young bulls							
Calves							

12. Do you keep animals in door 1 = Yes ( )
    2 = No ( )
13. What are the breeding method do you practices?
    1= Artificial Insemination (AI) ( )
    2 = Natural/use of bulls ( )
    3 = Both ( )

14. Do you own a bull? 1 = Yes ( ) 2= No ( )
15 (a) If no, where and how you access bull service:
Borrow / hire from neighbours at _____ Tshs
15 (b) If you make use of Artificial Insemination, what is the cost per service.(Tshs)_____
16. Which breed do you prefer the most and why?
1. _____ _____
2. _____ _____

17. Give information on lactating cows and yield as follows:

No of milking cows	Total milk yield per day	Average per cow per day	Price (Tshs/liter)

18. What is the average lactation length _____ Months
19. What is the average calving interval _____ years
20. Other animal species owned

Type	Type	Number	Purpose
Beef cattle	Cross		
	Local		
Goats	Local		
	Cross		
	Pure		
Sheep	Local		
	Cross		
	Pure		
Pig			
Chicken	Local		
	Pure		
Other			

21. Do you keep animals in door 1 = Yes ( ) 2 = No ( )
22 (a) If yes where do you get the feeds
1 = Own pasture plot ( ) 2 = Purchase ( )
22(b) if you own a pasture plot, what is the size under pasture _____
22(c) If No, where do you graze 1 = Own land ( ) 2 = Communal land ( )
22(d) Distance from home _____
23. If you do not own land, then whose land do you use for livestock production activities?
1 = Father's land (free use) ( ) 2=Other relatives/friends (free use) ( )
3 = Hired (monetary payments) ( )
4 = Hired (payments in produce form) ( ) 5=Inherited ( )
24. What is the total farm size of the land in acres is used for livestock production activities to the household _____
25 (a) Have you ever-hired land for livestock production? 1 = Yes ( ) 2= No ( )
25 (b) If yes, what was the rent for hiring one acre of land? Value in Tshs._____

E. LABOUR AND OTHER INPUT USE INFORMATION

26. If hired labour was used, indicate cost per operation per month

Operation/activity	Tshs
Feeding (grazing + cutting grass)	
Transport (grass + other feeds)	
Spraying/dipping	
Milking	
Stall cleaning	
Marketing	
Others	
Total labour cost	

27. Variable Costs

Costs Details (average)	Quantity	Price /unit	Total Cost
Feeds: Grass/day			
Maize bran			
Other cereals			
Molasses			
Water			
Minerals			
Medication / month			
Fuel /lubricant per month			
Purchase and repair of equipment			
Salary payment per month			
Other payment (service) per month			
De-horning			
Pregnancy diagnosis			
Vaccination			
Other costs			
Total			

28. Capital Cost

Name of Capital Item	Number Owned	Year Acquired	Value when Acquired	Total Value
House/banda				
Milking containers				
Sprayer				
Starting herd	Cow			
	Heifer			
	Bull			
	Other			
Other	1			
	2			
	3			
Total Value				

F. MILK PRODUCTION

29. (a) Average number of milking cows per day _____
29. (b) Average milk production per day (litres) _____
30. (a) Amount given to calves per day (litres) _____
30. (b) Amount of milk consumed at home per day (litres) _____
30. (c) Other uses of milk per day (litres)_____
31. Where do you sell your milk?
    1 = People around ( )
    2 = processors ( )
    3 = other ( )

32. Amount sold per day (litres) _____
33. What is the average price per litre? Tshs _____

G. AVERAGE ENTERPRISE INCOME

Sales details	Quantity	Price per unit	Total revenue (Tshs)
Milk/day			
Yoghurt/day			
Cheese/day			
Butter/day			
Meat/year			
Skin			
Culls/year			
Bull calves/year			
Steers			
Heifers			
Farm yard manure/week			
Other			
Total revenue			

H. ACCESS TO CREDIT SERVICES

35. Do you have access to credit facilities? 1= Yes ( ) 2 = No ( )
36. If yes, what are the sources of credit?
    1 = Bank ( ) 2=Traders ( ) 3=Other farmers ( )
    4 = Others (Specify) _____
37. Have you applied for a credit from any agency in recent Years?
    1 = Yes ( ) 2 = No ( )
38. If yes, what was the amount obtained? _____
39. What was the interest rate to the credit? _____
40. What was the repayment procedure for the credit: 1= Cash ( ) 2 = In kind ( )
41. If in cash, what is the amount per year or month and repayment period? _____
42. If in kind, what is the amount (in Kgs/animals)? _____
43. From question one above, if no why?
    1 = Not available (lack of credit facilities) ( )
    2 = High interest rates ( )
    3 = Not interested ( )
    4 = The income obtained from crop sales is sufficient ( )
    5 = High risk ( )
44. Has credit restriction affected your livestock production in any way ?
    1 = yes ( ) 2 = No ( )
45. If yes, How?
    1 = Use less amount of input ( )
    2 = Restrict expansion of herd size ( )
    3 = Prevent adoption of improved animal breeds ( )
    4 = Reduced availability of capital for input purchases ( )
    5 = Others (Specify) _____

THANK YOU VERY MUCH FOR YOUR COOPERATION

APPENDIX 3: OUTGROWERS CANE PRICE (TSHS/TON) FOR 2000/2001

REND	PRICE (Tshs)	REND	PRICE (Tshs)	REND	PRICE (Tshs)
3.0	3867.33	6.4	8250.61	9.8	12633.89
3.1	3996.25	6.5	8379.53	9.9	12762.81
3.2	4125.17	6.6	8508.45	10.0	12891.73
3.3	4254.09	6.7	8637.37	10.1	13020.65
3.4	4383.01	6.8	8766.29	10.2	13149.57
3.5	4511.93	6.9	8895.21	10.3	13278.49
3.6	4640.85	7.0	9024.13	10.4	13407.41
3.7	4769.77	7.1	9153.05	10.5	13536.33
3.8	4898.69	7.2	9281.97	10.6	13665.25
3.9	5027.61	7.3	9410.89	10.7	13794.17
4.0	5156.53	7.4	9539.81	10.8	13923.09
4.1	5285.45	7.5	9668.73	10.9	14052.01
4.2	5414.37	7.6	9797.65	11.0	14180.93
4.3	5543.29	7.7	9926.57	11.1	14309.85
4.4	5672.21	7.8	10055.49	11.2	14438.77
4.5	5801.13	7.9	10184.41	11.3	14567.69
4.6	5930.05	8.0	10313.33	11.4	14696.61
4.7	6058.97	8.1	10442.25	11.5	14825.53
4.8	6187.89	8.2	10571.17	11.6	14954.45
4.9	6316.81	8.3	10700.09	11.7	15083.37
5.0	6445.73	8.4	10829.01	11.8	15212.29
5.1	6574.65	8.5	10957.93	11.9	15341.21
5.2	6703.57	8.6	11086.85	12.0	15470.13
5.3	6832.49	8.7	11215.77	12.1	15599.05
5.4	6961.41	8.8	11344.69	12.2	15727.97
5.5	7090.33	8.9	11473.61	12.3	15856.89
5.6	7219.25	9.0	11602.53	12.4	15985.81
5.7	7348.17	9.1	11731.45	12.5	16114.73
5.8	7477.09	9.2	11860.37	12.6	16243.65
5.9	7606.01	9.3	11989.29	12.7	16372.57
6.0	7734.93	9.4	12118.21	12.8	16501.49
6.1	7863.85	9.5	12247.13	12.9	16630.41
6.2	7992.77	9.6	12376.05	13.0	16759.33
6.3	8121.69	9.7	12504.97	13.1	16888.25

Note: REND = % Sugar content

Source: Mtibwa Sugar Estates Ltd.

APPENDIX 4: DESCRIPTIVE ANALYSES FOR DAIRY ENTERPRISES

		N	Mean	Std. Error
Number of Animals in the Farm	Below 10 cows	24	9.0417	.1853
	11-15 cows	28	12.4286	.2381
	16-20 cows	21	17.3810	.3123
	21-25 cows	4	22.7500	1.0308
	26-30 cows	5	27.8000	.2000
	31-40 cows	8	33.5000	.8238
	41-60 cows	13	45.0769	2.7223
	Total	103	18.9612	1.4154
Cost of permanent labour	Below 10 cows	24	17333.3333	914.1930
	11-15 cows	28	18428.5714	885.5521
	16-20 cows	21	18819.0476	1956.2795
	21-25 cows	4	21250.0000	2393.5678
	26-30 cows	5	19400.0000	2712.9320
	31-40 cows	8	20625.0000	5463.9647
	41-60 cows	13	19461.5385	1713.0313
	Total	103	18924.2718	3316.6226
Variable costs other than casual labour (Tshs/cow)	Below 10 cows	24	4907.9167	646.6483
	11-15 cows	28	6467.6786	710.2807
	16-20 cows	21	6821.4286	794.6249
	21-25 cows	4	3950.0000	471.6991
	26-30 cows	5	5472.0000	1335.0221
	31-40 cows	8	5093.7500	855.4676
	41-60 cows	13	6823.8462	6147.8924
	Total	103	6230.6311	888.4967
Initial cost for the banda for keeping the animals (Tshs/cow)	Below 10 cows	24	63526.5873	15443.9420
	11-15 cows	28	54450.4135	13272.8702
	16-20 cows	21	29588.1962	9557.4363
	21-25 cows	4	10542.7171	2053.9856
	26-30 cows	5	10962.9067	2872.4136
	31-40 cows	8	13819.4444	6190.5795
	41-60 cows	13	6761.8407	1686.2245
	Total	103	38505.3076	5810.6725
Initial cost for milking containers (Tshs/cow)	Below 10 cows	24	2292.9315	369.4940
	11-15 cows	28	2369.6520	196.8020
	16-20 cows	21	899.7410	122.6187
	21-25 cows	4	868.8142	318.7624
	26-30 cows	5	722.5296	337.1772
	31-40 cows	8	1407.9861	230.9475
	41-60 cows	13	1820.00	504.9255
	Total	103	1828.8893	138.8897
Initial cost for sprayer(s) (Tshs/cow)	Below 10 cows	24	11105.6548	1059.9844
	11-15 cows	27	8610.4791	840.7460
	16-20 cows	21	4639.6573	380.0064
	21-25 cows	4	3047.2689	570.8654
	26-30 cows	5	2462.6026	155.9244
	31-40 cows	8	3901.0417	588.7787
	41-60 cows	12	1830.3467	370.3259
	Total	101	6674.5152	483.6770

Appendix 4 continued

		N	Mean	Std. Error
Initial cost for the starting herd (Tshs)	Below 10 cows	24	589166.6667	56168.9566
	11-15 cows	28	682321.4286	49585.2388
	16-20 cows	21	677619.0476	132625.3311
	21-25 cows	4	712500.0000	129703.1868
	26-30 cows	5	547000.0000	123263.9444
	31-40 cows	8	716250.0000	124841.8643
	41-60 cows	13	805384.6153	104965.8727
	Total	103	623883.4951	83442.9775
Average cow purchasing price	Below 10 cows	24	11657.00	9849.52
	11-15 cows	28	9200.00	8762.45
	16-20 cows	21	2674.00	11701.04
	21-25 cows	4	2471.00	4083.46
	26-30 cows	5	1086.00	27091.93
	31-40 cows	8	1304.00	4046.46
	41-60 cows	13	487.00	11997.53
	Total	103	866.01	4856.92
Number of milking cows	Below 10 cows	24	4.7500	.2709
	11-15 cows	28	12.6071	.5595
	16-20 cows	21	14.5600	.4502
	21-25 cows	4	22.2500	1.8875
	26-30 cows	5	26.8000	2.3749
	31-40 cows	8	32.4615	.7545
	41-60 cows	13	45.0500	3.2155
	Total	103	13.5825	2.0228
Total milk produced per day	Below 10 cows	24	47.7917	4.2537
	11-15 cows	28	71.7143	6.5376
	16-20 cows	21	140.5238	16.3000
	21-25 cows	4	198.5000	32.6305
	26-30 cows	5	269.0000	44.7605
	31-40 cows	8	283.2500	18.1224
	41-60 cows	13	410.7692	65.9350
	Total	103	150.0097	23.8267
Average milk price per litre (Tshs/cow)	Below 10 cows	24	264.1667	8.2074
	11-15 cows	28	255.3571	6.4341
	16-20 cows	21	264.7619	9.0926
	21-25 cows	4	264.3572	12.5000
	26-30 cows	5	270.0000	12.2474
	31-40 cows	8	275.0000	9.4491
	41-60 cows	13	254.6154	5.9502
	Total	103	259.8058	3.5419
Average labour adjustment values (Tshs/cow)	Below 10 cows	24	33854.00	1785.5332
	11-15 cows	28	35993.00	1729.5940
	16-20 cows	21	36755.00	3820.8584
	21-25 cows	4	41503.00	4674.9370
	26-30 cows	5	37890.00	5298.6953
	31-40 cows	8	40283.00	5671.8061
	41-60 cows	13	38588.00	4595.7643
	Total	103	35693.00	1777.7786

Appendix 4 continued

		N	Mean	Std. Error
Average cow purchase price (Tshs/cow)	Below 10 cows	24	11657.6279	1286.1659
	11-15 cows	28	9200.0684	758.9971
	16-20 cows	21	2674.9325	531.4948
	21-25 cows	4	2471.7845	805.7675
	26-30 cows	5	1086.4807	222.2072
	31-40 cows	8	1304.1777	256.5862
	41-60 cows	13	487.1925	100.0894
	Total	103	6074.2236	577.9983
Average depreciation charges (Tshs/cow)	Below 10 cows	24	25403.4970	2461.4671
	11-15 cows	27	21770.8085	1547.2352
	16-20 cows	21	15430.6843	2774.3566
	21-25 cows	4	9876.6518	1146.7948
	26-30 cows	5	7054.7619	812.4011
	31-40 cows	8	7928.9908	1672.2837
	41-60 cows	12	4823.5578	1130.2442
	Total	101	17006.2888	1181.8784
Stock adjustment (Tshs/cow)	Below 10 cows	24	54542.00	11133.5189
	11-15 cows	28	56002.00	10583.5531
	16-20 cows	21	48156.00	6641.7740
	21-25 cows	4	40318.00	11673.0756
	26-30 cows	5	40378.00	9734.3487
	31-40 cows	8	64062.00	10845.2744
	41-60 cows	13	55494.00	15391.3786
	Total	103	53002.00	5946.4778
Average income from animals sold (Tshs/cow)	Below 10 cows	13	536778.00	60333.7385
	11-15 cows	12	644060.00	84879.9510
	16-20 cows	8	762515.00	91680.5972
	21-25 cows	3	788044.00	95200.0000
	26-30 cows	3	813434.00	102625.3542
	31-40 cows	5	860407.00	103812.2628
	41-60 cows	10	877269.00	112931.3153
	Total	54	732515.00	83720.7284
Economic Farm Surplus per cow	Below 10 cows	24	359793.00	1038.3745
	11-15 cows	28	479686.00	1779.4206
	16-20 cows	21	634513.00	5643.7570
	21-25 cows	4	683183.00	8556.0423
	26-30 cows	5	723983.00	7501.7683
	31-40 cows	8	762957.00	9897.1379
	41-60 cows	13	792126.00	9394.8214
	Total	103	635423.0000	2911.9590

APPENDIX 5: DESCRIPTIVE ANALYSES FOR SUGARCANE FARMS

		N	Mean	Std. Error
Farmer's Age (Years)	Below 10 Ha	49	47.92	1.33
	11-15 Ha.	29	44.14	1.23
	16-20 Ha.	10	46.50	2.38
	21-25 Ha.	12	45.50	2.69
	26-30 Ha.	10	47.20	2.51
	31-35 Ha.	2	59.00	1.00
	36-40 Ha.	4	38.25	1.44
	41-45 Ha.	3	46.33	4.26
	above 45 Ha.	11	47.64	2.83
	Total	130	46.50	.74
Average annual seed cane cost (Tshs/ha)	Below 10 Ha	49	46000.00	565.9465
	11-15 Ha.	29	43716.5500	506.3823
	16-20 Ha.	10	43193.5000	733.1801
	21-25 Ha.	12	43223.0000	742.8069
	26-30 Ha.	10	42071.5000	681.0909
	31-35 Ha.	2	41750.0000	750.0000
	36-40 Ha.	4	41750.0000	323.0706
	41-45 Ha.	3	40500.0000	172.8439
	above 45 Ha.	11	41361.8182	461.1822
	Total	130	43348.9231	553.0770
Total cost for hired labour (Tshs per hectare)	Below 10 Ha	49	89500.00	2338.6727
	11-15 Ha.	29	89500.00	2815.1866
	16-20 Ha.	10	89768.00	3761.2479
	21-25 Ha.	12	89000.00	2797.6785
	26-30 Ha.	10	87587.00	5915.8633
	31-35 Ha.	2	85525.00	3070.0000
	36-40 Ha.	4	84427.00	2906.4766
	41-45 Ha.	3	83503.00	4605.5727
	above 45 Ha.	11	82512.00	4553.5441
	Total	130	89785.00	1370.6311
Total Cane cutting, loading and transport charges	Below 10 Ha	49	1824103.7218	43184.8543
	11-15 Ha.	29	2058137.0935	31943.8462
	16-20 Ha.	10	1663198.5040	28160.9706
	21-25 Ha.	12	3065476.2867	53590.2185
	26-30 Ha.	10	2422874.6320	49300.4574
	31-35 Ha.	2	1341979.7600	43272.3200
	36-40 Ha.	4	4047146.3300	150352.7933
	41-45 Ha.	3	6011998.7200	134672.5200
	above 45 Ha.	11	11846319.7373	323971.6265
	Total	130	3030242.7922	40816.7730
Average gross income for 1997/98-1999/2000	Below 10 Ha	49	4850126.3834	111924.8356
	11-15 Ha.	29	5597589.3566	91425.8758
	16-20 Ha.	10	4597680.7635	79243.6092
	21-25 Ha.	12	8593395.2850	153265.9204
	26-30 Ha.	10	6691948.5165	142040.5355
	31-35 Ha.	2	4098585.5650	110484.0350
	36-40 Ha.	4	10808146.6638	350965.1551
	41-45 Ha.	3	14912471.2300	133734.2250
	above 45 Ha.	11	32602697.0366	866727.6525
	Total	130	8236924.3017	109871.4834

Appendix 5 continued

		N	Mean	Std. Error
Average yield for sugarcane for 1997/98-1999/2000 (Tons/ha)	Below 10 Ha	49	39.9756	1.4443
	11-15 Ha.	29	41.9122	1.8751
	16-20 Ha.	10	48.5765	3.3175
	21-25 Ha.	12	52.3533	1.6479
	26-30 Ha.	10	52.9791	1.7545
	31-35 Ha.	2	55.7711	1.1851
	36-40 Ha.	4	56.7769	5.5208
	41-45 Ha.	3	58.0350	5.0123
	above 45 Ha.	11	60.2450	2.7110
	Total	130	46.4593	1.0539
Average land preparation charges for 'plant cane'	Below 10 Ha	49	45868.1633	945.1656
	11-15 Ha.	29	47003.7931	866.5172
	16-20 Ha.	10	49415.0000	850.2863
	21-25 Ha	12	40721.6667	629.2309
	26-30 Ha.	10	50855.0000	863.3830
	31-35 Ha.	2	41950.0000	950.0000
	36-40 Ha.	4	54320.0000	676.2277
	41-45 Ha.	3	56356.6667	745.8950
	above 45 Ha.	11	38597.2727	914.4015
	Total	130	46129.4615	914.8333
Average harvest and transport charges for 1997-2000	Below 10 Ha	49	181240.00	1270.9021
	11-15 Ha.	29	197000.00	1138.1939
	16-20 Ha.	10	204880.00	4062.7064
	21-25 Ha.	12	212760.00	1836.9690
	26-30 Ha.	10	220640.00	3027.8560
	31-35 Ha.	2	224580.00	7196.7992
	36-40 Ha.	4	226550.00	1689.8961
	41-45 Ha.	3	228520.00	2833.6842
	above 45 Ha.	11	232460.00	3437.7572
	Total	130	203880.00	867.9757
Natural logarithm for average gross margin for 1997/98-1999/2000	Below 10 Ha	49	19.0180	.4573
	11-15 Ha.	29	21.1863	.2531
	16-20 Ha.	10	22.8191	.3733
	21-25 Ha.	12	24.1594	.2804
	26-30 Ha.	10	25.1910	.3818
	31-35 Ha.	2	25.6368	.5445
	36-40 Ha.	4	26.7180	1.1111
	41-45 Ha.	3	27.3432	.2669
	above 45 Ha.	11	31.3164	.6439
	Total	130	22.3150	.3786

APPENDIX 6: ANOVA FOR SELECTED VARIABLES (SUGARCANE)

		Sum of Squares	df	Mean Square	F	Sig.
Farmer's level of education	Between Groups	13.290	8	1.661	1.465	.177
	Within Groups	137.241	121	1.134		
	Total	150.531	129			
Harvestable area under Sugarcane 1997/98-1999/2000	Between Groups	23460.143	8	2932.518	9.303	.000
	Within Groups	38143.675	121	315.237		
	Total	61603.817	129			
Total cost for hired labour (per hectare) 1997/98-1999/2000	Between Groups	4220812889.2	8	527601611.147	2.340	.023
	Within Groups	27283804383	121	225485986.635		
	Total	31504617272	129			
Cane cutting, loading and transport charges 1997/98-1999/2000	Between Groups	1.01255E+15	8	1.26568E+14	8.597	.000
	Within Groups	1.78134E+15	121	1.47218E+13		
	Total	2.79388E+15	129			
Average yield for the year 1997/98-1999/2000	Between Groups	73.443	8	9.180	3.619	.001
	Within Groups	306.905	121	2.536		
	Total	380.348	129			
Gross income for the year 1997/98-1999/2000	Between Groups	7.64689E+15	8	9.55861E+14	9.181	.000
	Within Groups	1.25975E+16	121	1.04112E+14		
	Total	2.02444E+16	129			
General average gross margin for sugarcane 1997/98-1999/2000	Between Groups	833.401	8	104.175	17.804	.000
	Within Groups	643.648	110	5.851		
	Total	1477.049	118			
Average land preparation charges 1997/98-1999/2000	Between Groups	1948835693 3	8	243604461.668	.335	.951
	Within Groups	87912421169	121	726548935.281		
	Total	89861256862	129			
Natural logarithm for average gross margin 1997/98-1999/2000	Between Groups	1762.402	8	220.300	41.558	.000
	Within Groups	641.418	121	5.301		
	Total	2403.820	129			

APPENDIX 7: DESCRIPTIVE ANALYSES FOR PADDY FARMS

		N	Mean	Std. Error
Area under paddy 1997/98-1999/2000	Below 10 Ha.	32	6.28	.43
	11-20 Ha.	3	20.00	.50
	21-30 Ha.	8	28.13	.91
	31-40 Ha.	3	45.00	1.32
	41-50 Ha.	7	71.43	10.10
	51-60 Ha.	8	50.00	3.78
	Total	61	24.93	3.22
Land preparation for paddy (Tshs/ha)	Below 10 Ha.	32	36786.00	570.3695
	11-20 Ha.	3	40083.00	434.0000
	21-30 Ha.	8	40937.00	65.4654
	31-40 Ha.	3	41416.00	355.0000
	41-50 Ha.	7	40416.00	303.0458
	51-60 Ha.	8	39404.00	275.0000
	Total	61	39504.00	320.8609
Seed cost for paddy (Tshs/ha)	Below 10 Ha.	32	12200.00	207.1309
	11-20 Ha.	3	12200.00	125.0000
	21-30 Ha.	8	13124.00	457.4532
	31-40 Ha.	3	13124.00	342.0000
	41-50 Ha.	7	14000.00	707.1068
	51-60 Ha.	8	13750.00	188.9822
	Total	61	12580.00	159.3940
Planting cost for paddy (Tshs/ha)	Below 10 Ha.	32	38662.50	202.2928
	11-20 Ha.	3	34500.00	198.0000
	21-30 Ha.	8	34500.00	231.4550
	31-40 Ha.	3	31500.00	165.0000
	41-50 Ha.	7	33879.06	686.9037
	51-60 Ha.	8	31968.90	170.0840
	Total	61	33768.89	190.8214
Weeding cost for paddy (Tshs/acre)	Below 10 Ha.	32	27378.1250	611.0167
	11-20 Ha.	3	31200.0000	512.0000
	21-30 Ha.	8	25175.0000	2369.5049
	31-40 Ha.	3	21200.0000	956.0000
	41-50 Ha.	7	23185.7143	1878.8837
	51-60 Ha.	8	26800.0000	3099.3087
	Total	61	26416.3934	668.8632
Harvesting cost for paddy (Tshs/ha)	Below 10 Ha.	32	26672.50	252.6117
	11-20 Ha.	3	25000.0000	135.2876
	21-30 Ha.	8	25620.5000	457.4532
	31-40 Ha.	3	29500.0000	232.2876
	41-50 Ha.	7	25742.8571	585.8885
	51-60 Ha.	8	28500.0000	132.2876
	Total	61	26462.2951	184.8669
Average gross revenue for paddy (Tshs/ha)	Below 10 Ha.	32	378665.00	16249.6641
	11-20 Ha.	3	411145.00	9792.4048
	21-30 Ha.	8	441833.00	29508.3380
	31-40 Ha.	3	435205.00	8892.4048
	41-50 Ha.	7	454606.00	30708.6374
	51-60 Ha.	8	493296.00	8992.4048
	Total	61	42627.1285	10737.4268

Appendix 7 continued

		N	Mean	Std. Error
Hired labour for paddy (Tshs/ha)	Below 10 Ha.	32	28462.5000	392.3860
	11-20 Ha.	3	29100.0000	.0000
	21-30 Ha.	8	30050.0000	557.4175
	31-40 Ha.	3	26000.0000	.0000
	41-50 Ha.	7	31742.8571	121.2183
	51-60 Ha.	8	35450.0000	850.4201
	Total	61	29873.7705	403.2850
Other input costs for paddy (Tshs/ha)	Below 10 Ha.	32	36962.00	531.4456
	11-20 Ha.	3	32300.0000	.0000
	21-30 Ha.	8	41025.0000	2407.8554
	31-40 Ha.	3	33000.0000	.0000
	41-50 Ha.	7	43428.5714	80.8122
	51-60 Ha.	8	48250.0000	1606.3490
	Total	61	39293.4426	734.4894
Average yield for paddy (Tons/ha)	Below 10 Ha.	32	3.7044	1.3475
	11-20 Ha.	3	4.3387	.0000
	21-30 Ha.	8	4.4857	2.3391
	31-40 Ha.	3	4.5178	.0000
	41-50 Ha.	7	4.6486	2.8464
	51-60 Ha.	8	4.9974	.9387
	Total	61	4.3554	.8877
General average gross margin for paddy (Tshs/ha)	Below 10 Ha.	32	216275.00	12837.3546
	11-20 Ha.	3	247522.00	31635.8541
	21-30 Ha.	8	269121.00	28974.2033
	31-40 Ha.	3	275589.00	41530.3516
	41-50 Ha.	7	278510.00	29118.7790
	51-60 Ha.	8	304736.00	43775.6286
	Total	61	257418.5900	10534.3774