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A SURVEY ON THE SOCIO-ECONOMIC SMALLHOLDER . DAIRY PRODUCTION IN THE LILONGWE MILKSHED AREA IN MALAWI: IMPLICATIONS FOR DAIRY PRODUCTION POLICY

November 1989

A SURVEY ON THE SOCIO-ECONOMIC CONSTRAINTS TO SMALLHOLDER DAIRY PRODUCTION IN THE LILONGWE MILKSHED AREA IN MALAWI: IMPLICATIONS FOR DAIRY PRODUCTION POLICY

by

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A dissertation submitted to the University of Malawi
in partial fulfilment of the requirements for the
degree of Master of Science
in Agricultural Economics

Rural Development Department
Bunda College of Agriculture
University of Malawi

November 1989

To my Canadian host family

of Dr R.A. MacNeil

DECLARATION BY CANDIDATE

I hereby declare that the whole work embodied in this dissertation is my original work and has not been presented for any other awards.

Signed: .....
Candidate

Date: 14/11/89

DECLARATION BY SUPERVISORS

We hereby declare that this dissertation has been submitted with our approval.

Signed: ..... Date: 14/11/89
Major Supervisor

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Member,
Supervisory Committee

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Member,
Supervisory Committee

ABSTRACT

The past record of dairy production in Malawi has been disappointing. This poor performance, which has been accompanied by a high rate of malnutrition, has transpired into imports of milk and milk products. In addition there has been limited work in Malawi on the socio-economic aspects of livestock production in general and dairy production in particular. Thus, the study was carried out in order to identify and/or ascertain some of the major socio-economic constraints to smallholder dairy production in the Lilongwe milkshed area in Malawi with the intention of advising government on their implications for dairy production policy.

Survey data were collected for the 1987-1988 period and were analysed using: (1) frequencies and percentages; (2) linear correlation analysis; (3) Chi-squared analysis; and (4) Gross Margin analysis. Several hypotheses based on review of related literature were then tested using linear correlation, Chi-squared and Students' t tests.

The survey results have shown that the matriachal social organization discourages investment in dairy production in the village of marriage because of insecurity, distrust of wife's relatives and lack of land at wife's home. No significant positive linear correlation was established between years as dairy farmer (proxy for experience) and average milk yield per cow. However, dairy

farmers, with an average holding size of 3.27 ha and a mean labour supply of 5416.8 man-hours/year, had significantly more land ($P \leq 0.01$) and labour ($P \leq 0.05$) than non-dairy farmers who had respective averages of 2.53 ha and 4670.2 man-hours/year. Mean Total Gross Margin (TGM) for dairy farmers (K1,271.33) was also significantly ($P \leq 0.01$) higher than that of non-dairy farmers (K731.84).

This study has further shown that the major constraints to smallholder dairy production in the Lilongwe milkshed area are: (1) lack of land; (2) lack of dairy foundation stock; (3) ignorance; and (4) poor management. In case of marketing the main problems were: (1) sour milk; (2) delayed payments; and (3) low milk prices.

Recommendations made from the study relate to: (1) the need to intensify alley cropping; (2) relaxation of the 1.21 ha of pasture regulation for dairy cattle; (3) expansion of breeding programmes; (4) assessment of technical and economic feasibility of using other livestock species such as goats and sheep; (5) involvement of private breeders; (6) intensification of dairy extension programmes on general management; (7) establishment of small scale rural processing plants to minimize souring of milk; and (8) annual upward price revisions that reflect cost of dairy production.

ACKNOWLEDGEMENTS

A number of experts gave valuable assistance which helped to initiate the study and/or improve the logic and organization of this dissertation. It is impossible to list all the names but a lot of injustice would be made if I failed to mention my special gratitude to the Beef/Dairy Production Systems (IDRC) Project for granting me their Fellowship to study at the University of Malawi and to the Council for the Development of Economic and Social Research in Africa (CODESRIA) for the September 1988 Research Proposal writing competition award.

I am very much indebted to my supervisors: Drs J.S. Nankumba and D.H. Ng'ong'ola of Rural Development Department, Bunda College of Agriculture, University of Malawi for their excellent supervision, interest in my problem oriented study and general friendliness. I owe a debt of thanks to Dr L.A. Kamwanja, Professor T.P.E. Makhambera and Mr James Banda for being very helpful especially in areas of the study that were related to livestock.

I am also indebted to Dr B.F. Kandoole of Chancellor College and Mr C.J. Redston of the University of Wales for accepting to teach me Econometrics and Development Economics, respectively. These courses were surely vital for my training in Agricultural Economics.

Dr S.S. Chiyenda, Mr M. Kamanga and Mr Steve Ngwira will

also be remembered for their stimulating lectures in the supporting courses. I am indebted too to Professor N.C. Chiu of the Rural Development Department, University of Malawi, who is seconded from Taiwan, R.O.C., for his direct personal encouragement and for the interesting lectures and discussions pertaining to my training in Agricultural Economics that I used to have with him.

I would further like to thank the Ministry of Agriculture for providing me with valuable practical training in various computer packages; in project planning, monitoring and evaluation and also for allowing me to carry out my study in the Lilongwe Agricultural Development Division. The field staff of the Ministry of Agriculture is also hereby thanked for being friendly and willing to give me any information I asked for during the study period.

The Librarian, Mrs M. Ngwira, and her staff at Bunda College of Agriculture and Mr P. Ferguson of the Ministry of Agriculture library cannot be commended enough for graciously providing reading materials and space in their libraries during the preparation of this dissertation. Finally, but certainly not the least, I thank all the interviewees for sacrificing their time to answer my thick questionnaire; Miss Enifer Simika, Women's Programme Consultant of DEMATT for being the first reviewer, editor and confidant of my work; and also Miss Miriam Lengani Chabwera for expertly typing this dissertation.

Julius H. Mangisoni
November 1989

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CHAPTER I

INTRODUCTION

Background Information to Malawi[1]

Malawi is a small land-locked developing country in Central Africa lying between the latitudes of 9°45' and 17°16' South and longitudes of 32° and 36° East. It is bordered by Zambia in the west, Tanzania in the north and northeast and Mozambique in the east, south and southwest (Figure 1). Total land area for Malawi is 11.8 million hectares, 20 percent of which is water surface.[2]

Administratively Malawi is divided into three regions: the Northern, Central and Southern Regions with Mzuzu, Lilongwe and Blantyre as the Regional cities, respectively (Figure 1). The country's population was estimated at 8.0 million people in 1987 giving an average population growth rate of 3.7 percent per annum during the 1977-1987 period. The overall population density in 1987 was 85 persons per square kilometre (km^2) as compared to 59 persons/km^2 in 1977.[3]

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[1]Detailed presentation of background information to Malawi is found in Appendix A.

[2]J. Sinoya Nankumba, "Progress in Agrarian Reform and Rural Development in Malawi: Country Report for 1980-1985/86" (Lilongwe: Ministry of Agriculture, 1987), p. 5.

[3]Malawi Government, National Statistical Office (NSO), Population and Housing Census 1987, Preliminary Report 1987 (Zomba: Government Printer, December 1987), pp. xiii-3.

Agriculture in Malawi

Agriculture is the main spring of Malawi's economy accounting for 36.9 percent[4] and 88 percent of the Gross Domestic Product (GDP) and the total export earnings in 1987, respectively. Agriculture also contributed 46 percent of wage employment in 1985 apart from supporting 85 percent of the population residing in rural areas and earning their living from farming.[5]

Malawian agriculture is commonly termed bimodal, referring to agricultural production which is derived from two subsectors: (1) the estate or commercial subsector which operates land under leasehold and freehold tenure systems and grows mostly export crops such as burley and flue-cured tobacco, tea, coffee and sugarcane on plantations; and (2) the smallholder subsector which comprises the majority of the rural population working on small holdings mostly under customary land tenure system. The average holding size was estimated at 1.1 ha/farm family in 1987 and the major cash crops were fire-cured and sun/air cured tobacco, groundnuts, hybrid maize and cotton. Local maize, sweet potatoes, cassava

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[4]Economist Intelligence Unit, Country Report No. 4, Zimbabwe, Malawi: Analysis of Economic and Political Trends Every Quarter, 1988 (New York and London: Economist Intelligence Unit Limited, 1988), p. 3.

[5]D.H. Ng'ong'ola, "Integration of Research, University Teaching and Extension in Malawi", paper presented at the workshop on Integration of Research, Teaching and Extension, Arusha, Tanzania, 22-26 February 1988.

and pulses are mostly grown for food.[6] In 1988 the smallholder subsector accounted for 77 percent of agricultural output in Malawi.[7]

Agricultural development strategy.[8] As a result of the overriding importance of the agricultural sector, the Government of Malawi has launched a development strategy which is geared towards improving agricultural productivity in order to (a) maintain self-sufficiency in staple foods, (b) expand agricultural exports and (c) improve incomes of rural people. Before mid-1970s improvements in smallholder productivity were sought through intensive and expensive multicomponent rural development projects (major projects). These projects were: the Karonga Rural Development Project in the Northern Region; the Lilongwe Land Development Programme and the Central Region Lakeshore Development Project in the Central Region and the Shire Valley Agricultural Development Project in the Southern Region. However, in the mid-1970s the need to change the Government's rural development strategy was recognized since the expensive major projects only covered 20 percent of the total population and could not be replicated

[6]World Bank, "Malawi Smallholder Agricultural Credit Project: Staff Appraisal Report" (Washington D.C.: World Bank, 1987), p. 3.

[7]Malawi Government, Office of the President and Cabinet (OPC), Department of Economic Planning and Development, Economic Report 1988 (Zomba: Government Printer, 1988), p. 29, Table 4.4.

[8]Malawi Government, Ministry of Agriculture and Natural Resources, Planning Division, National Rural Development Programme: Policies, Strategies and General Features (Lilongwe: Planning Division, 1978), pp. 47-50.

within a reasonably short period. Consequently, the concept of National Rural Development Programme came into being.

The National Rural Development Programme (NRDP) was formulated in 1978 in order to spread agricultural development over the entire country by less intensive and costly avenues. The programme is designed to increase smallholder production level through the provision of agricultural inputs, and to increase the scope and efficiency of marketing, extension and credit services. It also emphasises on afforestation, watershed management and soil conservation.

Under NRDP, for planning and implementation purposes, the country has been divided into eight Agricultural Development Divisions (ADDs): Karonga and Mzuzu ADDs in the Northern Region; Kasungu, Salima and Lilongwe ADDs in the Central Region; and Liwonde, Blantyre and Ngabu ADDs in the Southern Region (Figure 1). Each ADD is administered by a Management Unit headed by a Programme Manager. The ADDs are further divided into 2-5 Rural Development Projects (RDPs)[9], each RDP being headed by a Project Officer. Finally, the RDPs are in turn subdivided into Extension Planning Areas (EPAs), each headed by a Development Officer. Each EPA is expected to have uniform soils, rainfall, temperature, topography and other natural

[9]Lilongwe ADD has 5 RDPs: Lilongwe North East, Lilongwe, Thiwi/Lifidzi, Dedza Hills and Ntcheu RDPs.

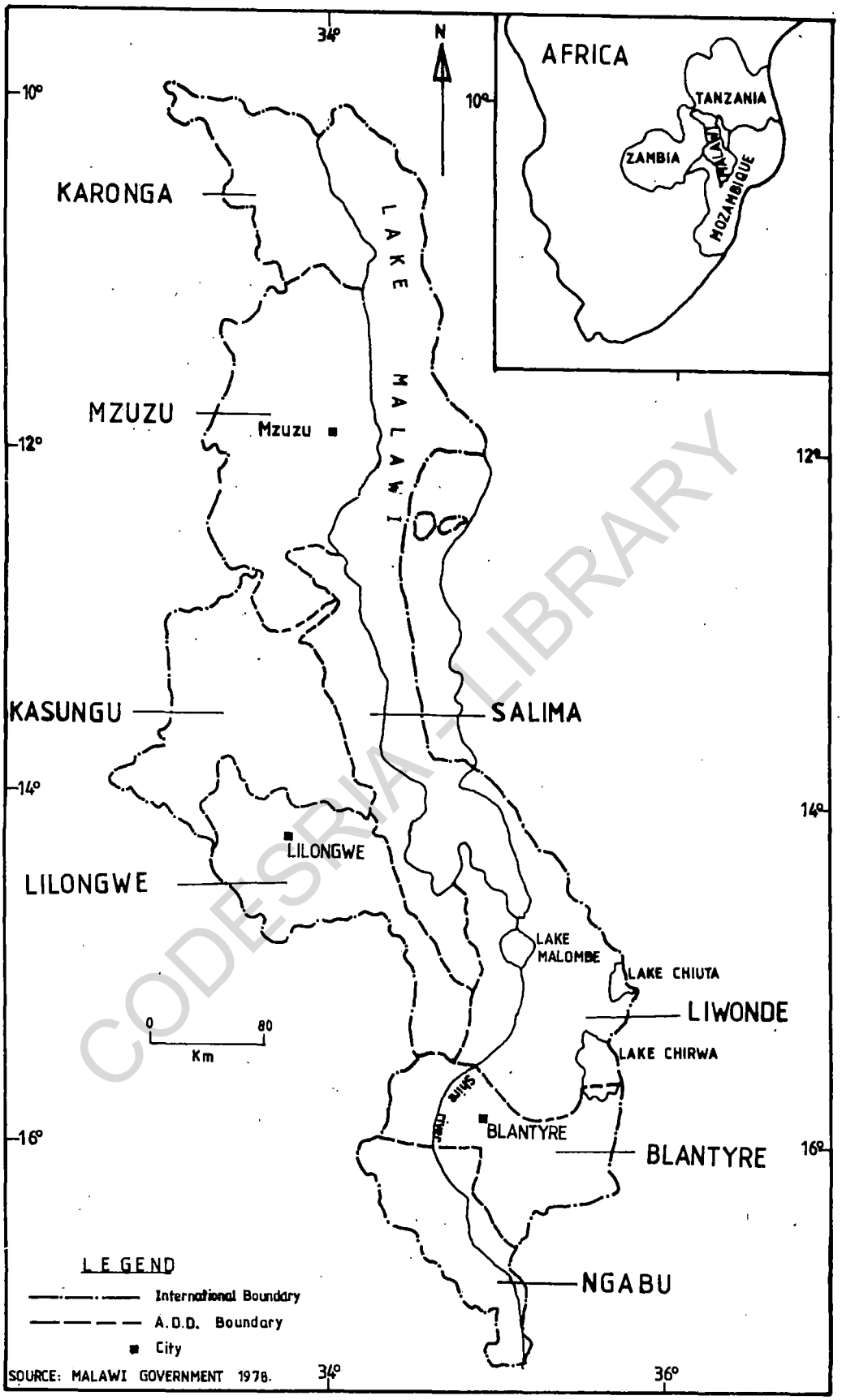

FIGURE 1: Agricultural Development Divisions (ADDs), Malawi.

resources. Thus the EPAs are used as the basic units for planning purposes in Malawi.[10]

Livestock production in Malawi. In addition to crop production farmers in Malawi rear various livestock species such as cattle, goats, sheep, pigs and poultry. According to the 1987 livestock census the country's population of cattle, goats, sheep, pigs and poultry was estimated at 838471; 799060, 75952; 238302 ad 3262203, respectively.[11] The distribution of cattle in Malawi was estimated at among less than 13 percent of all households in 1981 while 28.2%, 1.9%, 8.1% and 70.3% of the smallholder farmers reared goats, sheep, pigs and poultry, respectively in the same year.[12]

The national livestock development policy of Malawi as embodied in the 1967 statement aims among other things at self-sufficiency in all livestock products and to export profitably any surplus that may arise. It is also in the domain of the government to ensure that the population of Malawi has nutritious food.[13]

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[10] Malawi Government, Ministry of Agriculture and Natural Resources, Planning Division, National Rural Development Programme : Policies, Strategies and General Features (Lilongwe: Planning Division, 1978), pp. 47-50.

[11] Malawi Government, Ministry of Agriculture, Department of Animal Health and Industry, "Livestock Population Census for 1987" (Lilongwe: Department of Animal Health and Industry, 1988).

[12] NSO, National Sample Survey of Agriculture 1980/81 Vol. III (Zomba : Government Printer, 1984), pp. 17-18.

[13] Arup Atkins International Limited, "National Livestock Development Study : Final Report" (Cambridge, UK : Arup Atkins International Limited, 1988), pp. 8-10.

Dairy production has, therefore, been one of the avenues explored by the Malawi Government in her endeavour to maintain self-sufficiency in food products and to provide nutritious food to the expanding population in the country. To achieve this policy objective in dairy production the government came up with the following three "tools" in dairy development: establishment of estate owned and parastatal farms such as Katete, Ndata and Mikolongwe; promotion of medium sized farms - most of which are commercial farms like Bwemba and Chitedze, and finally introduction of Smallholder Dairy Development Scheme in all the three administrative regions of the country.

To ease management, dairy production in Malawi is organized into three milkshed[14] areas around Lilongwe, in the Centre; Blantyre in the South and Mzuzu in the Northern Region. Within these milkshed areas smallholder dairy farmers who are usually members of bulking groups[15] and within a radius of 8 km of a cooling centre deliver milk twice daily to their nearest cooling centre or collection point. The milk is collected from these centres by bulk tankers or churn lorries every one or two days and then transported to the nearest

[14] Radius within which farmers are allowed to produce milk to sell to the Malawi Dairy Industries Limited (MDI). Malawi Dairy Industries is a parastatal body charged with the purchase, processing and marketing of milk in Malawi.

[15] Individuals who pool their milk and sell it as one supplier.

processing plant in each milkshed. Some larger estates deliver their milk directly to the plant.[16]

Farmers are encouraged to form bulking groups mainly for administrative convenience on the part of extension workers and the Malawi Dairy Industries Limited (MDI). Regional associations of bulking groups such as Shire Highlands Milk Producers Association (SHMPA) for Blantyre and Central Region Milk Producers Association (CREMPA) for Lilongwe have been formed to guide and direct the activities of the bulking groups. There are currently more than 4,000 milk producers, including 1,687 with improved dairy cattle, organized into 46 bulking groups and three regional associations of producers.[17] In 1974 there were 110 dairy cows in Blantyre and Lilongwe milksheds but at present there are 3,000 dairy cows in all the three milksheds.[18]

Rationale for the Study

Dairy production is very important to a developing country like Malawi in that the Dairy Industry is capable of supplying both milk (main product) and meat (byproduct) to the people both in rural

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[16] Arup Atkins International Limited, "National Livestock Development Study : Final Report" (Cambridge, UK : Arup Atkins International Limited, 1988), pp. 8-10.

[17] Ibid.

[18] M. Kanyenda, "Livestock Production Extension Strategies in Malawi", paper presented at the 1st National Workshop on Livestock Production in Malawi, University Great Hall, Zomba, 3-9 January 1988.

and urban areas thereby providing a means of curtailing malnutrition. Nutritionally, milk is a very important food for growing children, expectant and lactating women, and the sick and it provides many of the essential nutrients.[19]

Produced from feedstuffs such as roughages and crop residues which are nonutilizable by man, milk ensures that minimum competition prevails between man and the dairy animals for food items unlike other enterprises such as pig production. In this connection dairy production can be easily incorporated in a crop enterprise so that livestock dung can be used as fertilizer for crops while crop residues can be fed to dairy animals thereby creating a symbiotic relationship.

Meat and milk are export products and they earn a country foreign exchange while bones and some tissues and organs are raw materials for the manufacturing sector not to mention the role the hide of the animal plays in construction of drums for entertainment. Indeed the dairy industry helps in reduction of unemployment by offering jobs to citizens since dairy production is labour intensive and less seasonal than crop and other enterprises. On the whole the dairy enterprise assures the farmer of a regular income unlike other enterprises.

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[19] Janny van der Meer and Beatrice R. Mansur, Compilers, Tanzania Food with Traditional and New Recipes (Rome : Food and Agriculture Organization, 1973), p. 111.

However, in Malawi, the self-sufficiency policy objective in dairy products has not been achieved as a lot of milk products have still got to be imported.[20] Coupled with this is the high malnutrition problem of 49 percent to over 60 percent of the population of underfive children in Malawi[21] and the country's alarming infant mortality rate of 165 deaths/1000 livebirths which is the fifth highest in the world.[22] Thus investment in dairy industry could be one of the measures for cutting down the high rate of malnutrition and reducing importation of milk products in Malawi thereby satisfying the well intentioned objective of achieving self-sufficiency in milk and milk products plus providing nutritious food to the population and exporting profitably any surplus that may arise. But before this is done there is need for research into the factors that are crucial for dairy development, one of which is the socio-economic constraints to smallholder dairy production.

However, in Malawi, there is very little research that has been done on the socio-economic aspects of livestock production in general and dairy production in particular. For instance it

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[20]Malawi Government, Ministry of Agriculture (MOA), Guide to Agricultural Production in Malawi 1988-1989 (Lilongwe : Extension Aids Branch, 1988), p. 121.

[21]International Baby Food Action Network (IBFAN) African News, Country Reports (Nairobi : IBFAN African News, 1986), p. 6.

[22]Population Reference Bureau Inc., World Population Data (Washington : Population Reference Bureau Inc., 1985).

was reported that there was insufficient data available on the social, economic and technical problems facing dairy farmers in Malawi[23] and also that of the total manpower assigned to food crops, commercial crops, livestock, farming systems and others in Malawi, only 12 percent was assigned to livestock while crops took the largest share of 38.4 percent.[24] In view of the limited work on dairy production done in Malawi this study was deemed useful in identifying some of the problems hindering dairy production while being a benchmark for further research. The results and solutions that have emerged from the study as well as the approaches or analytical techniques employed can then be applied to places with similar conditions in Malawi.

Objectives of the Study

The work was undertaken with the general objective of identifying the major socio-economic constraints affecting smallholder dairy production in the Lilongwe milkshed area and advising Government on their implications for dairy production policy in Malawi. The

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[23] J. Nzima, "An Economic Evaluation of the Main Constraints of Animal Health and Production of Smallholder Dairy Cattle in Malawi" (M.Phil. thesis, University of Reading, 1985), p. 2.

[24] DEVRES INC. (USAID), Agricultural Resource Assessment in the SADCC Countries Vol. 1 : Regional Analysis and Strategy (Washington, D.C. : DEVRES INC. (USAID), 1985), pp. 38-39.

specific objectives of the study were:-

1. To assess the impact of the matriachal type of social organization in the Central Region on investment in dairy production in the village of marriage.

2. To estimate the availability of land and labour to both dairy and non-dairy farmers in the milkshed area.

3. To evaluate smallholder dairy production in the Lilongwe milkshed area through:-

   (a) appraisal of management practices of the smallholder dairy farmers in the milkshed area,

   (b) assessment of the milk production levels, and,

   (c) estimation and comparison of gross margins arising from the dairy enterprise to those of selected non-dairy enterprises.

4. To estimate and compare Total Gross Margins (TGM) for dairy and non-dairy farmers.[25]

5. To suggest solutions to the identified problems with respect to smallholder dairy production.

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[25]Non-dairy farmers are those farmers whose objective is not milk production for the market.

Hypotheses

The underlying hypotheses of the study were as follows:-

1. Matriachal type of social organization discourages investment in dairy production in the wife's home.

2. There is a significant positive linear relationship between years as dairy farmer (proxy for experience) and average milk yield per cow.

3. Incomes of dairy farmers are higher than those of non-dairy farmers because the present land holding per family does not allow profitable crop production.

Summary and Thesis Organization

Thus far, a discussion on the importance of dairy production in developing countries, Malawi Government's policy objectives in dairy production and problems of research in dairy production in Malawi, by way of justification of the study have been presented in the foregoing chapter. Furthermore, Chapter I has introduced the objectives of the study and hypotheses to be tested apart from giving background information to Malawi. This background information included location, population and land tenure.

While discussing agriculture in Malawi Chapter I has also explored livestock production in general and dairy production in particular through description of milk marketing, bulking groups and regional associations of dairy producers created to guide and coordinate the activities of the bulking groups in the country. In Chapter II a review of related literature including trends in dairy imports in Sub-Saharan Africa, infrastructure, illiteracy, farm management, social values and land tenure will be presented.

Chapter III will be devoted to a thorough treatment of the survey methodology used. Thus, in Chapter III emphasis will be put on data collection; sampling techniques employed; how measurements were taken; analysis and analytical tools and then limitations of the methodology used will wind up the chapter.

In Chapter IV a description of the study area (Lilongwe milkshed) will be provided. Also in this chapter there will be a general discussion on the characteristics of sample households in the study area. This will include household size and composition; marital and social status; education levels of respondents; land holding sizes and acquisition of land; cropping patterns and allocation of land to various enterprises and finally tools and/or implements mostly used in agricultural production in the study area will also be discussed in the chapter.

Chapter V will provide an insight into dairy production in the study area in terms of dairy cattle population among the sample households; methods of acquiring dairy cattle; important source of income to dairy farmers; cattle grazing systems and type of feed frequently given to dairy cattle. Discussions on herd boys' terms and conditions of service plus their ages and wages will also be reviewed in this chapter.

In Chapters VI and VII major discussions will be on the socio-economic handicaps presented to dairy production in the Lilongwe milkshed area. Chapter VI will look at investment in and management of dairy enterprise while Chapter VII will be restricted to returns to dairy enterprise. Finally, Chapter VIII will look at the policy implications of the problems discussed in the dissertation for dairy production in Malawi while drawing conclusions and recommendations.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

The literature on socio-economics of livestock production in Malawi is very scanty. However, available information shows that in the past years the record of performance of the livestock sector in Malawi and indeed in some countries of Sub-Saharan Africa has been very discouraging. For instance, in 1980 about 5 percent of Sub-Saharan Africa's total revenue derived from exports of forestry, fishery and agricultural products was spent on imports of dairy products. In 1960 dried and condensed milk accounted for two thirds of the dairy imports by value but from 1970 onwards the proportion of these two products in the dairy import bill climbed to approximately 90 percent on average.[1] Thus Sub-Saharan Africa has failed over the years to meet domestic consumption in dairy products from own production.

Many development economists feel that inappropriate government policies are responsible for Sub-Saharan Africa's dismal record of performance in dairy production.[2] However, others feel that

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[1]Valentin H. von Massow, Dairy Imports into Sub-Saharan Africa: Problems, Policies and Prospects (Addis Ababa: ILCA Publications Division (1988)), pp. 1-4.

[2]Ibid.

in addition to ineffective government policies socio-economic factors such as infrastructure, illiteracy, farm management, social values and land tenure also come into force.

Infrastructure

Good infrastructure in the form of roads and markets is essential for the success of a dairy enterprise for producers need to be assured of ease of access to a ready market for the surplus milk produced. For example, it was reported in 1971 that the presence of all weather roads and nearness to markets were some of the factors responsible for distribution of salable milk in Blantyre-Limbe markets in Malawi.[3] However, not all farmers are suitable for dairy production because some are far from the milk collection points while others may not spend much time on their farms because they might be having other businesses thereby leaving important activities such as daily feeding and heat detection to the untrained labourers.[4] Therefore, careful selection of farmers for the Smallholder Dairy Development Scheme is paramount for the success of the industry. Consequently in Malawi only farmers located within 8 kilometres (km) radius around each milk collection centre are

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[3] R.H. Schmidt, Jr., "The Rural Dairy Industry of Blantyre-Limbe, Malawi", Rocky Mountain Social Science (RMSS) Journal Vol. 8/No. 2 (October 1971), 35.

[4] D. Lines and H.M. Luteijn, The Smallholder Dairy Scheme in Malawi: Project MLW 75/020, Assistance to Livestock Development, Food and Agriculture Organization of the United Nations (FAO) (Lilongwe: Extension Aids Branch, 1988), p. 9.

considered for dairy production for easy administration and supervision by field staff; to ensure prompt artificial insemination of the dairy cows and that milk arrives at the collection centre in acceptable condition.[5] The problem with this arrangement is that potential farmers are condemned or discriminated against by their geographical location in relation to the milk collection centre and this can precipitate into low milk production in the whole country.[6] Therefore, for successful milk production there is need for suitable marketing procedures in order to capture all potential farmers (where feasible) as well as to ensure smooth running of the marketing system. For instance in 1987 it was reported that milk is produced in almost every Sub-Saharan country in Africa but only a small portion of the milk enters the commercial market because of marketing hitches and "lack of suitable techniques for smallholder dairying."[7] In a separate report Nankumba in 1988 pointed out that in Mzuzu ADD during the rainy season all roads to milk collection centres were impassable[8] while in its Annual Report for the Southern Region,

[5] I.H. Proverbs, "Dairy Extension in Malawi: Notes for Guidance of Field Staff, 1974" (Bunda College of Agriculture, University of Malawi, 1984), p. 1.

[6] Interview with James Banda, Bunda College of Agriculture, University of Malawi, 1988.

[7] F. O'Mahony and K.J. Peters, "Options for Smallholder Milk Processing in Sub-Saharan Africa", International Livestock Centre for Africa (ILCA) Bulletin No. 27 (1987), 1

[8] John Sinoya Nankumba, "Socio-economic Constraints to Beef/Dairy Production in Malawi: Some Experiences", paper presented at the 1st National Workshop on Livestock Production in Malawi, University Great Hall, Zomba, 3-9 January 1988.

the Malawi Government indicated that the total milk intake for the financial year ending 31st March 1985 decreased by 6.93 percent over the previous year.[9] This decrease was mostly because of the drop in the number of farmers selling milk particularly in the Chileka area where one bulking group (T.A. Symoni Group) had stopped sending milk to Matope due to local transport problems in addition to the drought that hit the area.[10]

However, in the developing world not all economies have been unsuccessful with dairy production, other countries have experienced tremendous strides in dairy development. Some examples are Kenya and India. These two countries have been labelled as some of the most successful economies as far as Smallholder Dairy Development is concerned.[11] The success story of Kenya and India hinges on an "effective marketing system based on cooperative structure, well developed infrastructure, provision of technical services and a reform in the pricing policy that abolished supply quotas which discriminated against smallholder farmers."[12] As for the other unsuccessful developing countries, their failures have mostly

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[9]Malawi Government, MOA, "Annual Report for Southern Region 1985" (Blantyre: Department of Animal Health and Industry, 1985), p. 18.

[10]Ibid.

[11]P.J. Brumby and G. Gryseels, "Stimulating Milk Production in Milk Deficit Countries in Africa and Asia", ILCA Bulletin No. 19 (1984), 4.

[12]Ibid.

centred around pursuance of conflicting policies which tend to hack down the progress of small scale farmers. For instance in Zimbabwe an analysis of milk pricing policy showed that "government policy of depressing consumer prices was not consistent with the objective of achieving self-sufficiency in dairy products"[13] because it is generally the producer who plays victim of such a move. In a related report the Malawi Government indicated in 1973 that:

> ....existing prices are controlled below import parity and price controls have a clear sign of disincentive effect on supplies of cattle to markets and there is some evidence that in the absence of higher prices shortages are occurring and allocation is taking place by queuing.[14]

The report also advised that "....since demand is higher than supply meat prices must rise to equate demand to supply."[15] This was supported in 1980 by Mthindi who recommended that price policy must be oriented toward increasing farmers' incomes relative to cost of living apart from providing incentive to farmers for adoption of new technologies and efficient allocation of resources.[16]

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[13] G. Rodriguez, Jr., "The impact of the Milk Pricing Policy in Zimbabwe", ILCA Bulletin No. 26 (1987), 6.

[14] Malawi Government, Ministry of Agriculture, "Economic Appraisal of Dzalanyama Ranch" (Lilongwe: Ministry of Agriculture, 1973).

[15] Ibid.

[16] G.B. Mthindi, "An Analysis of Agricultural Resource Use in Ntcheu District, Malawi" (M.Sc. dissertation, University of Wales, 1980), pp. 87-88.

Illiteracy and Farm Management

Illiteracy on the part of the producer is hazardous to dairy production since modern production requires knowledge of combining inputs in desirable levels to obtain optimum output.[17] Illiteracy is a precursor of most farm management problems because it sets a limit to the farmer's managerial ability. For example, in a discussion on the major development constraints to the three major Agriculture Projects in Malawi the problems that featured high were illiteracy and farm management.[18] Thus to increase livestock production there is need for training of farmers in all animal husbandry practices by extension workers. These extension workers should also be well trained in order to effectively conduct demonstrations, field days and short courses to improve the management of the farmers. However, it was noted in 1984 that in most African and Asian countries the main constraints to the provision of excellent animal husbandry practices to farmers is the limited farm management knowledge of the advisory officers themselves[19] who having repeated the same messages to farmers over many years due to lack of new recommendations from research have become technologically obsolete. Besides in Malawi it has been reported that farmers are more responsive

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[17] P.P. Chirwa, "Development Constraints in Three Major Agricultural Projects in Malawi: A Critical Examination of the Lilongwe, Salima and Lower Shire Agricultural Development Projects" (M.Sc. dissertation, University of Wales, 1979), p. 92, Table 19.

[18] Ibid., pp. 91-92.

[19] Brumby and Gryseels, ILCA Bulletin No. 19, p.6.

to the use of improved seed and fertilizers for crop production than to stall feeding and dairy production mainly because the last two mentioned activities attract considerable managerial complexities to the farmers.[20]

However, literacy per se may not bring forth increase in yields. Some form of experience in terms of number of years on the job or training may be necessary. For example, with respect to tenants in the burley tobacco industry, a significant ($P \leq 0.01$) relationship between years as tenant farmer (proxy for experience) and yield of burley tobacco was reported in Malawi.[21]

Social Values

Another striking factor especially in places where dairy production is significant and expanding is social values people place upon cattle keeping. In 1971 a close relationship was observed between the Ngoni people, who kept a lot of cattle and formed greater than one third of Blantyre citizens, and the important milk producing areas in Blantyre.[22] However, in Malawi the majority of cattle

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[20] J. Sinoya Nankumba, "An Economic Analysis of the Application of Appropriate Technology to Farm Systems in Malawi: Implications for the National Rural Development Programme" (Ph.D. thesis, University of Wales, 1985).

[21] Idem, "Tenure Systems in the Estate Subsector of Malawi: The Case of Tenancy Arrangement", report to Winrock International, Rural Development Department, Bunda College of Agriculture, Lilongwe, June 1988.

[22] Schmidt, Jr., RMSS Journal Vol. 8/No. 2 (October 1971), 35.

are kept for prestige and this attitude toward cattle can cripple livestock production. In the patrilineal society of the Northern Region of Malawi, lobola[23] is quite rampant. As a result farmers keep a lot of cattle and do not cull them so that they can have enough cattle for dowry. For instance, in 1979 it was reported that despite Mzimba being one of the chief cattle rearing areas in the Northern Region of Malawi, farmers in South West Mzimba realised little cash income from cattle production[24] which emphasized the fact that cattle were being used for other purposes in the area such as dowry and social status than economic ones. Similarly, farmers in Thiwi/Lifidzi area, in Central Malawi, used cattle as a symbol of wealth and/or to honour court fines and debts from creditors and not for economic reasons. The extended family system was also a setback to cattle keeping as an economic undertaking in the area because it was obligatory for a farmer to share cash income gained from cattle sales with family members thereby depressing his cash income.[25] It is hoped that in the foregoing the term "economic" was used to mean "commercial" because to honour court fines and debt obligations using income from cattle sales suggests more of an economic activity than a social obligation. In addition

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[23]The practice of paying bride price in patrilineal societies.

[24]E.B. Makumba, "An Economic Analysis of the Factors Affecting Smallholder Farm Income in South West Mzimba" (M.Sc. dissertation, University Wales, 1979), p. 57.

[25]D.H. Ng'ong'ola, "An Economic Analysis of Smallholder Farm Expenditure in Thiwi/Lifidzi" (M.Sc. dissertation, University of Wales, 1979), p. 57.

the attitude farmers have for cattle especially dairy cattle in Malawi was reported in 1971 as leaning more towards the market than otherwise.[26]

Land Tenure

Land tenure[27] mostly in terms of land scarcity and distribution amongst the rural households and other users can also affect dairy production. For instance, in Thyolo District in the Southern Region of Malawi customary land has been constrained by the presence of a large number of tea estates. As a result very few farmers have dairy cattle because there is hardly any place to graze them in the District.[28] Within similar lines of emphasis LADD authorities point out that initially a total of 1.2 ha is required for a two-cow unit. This is liable to upward adjustment by 0.6 ha for each additional cow unit acquired. Therefore, only those farmers with land sufficient for two cows are hot favourites for the Smallholder Dairy Development Scheme in Malawi.[29]

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[26]Schmidt, Jr., RMSS Journal Vol. 8/No. 2 (October 1971), 35.

[27]The right people have to the acquisition and use of land.

[28]Schmidt, Jr., RMSS Journal Vol. 8/No. 2 (October 1971), 35.

[29]John Sinoya Nankumba, "Socio-economic Constraints to Beef/Dairy Production in Malawi: Some Experiences", paper presented at the 1st National Workshop on Livestock Production in Malawi, University Great Hall, Zomba, 3-9 January 1988.

CHAPTER III

METHODOLOGY

Smallholder Farm Survey

Introduction

The purpose of this chapter is to describe the methodology that was used in the smallholder farm survey. Therefore, the areas of emphasis in the chapter will be sampling techniques, questionnaire pretesting and training of enumerators, data collection, type of data collected, analysis and analytical tools and finally, limitations of the methodology.

Dairy and non-dairy farmers in this study were defined based on the objective of the farmer. Dairy farmers were those individuals rearing cows for the sake of producing milk for the market while non-dairy farmers were not market oriented if kept cattle or had no cattle at all residing within the milkshed area.

Under analysis and analytical techniques there will be a discussion on gross margins and how they were used to compare incomes of dairy and non-dairy farmers. A gross margin is defined as the difference between an enterprise's gross return and the variable costs incurred during the production period of the enterprise. To compare enterprises on the same basis the gross margins for the respective enterprises were calculated for the unit area.

A household, for purposes of this study, was defined as a group of individuals living within the same house. By this definition therefore a household comprised the household head, his/her spouse, children, nephews, nieces and other dependants living under the same roof. All households interviewed had gardens but some of them had more than one garden. A garden is a piece of land on which production endeavours are or can be carried out. In this chapter, therefore, a description of how land availability to the household was estimated will be given. The chapter will also show how potential labour available to the households as well as labour requirement (labour demand) for various enterprises was determined. Finally, the procedure that was used for estimating annual food requirement for an average household will be highlighted towards the end of the chapter.

Sampling Technique

Stratified random sampling technique was used in this study in order to obtain unbiased, efficient and consistent estimates of the target population.[1] It was also cheaper and easier in terms of administration and transportation to deal with Rural Development Projects (RDPs) which have already been demarcated by the Ministry of Agriculture through the National Rural Development Programme

[1] As opposed to simple random sampling, stratification gives lower standard errors, C.A. Moser and G. Kalton, Survey Methods in Social Investigation (London : Heinemann Educational, 1971), pp. 59-78.

(NRDP). Thus during the study period the population of three RDPs: Lilongwe, Lilongwe North East and Thiwi/Lifidzi, was first stratified according to RDP and then later the population of each RDP was again stratified into dairy and non-dairy farmers based on sampling frames provided by the respective RDPs. The three RDPs were selected out of the five RDPs of the Lilongwe ADD because of the following reasons. First, the three RDPs chosen were having at least ten dairy farmers. Secondly, the survey budget was capable of supporting only three RDPs and finally, the three RDPs had relative proximity to each other as any one RDP shared a boundary with the other two (see Figure 2).

Having stratified the population a random sample was drawn from the dairy stratum of each RDP to give a composite sample of 100 dairy farmers. The same approach was also used for the non-dairy stratum to give a composite sample of 100 non-dairy farmers. The contribution of each RDP to either dairy or non-dairy sample was based on the relative proportion of farmers in each stratum in each RDP (Table 1). The sample sizes of dairy and non-dairy farmers to be inteviewed in the entire survey were based on the maximum number of farmers the budget was able to support and since the main objective of the study was to determine or ascertain socio-economic constraints to smallholder dairy production and the non-dairy farmers were used mainly for comparison, the proportion of dairy farmers was purposely overrepresented. The sample of dairy farmers was

TABLE 1.: Number of dairy and non-dairy farmers interviewed in the Lilongwe milkshed area, 1988.

Rural Development Project (RDP)	Number of respondents interviewed		
	Dairy	Non-dairy	Total
Lilongwe North East	67	26	93
Lilongwe	10	55	65
Thiwi/Lifidzi	23	19	42
Total	**100**	**100**	**200**

chosen from a total of 275 dairy farmers from all the three RDPs while that of non-dairy farmers was similarly chosen from 219725 households (see Table 1 for number of respondents interviewed).

Training of Enumerators and Questionnaire Pretesting

Data collection was chiefly done by the principal investigator with the help of three enumerators. The enumerators were trained for a period of one week on techniques of administering a questionnaire for collecting socio-economic data. Thus, the enumerators were exposed to a prepared questionnaire which was later explained to them in detail. This was done to ensure that all the enumerators

were asking the same questions to the farmers in order to minimise enumerator bias.

After the training the questionnaire was taken to the field for pretesting for a period of one week. Emphasis during pretesting was placed on detection of ambiguities in the wording of the questions as well as on assimilation of additional answers for precoded questions.

Completed questionnaires were then taken to base (Bunda College) for preliminary analysis and elimination of ambiguities. Corrections were incorporated in the final questionnaire which was later used in collecting socio-economic data in the main smallholder farm survey.

Data Collection

Both primary and secondary sources of data were used in this study. The secondary source was used mainly to supplement the primary source. In the primary source a survey was conducted involving collection of socio-economic and related data through direct measurements, observations and formal and informal interviews, from smallholder dairy and non-dairy farmers and from advisory officers in the Lilongwe ADD of the Lilongwe milkshed area using two sets of prepared and pretested questionnaires (Appendix C) for a period of 3 months (November 1988 to February 1989).

The first questionnaire was general purpose and was administered to both dairy and non-dairy farmers, with a few questions specific to dairy farmers only. The second questionnaire, while being a monopoly of dairy farmers, was geared toward acquisition of data on dairy cattle inventory values in the opinion of the farmer as well as assessment of dairy cattle management practices on the respondents' farms.

The selected dairy and non-dairy farming families, as units of enquiry, were asked questions on management practices, output levels, family annual food availability, purchases and payments, sales and receipts, payments of hired labour in cash or kind, number of years as dairy farmer, land tenure, agricultural extension, marketing and production problems faced, method of acquiring dairy animals, social customs governing investment in dairy cattle, number of dairy cows kept, garden sizes, reasons for integrating or not integrating livestock in crop production and where cattle are grazed plus dairy cattle inventory values in 1987/88 season (Appendix C).

Furthermore, background data on family size, age distribution, gender, level of formal education, marital status and social status of respondents were also sought from the households. Dairy farmers were visited twice during the study period while non-dairy farmers were visited only once. The second visit for the dairy farmers, as already mentioned, was mainly aimed at acquiring data on management

practices, dairy cattle sales and purchases and inventory values of dairy cattle as perceived by the respondents both at the beginning and at the end of the 1987/88 season, which was taken to be from October 1987 to September 1988.

Analysis and Analytical Techniques

During the first visit to both dairy and non-dairy farmers, estimates of crop yields of selected major crops (maize, tobacco, groundnuts and sweet potatoes) were recorded in local units of measurement, for example, oxcarts for maize and sweet potatoes and 90 kg bags for unshelled groundnuts as given by the households. Shelled groundnuts and tobacco yields were recorded in kilograms as presented at the Agricultural Development and Marketing Corporation (ADMARC) markets by the households. For the local units of measurements conversion factors were used to convert the yield into kilograms (Appendix E).

These conversion factors were based on average oxcarts for maize and sweet potatoes and the weight of shelled groundnuts arising from a known weight of unshelled groundnuts. Yield of minor crops plus their share of the total cultivated land were ignored from the analysis mainly because these were consumed progressively straight from the field in the study year. Besides it was difficult to establish the amount consumed per day by the households and further probing was therefore only going to encourage guesses from the farmers. Minor

crops included beans, cassava, pumpkins, vegetables, soyabeans and peppers and these were mostly grown in association with the major crops used in the analysis.

Milk yields were obtained from records at Milk Collection Centres and from estimates of quantities of milk sold privately and consumed by the households. Milk Collection Centres provided amounts of milk released by individual farms to the market while the target households themselves gave figures for amounts of milk consumed by household members. Total milk yield per household was therefore a simple summation of milk sold to the market and milk consumed by the family members. As such milk consumed by calves was excluded from the analysis due to the problem of measurement and the need to rely on the farmers' memory for figures. Therefore the analysis was based on the milk that was available to the farmer either for own consumption or for disposal to the market. Average prices of fertilizers, crops[2] and milk operational in the 1987/88

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[2]Sweet potatoes are not sold to ADMARC. Therefore unit prices for sweet potatoes were obtained from the respondents during the study period. Later an average price per kilogram (kg) was established using a weighting system as follows:-

$$\text{Price per kilogram} = \frac{P_1N_1 + P_2N_2 + \ldots + P_nN_n}{N_1 + N_2 + \ldots + N_n} \Big/ 452.52$$

where: P_i = price per unit oxcart as given by the respondents.

N_i = number of oxcarts of sweet potatoes harvested.

452.52 = conversion factor from oxcarts to kilograms.

season were obtained from ADMARC and MDI, respectively and were used for evaluation of purchases and sales.

Area (ha) for the various crops was estimated using pacing and a pacing coefficient[3] for each enumerator was established in order to convert the number of paces into metres. This is a method that was recommended by the Land Husbandry Officers in the study area as being handy and less time consuming especially during the rainy season. Distance from Milk Collection Centres (market) to farmer's home was estimated using a motorcycle speedometer. This was found to be more reliable than the wild estimates that could have been made by the farmers.

Questionnaires on which the foregoing was recorded were first checked in the field to identify incomplete and/or ambiguously completed questionnaires. Those having anomalies were taken back to the farmers for clarification through reinterviewing. Completed and checked questionnaires were then sent to base for further analysis.

During this analysis the data that was transcribed from questionnaires was described using percentages and frequencies of relevant variables. Incomes of dairy farmers were compared with those of non-dairy farmers using gross margins. Even though gross

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[3] Pacing coefficient = average number of normal paces of an individual over a known distance divided by the known distance.

margin is not an absolute measure of enterprise profitability it is the only satisfactory measure of efficient resource use that is available in smallscale agriculture due to the problem of valuing and allocating fixed costs to each enterprise.[4] Besides in Malawi, smallholder farmers use mostly family labour and so the use of gross margins can be done to compare incomes of dairy farmers to those of non-dairy farmers. Furthermore, Student's t-test was used to test whether the differences in mean gross margins between the two sets of farmers was significant while milk production levels of the dairy farmers in the study area were assessed by comparing the study area mean milk yield per cow to that of Blantyre milkshed due to lack of data on country averages.

Management practices of dairy farmers were appraised by calculating the proportion of the cattle kraals (kholas) of the sample households that were in good condition and those that were in poor state. Besides, questions on feeding, pasture management, dipping, culling, watering and heat detection were administered to assess whether farmers knew what they were expected to do on their dairy farms and proportions of farmers were described to establish the state of managerial ability of farmers in the study area.

Labour availability to both dairy and non-dairy farmers

[4] E.M. Richard, "An Exercise in the use of Gross Margins for the Analysis of Farm Management Data", Journal of Social Science 7 (1978), 34-51.

in the study area was estimated by determining gender age category and availability (whether permanent resident, permanent resident in local employment, permanent resident in full education, polygamist spending part of time in other households or resident hired labour) of each household member. Having established this, conversion rates by age category were employed to estimate labour availability to the households in man-equivalents (Table 2). These man-equivalents were later converted into man-hours per household per year and then a figure for mean labour availability per household per year was determined for each category and compared accordingly using Student's t-test. Due to financial and time constraints no attempt was made to estimate labour demand for the various enterprises. Instead estimates of labour demand obtained by some researchers[5] in Malawi were used to compare labour demand to labour supply.

To assess the availability of land to both dairy and non-dairy farmers, areas (ha) were estimated by using pacing and pacing coefficients as stated earlier. Mean holding sizes between the two categories were then compared using Student's t-test. These were also compared to country averages.

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[5] D.W. Nothale, "Labour Use in Smallholder Agriculture in Malawi : A Critical Analysis of Labour Use Data from Twelve Survey Areas" (M.Sc. dissertation, University of Wales, 1980), pp. 80-85; and "Smallholder Milk Producers in the Lilongwe Milkshed" (Working Paper No. 28 MLW/75/020, Assistance to Livestock Development, Lilongwe, 1979), p. 12, Figure 1.

TABLE 2.: Conversion rates employed in estimating contribution to family labour of household members by availability of household member, gender and age category.

Availability of member	Gender	Conversion rates by age category[a]		
		<15	15-59	≥60
		----- man-equivalents -----		
Permanent resident	Male	0.2	1.0	0.6
	Female	0.2	0.8	0.4
Permanent resident in local employment	Male	-[b]	0.2	-
	Female	-	0.2	-
Permanent resident in full-time education	Male	0.1	0.5	--[c]
	Female	0.1	0.4	---
Polygamist spending part of time in other households	Male	-	0.5	0.5
Resident hired labour	Male	0.5	1.0	0.7
	Female	0.5	1.0	0.7

SOURCE: Ministry of Agriculture Headquarters, Lilongwe, 1985.

a. Age category in years.

b. Nil.

c. Not applicable.

Correlation analysis was used to test for relationship between number of years as dairy farmer (proxy for experience) and average milk yield per cow. The impact of the matriachal type of social organization in Central Region on location of investment in dairy production was assessed by calculating frequencies arising from opinions of both dairy and non-dairy farmers as regards where a man would keep dairy animals, reasons for keeping them in his parent's home, and from what farmers felt were the main factors that prevented people from investing in dairy production in Central Region.

Annual food requirement (mostly and exclusively maize) was obtained from work done by other researchers. This annual food requirement is based on age as follows: adult person from the ages of 10 to 60 years requires 0.68 kg of maize grain per day. Those below 10 years and above 60 years of age are assumed to be 0.5 adult equivalents for consumption requirements because they are agriculturally inactive.[6] All this information was found invaluable in establishing problem trends in dairy production and in making suggestions as to what should be done to remedy the situation.

Limitations of the Methodology

The study was handicapped by reliance on recall type of questions from farmers. It was not easy by such an approach to get

[6] Malawi Government, Ministry of Agriculture, Sample Survey of Smallholder Agriculture : 1977/78 Cropping Season (Lilongwe : Lilongwe Agricultural Development Division (LADD), February 1979).

accurate figures especially on yield; holding size and labour use for each month on a given enterprise. Furthermore, farmers were unable to give weights or quantities of minor crops such as pumpkins; beans and cowpeas which were consumed directly from the field. Similarly, the quantities of even the major crops consumed directly from the field in 1987/88 season were not given by the households. Also based on recall farmers gave yield figures of maize and sweet potatoes in terms of number of ngolos harvested. These were later converted into kilograms using conversion factors established by other workers. It should have been more appropriate if the weights were obtained while the farmers were harvesting their products because it is more likely that the ngolos were filled to different levels. Therefore as a result of these problems the study ignored the presence of mixed cropping, yields of minor crops and quantities of major crops consumed directly from the farm in the gross margin analysis. It is true that mixed cropping as well as consumption of some of the products directly from the farm do affect the yield figures as well as the resultant gross margins. However, quantities of major crops consumed directly from the farm are usually very small. With adequate funding a study of this nature requires a researcher to work with the households for a period of one year during which the researcher can record all the daily activities on the farm himself because most smallholder dairy farmers do not keep records.

The study was also conceived to estimate optimum enterprise

combination for dairy farmers but due to absence of reliable Linear Programming packages during the time of study and lack of funds to acquire new ones no attempt was made to estimate an optimum enterprise combination for the dairy households. Furthermore, due to lack of records in the smallholder sector, milk yields were expressed on a yearly basis as opposed to per lactation. This again could have been avoided by working with the households for a period of one year.

Pacing, though recommended by Land Husbandry Officers, as a method of estimating land area, leaves a lot to be desired. Although it gives figures close to the true area, more accurate measurements could have been obtained by using calibrated tapes. However, despite these limitations it is hoped that the study did not fail to achieve its major objective of identifying the main socio-economic constraints to smallholder dairy production.

CHAPTER IV

THE STUDY AREA AND SOCIO-ECONOMIC CHARACTERISTICS OF SAMPLE HOUSEHOLDS

Introduction

In the first section of this chapter a description of the study area will be presented. This description will be restricted to location, population, climate and vegetation in order to give a picture of the environment under which the study was carried out.

The purpose of the rest of the chapter is to give a comparison between the two household categories, i.e., dairy and non-dairy farmers interviewed during the study period. As a result this section of the chapter will discuss the general characteristics of the dairy and non-dairy farmers by looking at household size, age of household head, household composition, labour availability and holding sizes.

Furthermore, the chapter will also compare the two farmer categories by way of education. Here the levels of formal education as well as attendance of informal education by the sample households will be considered in order to establish the educational background of the farmers. Later in the chapter there will be a discussion on marital status, social status, land holding as well as means of acquiring land under the customary tenure system in Lilongwe. Finally, the chapter will highlight the cropping patterns and how

land is allocated to various enterprises apart from providing a presentation of the state of technology in terms of tools and implements used in agricultural production in the study area.

Description of the Study Area

Location and Population

The study was conducted in the Lilongwe milkshed area in Central Malawi. This milkshed area stretches over the Kasungu and the Lilongwe Agricultural Development Divisions (ADDs). But for administrative convenience the study was restricted to three Rural Development Projects: Lilongwe North East, Lilongwe and Thiwi/Lifidzi Rural Development Projects of the Lilongwe ADD (Figure 2).

These three RDPs as a unit are bordered by Mozambique in the south and south west, Kasungu ADD (KADD) in the north, Salima ADD (SLADD) in the north east, and Dedza Hills RDP in the east and south east (Figure 2). The dominant feature about the study area is that it is mostly "inhabited by the Chichewa speaking linguistic group"[1] although other linguistic groups also exist.

In 1987 the population density in Central Region was estimated at 83 persons per km^2 which was lower than the 125 persons per km^2

[1] "Smallholder Milk Producers in the Lilongwe Milkshed" (Working Paper No. 28 MLW 75/020, Assistance to Livestock Development, Lilongwe, 1979), p. 1.

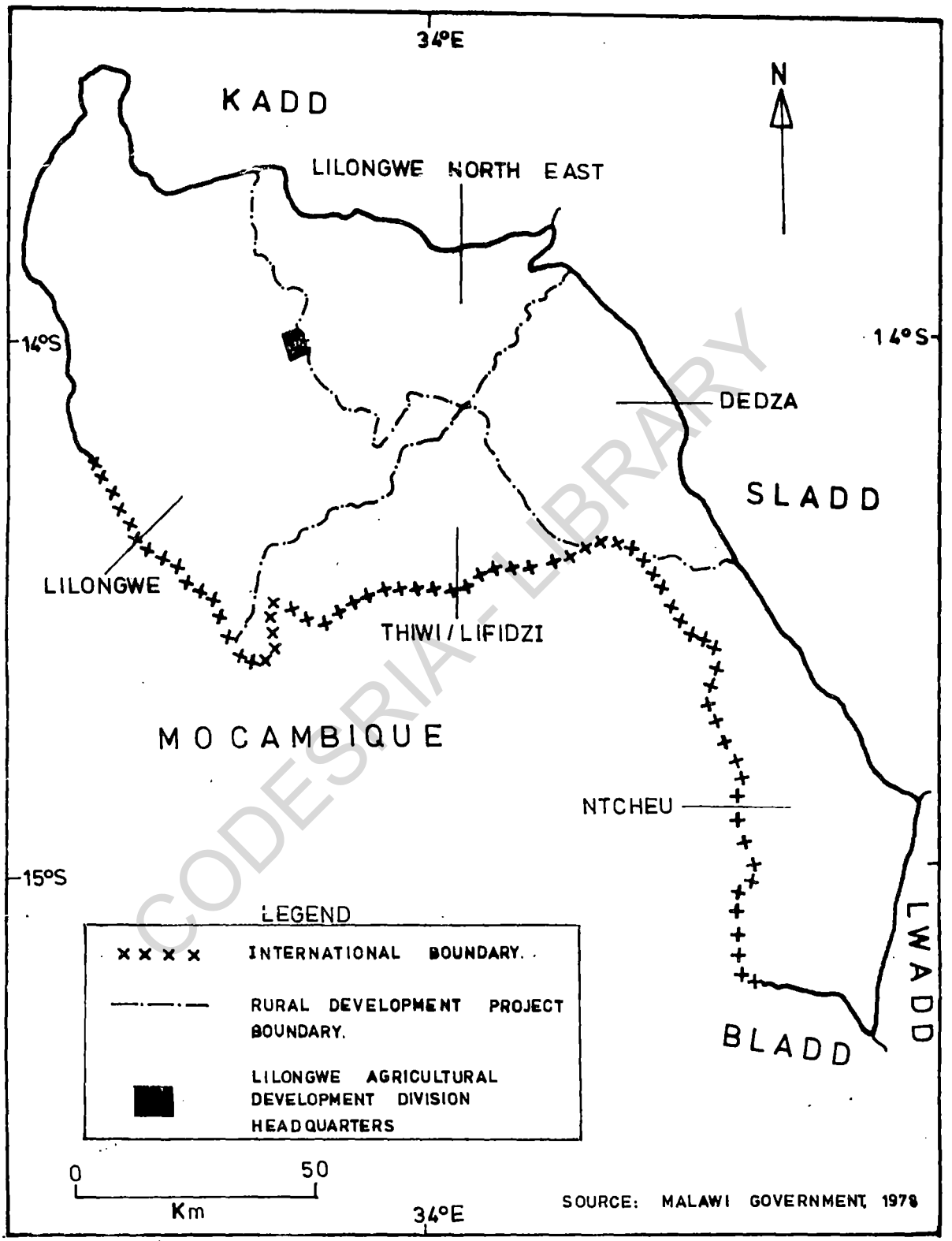

FIGURE 2: Lilongwe Agricultural Development Division and the Case Study Project Areas: Lilongwe, Lilongwe North East and Thiwi/Lifidzi Rural Development Projects.

in the Southern Region but higher than the density of 34 persons per km^2 of the sparsely populated Northern Region.[2] Lilongwe District had the largest share of the total population (12.4%) of Malawi and Mulanje (8.0%) was second followed by Blantyre District (7.4%) in 1987.[3] In case of Agricultural Development Divisions population is usually given in terms of farm families by the Ministry of Agriculture. Using this system, Lilongwe ADD has a total population of 320,000 farm families (57,000 farm families in Lilongwe North East RDP, 120,000 in Lilongwe RDP and 43,000 farm families in Thiwi/Lifidzi RDP, the rest being accounted for by the other two RDPs, Ntcheu and Dedza Hills).[4]

There are a total of 280 smallholder dairy farmers in the Lilongwe ADD owning a total of 1036 dairy cattle (Table 3). The Smallholder Dairy Development Scheme is the main distribution arm of improved dairy cattle to smallholder dairy farmers in the study area.[5]

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[2] NSO, Malawi Population and Housing Census, 1987, Preliminary Report, 1987 (Zomba : Government Printer, 1987), pp. xiii-3.

[3] Ibid.

[4] Interview with the Programme Manager, Lilongwe ADD, Lilongwe, 12 November 1988.

[5] "Smallholder Milk Producers in the Lilongwe Milkshed" (Working Paper No. 28 MLW 75/020, Assistance to Livestock Development, Lilongwe, 1979), p. 1.

TABLE 3.: Number of participating farmers and dairy cattle population in Lilongwe Agricultural Development Division, 1988.

Rural Development Project	Number of farmers	Number of dairy cattle
Lilongwe	29	124
Lilongwe North East	183	662
Thiwi/Lifidzi	63	225
Dedza Hills	5	25
Total for Lilongwe ADD	**280**	**1036**

SOURCE: Malawi Government, Ministry of Agriculture, LADD, "Dairy Husbandry Report", Lilongwe ADD, Lilongwe, August 1988.

Climate and Vegetation

The climate of the three studied RDPs is generally similar to that throughout the Lilongwe milkshed area. The mean daily minimum temperature varies between 21°C in January and 15°C in June. The mean daily maximum temperatures for most of the area are between 25°C and 27.5°C in January and between 22.5°C and 25°C in July.[6] Mean daily variations in temperature are less than 10°C in January while in July they range from 9°C at the northern end of the milkshed area to more than 15°C around Lilongwe City.[7]

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[6] Ibid. [7] Ibid.

The study area has an altitude of between 1000 and 1400 metres and most of it lies between 1100 and 1300 metres. The annual rainfall varies between 810 and 1020 mm and the majority of it comes in the period between December and March with minor rainfall in November and April.[8]

In the study area the vegetation is mostly characterised by natural Brachystegia-Jubernadia woodland and broad-leaved deciduous woodland. There are also dambos in the area which are generally water logged during the rainy season and these are used for grazing cattle.[9]

Socio-economic Characteristics of Dairy and Non-dairy Farmers

Household Size and Average Age of Household Head

The average household size in the dairy category was 7.0 persons compared to 6.5 persons in the non-dairy category (Table 4). These mean household sizes were not significantly different. When the average ages of the household heads were compared dairy households tended to have relatively older heads than the non-dairy households but the respective mean differences between the two groups were not significant (Table 4). The dairy farmers were generally older

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[8] Ibid. [9] Ibid.

TABLE 4.: Characteristics of dairy and non-dairy farmers in the Lilongwe milkshed area, 1987/88.

Characteristic	Non-dairy	(CV)[a] SE[b]	Dairy	(CV) SE	Total	(CV) SE
Number of households	100		100		200	
Average household size[c]	6.5	(41) ± 0.3	7.0	(37) ± 0.3	6.7	(39) ± 0.2
Average age of household head	48.9	(27) ± 1.3	52.1	(25) ± 1.3	50.5	(27) ± 1.0
Household composition (%):						
Males:						
<15 years	21.1		21.9		21.4	
15-59 years	24.4		25.6		25.0	
≥60 years	3.8		4.7		4.3	
Females:						
<15 years	25.6		19.5		22.5	
15-59 years	23.5		25.5		24.6	
≥60 years	1.5		2.7		2.2	
Average available labour per household (mandays)	3.2	(60) ± 0.2	3.7*	(37) ± 0.1	3.4	(50) ± 0.1
Average holding size per household (ha)	2.53	(68) ± 0.17	3.27**	(57) ± 0.19	2.9	(64) ± 0.13

a. CV = Coefficient of Variation (%), Significant levels * = P≤0.05, ** = P≤0.01

b. SE = Standard Error

c. Size includes cousins, nephews, nieces and orphans living in the house.

than the non-dairy heads mainly because one of the requirements for accepting farmers into the dairy industry is that the incumbent should be old (30 years and above) for the popular reason that old people are more reliable than youngsters.

Household Composition

Both dairy and non-dairy households had a high proportion (51.1% and 47.9%, respectively) of household members in the 15-59 years age category and very few members (7.4% and 5.3%, respectively) were 60 or more years old. Therefore both household categories had a higher proportion of members in the 15-59 age category implying a larger proportion of economically active members. However, dairy households had more labour available than non-dairy farmers and the respective mean differences were significantly ($P \leq 0.05$) different (Table 4).

Level of Formal Education of the Respondent

Education is usually described as the kingpin of development because farmers need to know how to combine inputs in recommended levels for optimal production. Enhanced absorption of these management practices generally hinges on the educational level of the farmer in that the higher the level of education the better able the farmer

is in understanding management practices. In the Lilongwe milkshed area the majority of the farmers had primary school education, given by 87.1 percent of the dairy households and 83.5 percent of the non-dairy farmers (Table 5).

TABLE 5.: Proportion of farmers by level of formal education in the Lilongwe milkshed area, 1987/88.

Level of formal education	Proportion of farmers		
	Dairy	Non-dairy	Total
	%	%	%
None	9.7	15.5	12.6
Standard 1-5	59.1	64.9	62.1
Standard 6-8	28.0	18.6	23.2
Form 1-2	3.2	1.0	2.1
Total	**100.0**	**100.0**	**100.0**

Proportions of farmers in the Standard 6-8 and Form 1-2 categories were greater in the dairy system than in the non-dairy households while the reverse was true for the "None" and Standard 1-5 educational levels (Table 5). As a result the proportion of dairy respondents from Senior Primary School (Standard 6) was 31.2

percent compared to 19.6 percent for non-dairy farmers. However, there was no significant difference in the frequencies of illiterate dairy and non-dairy farmers.

Informal Education

The formal education channel is not the only avenue for acquiring new ideas because knowledge can also be gained informally via adult literacy, homecraft classes and farmer training centres. Adult literacy classes are concerned with teaching of illiterate men and women how to read and write while homecraft classes provide training to women in income generating activities such as embroidery. At farmer training centres, on the other hand, knowledge of crop and livestock production is generally imparted to both male and female farmers. In the study area of all the informal education channels farmer training was the most prevalent for both dairy (90.0%) and non-dairy (56.3%) household heads. (See Table 6.) This should not be surprising because every year the Ministry of Agriculture organises farmer training in Residential Training Centres (RTCs). At these centres farmers are taught modern farming techniques in both animal and crop production. Since each RDP has its own Residential Training Centre and these courses are organized every year, one would expect the proportion of farmers who have attended these courses to rise with each passing year. It also appears that the greatest proportion of farmers who go for farmer training are dairy farmers (Table 6). This is because when a farmer has been entrusted with

TABLE 6.: Proportion of farmers by type of informal education attended in the Lilongwe milkshed area, 1987/88.

Type of informal education	Proportion of farmers		
	Dairy	Non-dairy	Total
	%[a]	%[a]	%[a]
None	6.0	36.5	20.9
Adult literacy	1.0	1.0	1.0
Homecraft	2.0	2.1	2.0
Farmer training	90.0	56.3	73.5
Other[b]	3.0	4.2	3.6
Total	-	-	-
n	100	96	196

a. Total percentages may be greater than 100 because some farmers attended more than one type of informal education.

b. "Other" include club discussions and education given by retired field extension workers and medical assistants to fellow villagers.

dairy cows after meeting the selection criteria, the next step is to let him go for a farmer training course mainly in dairy production. This is necessary because the animals the farmers get are crossbreds that need a higher level of management practices than the local

Zebu cattle. Besides some of the farmers who get dairy cows may not have had any previous experience in rearing cattle. As such then farmer training is deemed paramount.

Of particular interest in Table 6 is the very small proportion of dairy farmers (6.0%) who never had any informal education compared to 36.5 percent of the non-dairy household heads. This is mainly due to the reasons stated earlier.

Adult literacy and homecraft were rarely attended by household heads of both categories (Table 6). For adult literacy the possible reason for the low level of attendance could be that many of the household heads had at least some primary education (Table 5), therefore there was little need for adult literacy classes. In case of homecraft the main reason is that this is mostly for women and the frequency of female household heads was very low in this study at 6.0 percent for dairy and 5.0 percent for non-dairy households.

Therefore farmer training was the most common type of informal education for both dairy and non-dairy households with dairy households having an upper hand in this type of informal education. On the whole Chi-squared test revealed a highly significant ($P \leq 0.01$) difference in the frequencies of dairy and non-dairy farmers for attendance of informal education.

Marital Status of Sample Household Heads

In Table 7 proportions of sample household heads by marital status are presented. The results show that 80.0 percent of the dairy farmers and 76.0 percent of the non-dairy farmers were married. Unlike general crop production it appears in Table 7 that dairy production was also undertaken by unmarried individuals. This, therefore, means that dairy production is not restricted to married couples.

TABLE 7.: **Proportion of sample household heads by marital status in the Lilongwe milkshed area, 1987/88.**

Marital status	Proportion of sample household heads		
	Dairy	Non-dairy	Total
	%	%	%
Single	4.0	-	2.0
Married	80.0	76.0	78.0
Polygamist	13.0	22.0	17.5
Widowed	3.0	2.0	2.5
Divorced	-	-	-
Total	**100.0**	**100.0**	**100.0**

Polygamists were not prevalent in both household categories as the proportions for polygamists were only at 13.0 percent for dairy households and 22.0 percent for non-dairy farmers (Table 7). This may be because the study area was inhabited by mostly the Chichewa speaking linguistic group. Polygamy is not very common among the Chewa. Very low percentage of widowed individuals was also observed in both categories, 3.0 percent for dairy and 2.0 percent for non-dairy farmers. This may be because the ages of the majority of the respondents were within the life expectancy age zone of 47 years.[10] (See also Table 4.) Therefore, most of the farmers were married and living with their spouses. However, there was no significant difference in the frequencies of dairy and non-dairy farmers for marital status.

Social Status of Respondents

In the Lilongwe milkshed area there was a high frequency of farmers who were nzika.[11] Sixty-six percent of the dairy farmers were nzika while the proportion of non-dairy farmers in the same social status category was 69.0 percent (Table 8). It appears therefore that the majority of the respondents in the milkshed area were residents of their own land. This tallies very well with the observed low

[10] J. Sinoya Nankumba, "Progress in Agrarian Reform and Rural Development in Malawi : Country Report for 1980-85/86" (Lilongwe: Ministry of Agriculture, February 1987), p. 5.

[11] nzika = an individual who was born, brought up and still lives in the same village. This definition excludes chiefs and village headmen.

TABLE 8.: Proportion of farmers by social status in the Lilongwe milkshed area, 1987/88.

Social status	Proportion of farmers		
	Dairy	Non-dairy	Total
	%	%	%
Nzika	66.0	69.0	67.5
Mkamwini	6.0	14.0	10.0
Mtengwa	2.0	2.0	2.0
Chief (T/A)	5.0	-	2.5
Village headman	13.0	12.0	12.5
Pastor	-	1.0	0.5
Settler	8.0	2.0	5.0
Total	**100.0**	**100.0**	**100.0**

percentages of mkamwini[12] at 6.0 and 14.0 percent for dairy and non-dairy households, respectively (Table 8). Mkamwini is a direct opposite of nzika. Therefore if there is a high frequency of nzika one should expect a low frequency of mkamwini. The low frequency of mtengwa[13] as registered in Table 8 could be because of the low proportion

[12] mkamwini = man staying in wife's home in matrilineal societies.

[13] mtengwa = woman staying in husband's home in matrilineal societies.

of female household heads interviewed in this study as already stated.

However, it is pleasing to observe that all the chiefs were exclusively dairy farmers. This is mainly because of the need for influential local leaders to demonstrate acceptance of new innovations or because the milk collection centres were within their areas of authority. Thirteen percent of the dairy respondents were village headmen mostly because they were within the milk collection area (Table 8). Chi-squared test showed that the frequencies of dairy and non-dairy farmers for social status were not significantly different.

Land Holding

All interviewees had farms and most of them had 1-2 farms (Table 9). This may be because with population growth and subsequent changes in age categories, farmers tend to give some of their fragments of land to maturing children thereby reducing the number of farms farmers have. With the twin reaction of population growth and changes in household composition combined with changes in marital status one should expect the number of farms per household to decline with time. Data in Table 9 also shows that dairy farmers tend to have less cases of land fragmentation than non-dairy farmers. This may be because dairy farmers tend to be older and with larger families (Table 4) and therefore changes in household composition are expected

to be more frequent in the dairy than in the non-dairy households resulting in reduction in the number of gardens per household. However,

TABLE 9.: Proportion of households by number of farms owned in the Lilongwe milkshed area, 1987/88.

Number of farms	Proportion of farmers		
	Dairy	Non-dairy	Total
	%	%	%
1-2	76.0	68.4	72.2
3-4	22.0	26.5	24.2
5-6	2.0	4.1	3.0
>6	-	1.0	0.5
Total[a]	100.0	100.0	100.0

a. Total number of non-dairy farmers was not 100 because of missing observations and total percentage may not be equal to 100 because of rounding.

there was no significant difference in the frequencies of dairy and non-dairy farmers for number of farms owned.

Acquisition of Land Under Customary Tenure

In Malawi land under customary tenure is acquired through

various means. It can be allocated by the village headman to members of his village or an individual can rent or borrow the land on which to carry out his various agricultural endeavours. Land can also be inherited and there are two ways to this depending on whether one is in a matrilineal or patrilineal society. In the matrilineal society, inheritance is through the female line while the opposite is true for the patrilineal societies.

Data in Table 10 indicates that inheritance was the most common means of acquiring land amongst the sample households in the Lilongwe milkshed area. This is shown by 35.0 and 41.0 percent for acquisition via the female line and 37.0 and 32.0 percent for acquisition through the male line for dairy and non-dairy respondents, respectively.

Land is rarely bought amongst the rural households. No dairy household head indicated that the land on which agricultural production was being carried out was bought while 1.0 percent of the non-dairy households had bought part of or all the land they were working on (Table 10). This result is quite in line with Malawian tradition. In Malawi customary land is owned by the community. It can not be bought or sold. Individuals wishing to use land for agricultural ventures may contact village headmen for allocation. The individual, therefore, who reported that he bought land might have been renting it. Thus the most common avenues for acquiring

TABLE 10.: Proportion of households by method of acquiring land in the Lilongwe milkshed area, 1987/88.

Method of acquiring land	Proportion of households		
	Dairy	Non-dairy	Total
	%[a]	%[a]	%[a]
Allocated by village headman	33.0	16.0	24.5
Bought	-	1.0	0.5
Borrowed	7.0	4.0	5.5
Inheritance:			
Matrilineal	35.0	41.0	38.0
Patrilineal	37.0	32.0	34.5
Marriage	2.0	17.0	9.5
Other[b]	2.0	-	1.0
Total	-	-	-
n	100	100	200

a. Total percentage may be greater than 100 because of multiple responses.

b. "Other" include self opening and receipt from lazy people.

land in Malawi are inheritance and allocation by village headmen (Table 10). In case of inheritance individuals feel very responsible

and get satisfaction from handing over land to their children or relatives. Land is the most important asset villagers have and thus they are duty bound to groom the future of their children or relatives by simply handing over this important asset to them. Lilongwe being a matrilineal society, there were more cases of land being inherited via the female line (38.0%) than the male line (34.5%). (See Table 10.).

Land is also rarely borrowed in the Lilongwe milkshed area (Table 10). The land that was borrowed was usually used for growing sweet potatoes and some minor crops such as vegetables for a period of one or two years.

Marriage as a mode of acquiring land was more common among the non-dairy sample households (17.0%) than in the dairy households (2.0%). (See Table 10.) This may be because dairy production requires heavy investment in terms of land and capital. As such only those in possession of land acquired through other means than marriage were interested in dairy production for security purposes. It should also be noted that the frequencies of dairy and non-dairy households for method of acquiring land were significantly ($P \leq 0.01$) different using Chi-squared test.

Cropping Patterns and Allocation of Land to Various Enterprises

More than twenty different crops were grown in the Lilongwe milkshed area during the studied period (1987-1988). Out of these only four were considered as major to both dairy and non-dairy households and these crops were: maize, tobacco, groundnuts and sweet potatoes (Table 11). This categorization was based on the area planted and the income generating ability of the enterprise to the farmer.

TABLE 11.: **Percentage of area planted to different crops by dairy and non-dairy households in the Lilongwe milkshed area, 1987/88.**

Crop	Percentage of area planted		
	Dairy	Non-dairy	Total
	---------- Percentage ----------		
Maize	45.9	49.9	42.3
Tobacco	10.8	23.6	14.7
Groundnuts	12.0	13.7	11.3
Sweet potatoes	3.2	6.3	4.0
Pasture	21.4	-	21.5
Other[a]	6.6	6.6	6.1
Total[b]	**100.0**	**100.0**	**100.0**

a. "Other" include beans, groundbeans, garden peas, okra, egg plants, cucumbers, pumpkins, sorghum, cassava and some leaf vegetables.

b. Totals may not add up exactly to 100 because of rounding.

Maize, sweet potatoes and groundnuts are the major food crops in the study area while tobacco and groundnuts are cash crops, of which tobacco is the most important. The dairy households devoted almost 93.0 percent of their land to tobacco, maize, groundnuts, sweet potatoes and pasture while the non-dairy households had almost 94.0 percent of their land put to the first four crops (Table 11).

The non-dairy farmers had 8.8 percent more land under main food crops than the dairy farmers on percentage basis. These crops were mostly grown in association for non-dairy farmers (57.0% of the respondents) while pure cropping seemed to be common among the dairy households (60.0%). (See Table 12.) This result should be expected because mixed cropping is generally associated with land

TABLE 12.: Percentage of households by cropping pattern in the Lilongwe milkshed area, 1987/88.

Cropping pattern	Proportion of households utilizing		
	Dairy	Non-dairy	Total
	%	%	%
Pure stand	60.0	43.0	51.5
Mixture	40.0	57.0	48.5
Total	**100.0**	**100.0**	**100.0**

scarcity. The dairy farmers had relatively more land than the non-dairy farmers and the differences in the average holding sizes between the two categories of farmers were highly significant at 1 percent level of significance (Table 4). Chi-squared test also revealed a significant ($P \leq 0.05$) difference in the frequencies of dairy and non-dairy households for cropping pattern.

The most common crops grown in association among the non-dairy households were tobacco with pumpkins or maize with pumpkins, cowpeas, cucumber and sorghum. For dairy farmers the crops grown in association with tobacco were pumpkins and beans while maize was grown in mixed stands with beans, pumpkins, cowpeas and okra.

Tools and Implements

The tools and implements used by farmers in the Lilongwe milkshed area for growing crops are generally traditional. All dairy households had hoes but the ownership of the rest of the implements or tools varied (Table 13). A total of 97 non-dairy households responded to the question on ownership of tools/implements and all these farmers indicated possession of hoes (Table 13). Sixty percent of the dairy farmers had oxcarts (ngolo) compared to 58.8 percent of the non-dairy farmers. This, therefore, means that oxcarts are getting more and more popular with farmers in the Lilongwe milkshed area, because they are essential for transportation of produce from the field to homestead or to market among other uses.

From Table 13 it therefore appears that the tools and implements most demanded by households are hoes, oxcarts, pangas and axes. This result makes sense because these are mostly needed for land clearing, ridging and other forms of cultivation or for transportation

TABLE 13.: Proportion of farmers by type of tool/implement possessed in the Lilongwe milkshed area, 1987/88.

Type of tool/implement	Proportion of farmers possessing		
	Dairy	Non-dairy	Total
	%[a]	%[a]	%[a]
Hoe	100.0	100.0	100.0
Panga	56.0	47.4	51.8
Axe	52.0	37.1	44.7
Plough	21.0	11.3	16.2
Oxcart	60.0	58.8	59.4
Ridger	12.0	10.3	11.2
Cultivator	2.0	-	1.0
Other[b]	8.0	-	4.1
Total	-	-	-
n	**100**	**97**	**197**

a. Total percentage is more than 100 because of multiple responses.

b. "Other" include sickle, tins (pails), watering cans and baskets.

of produce to market from homestead or from the field to homestead. Ridgers, cultivators and ploughs are less common because they are expensive and they face some competition from the traditional tools like hoes which are by far cheaper. However, there was no significant difference in the frequencies of dairy and non-dairy farmers for ownership of tools and implements.

Concluding Summary

This chapter has given a background to the study area by describing the location, population, climate and vegetation of three Rural Development Projects: Lilongwe North East RDP, Lilongwe RDP and Thiwi/Lifidzi RDP. On socio-economic characteristics of dairy and non-dairy households the chapter has shown that the average household size in the dairy sample was 7.0 persons compared to 6.5 persons in the non-dairy category. However, there was no significant difference in the mean household sizes. When the average ages of the household heads were compared dairy households tended to have relatively older heads than non-dairy households because in the dairy industry older farmers are preferred as they are more reliable than youngsters. Nevertherless, there was no significant difference in the mean ages of the household heads.

In case of education, dairy household heads had more years of formal schooling than their counterparts in the non-dairy category

possibly because educated people are more innovative than those with little or no education. However, Chi-squared test revealed that there was no significant difference in the education levels of the two categories. In addition to formal education the farmers had also some informal education such as adult literacy, homecraft and farmer training. Again, the dairy farmers had an upper hand in terms of attendance of informal education because of the condition that all dairy farmers should undergo farmer training before getting dairy cows. Unlike formal education, the differences in the frequencies of dairy and non-dairy farmers for attendance of informal education were highly significant ($P \leq 0.01$).

All the non-dairy farmers had at least been married at one time or another while 4 percent of the dairy farmers were not married. Polygamists were not common in the study area because the area is inhabited mostly by the Chichewa speaking linguistic group. Polygamy is not very common among the Chewa.

With respect to social status, most of the respondents were nzika and there was very low frequency of mkamwini and mtengwa. This is because mkamwini is a direct opposite of nzika and as for mtengwa the reason is that there were very few female household heads that were interviewed.

All the interviewees had farms and most of them had 1-2 farms but there were more households in the dairy category with 1-2 gardens than in the non-dairy category. This was probably because dairy farmers tended to be older and with larger families and so changes in household composition were expected to be higher in the former than in the latter culminating in more members of the dairy households getting married and taking some land from their families than their counterparts in the non-dairy category. However, there was no significant difference in the frequencies of the two farmer categories for number of farms.

The land on which the households were carrying out agricultural production was mostly acquired through inheritance. Land was rarely bought because customary land in Malawi is owned by the community and issued out to members of the community by village headmen and chiefs. Very few farmers in the dairy category obtained their land via marriage because dairy production requires heavy investment in terms of land and capital. Dairy production in the Lilongwe milkshed area was therefore carried out mostly on land acquired through inheritance from parents for security reasons. There was also a high significant ($P \leq 0.01$) difference in the frequencies of dairy and non-dairy households for method of acquiring land.

There were more than twenty crops grown by the farmers in the study area but only four of the crops were considered as major

crops. These were maize, tobacco, groundnuts and sweet potatoes. Both household categories allocated the largest proportion of their land to maize but the non-dairy farmers had more land under food crops than the dairy households on percentage basis. The crops for non-dairy farmers were mostly grown in mixtures while pure cropping appeared to be more common amongst the dairy households. This was mostly because of land scarcity amongst the non-dairy households. The dairy farmers had a significantly ($P \leq 0.01$) higher average holding size than the non-dairy respondents. However, both household categories grew crops by using traditional tools/implements, of which the hand hoe was possessed by all the sample households. Some of the households had pangas, axes, ploughs, oxcarts and ridgers. Of all the tools/implements, ridgers, cultivators and ploughs were less common because they were expensive and also they faced competition from the cheaper indigenous tools like hoes.

CHAPTER V

DAIRY PRODUCTION IN THE LILONGWE MILKSHED AREA

Introduction

In this chapter some aspects of dairy production in the Lilongwe milkshed area will be discussed. The discussion here will mainly centre around dairy cattle population, type of cattle culled, type of stock kept for dairy production, methods of acquiring improved dairy cattle, source of improved dairy cattle, important source of income for dairy farmers, herdboys and cattle grazing systems.

For those farmers who acquired their dairy cattle on cash basis, the chapter will look at their important source of income for the purchase. In addition, types of feed given to dairy cattle and reasons for not using dairy ration in the milkshed area will be explored in the chapter.

Number of Dairy Animals and Methods of Acquisition

The sample households had a total number of 483 dairy cattle, 81 percent of these were female. The principal reason for the low proportion of male cattle is that many farmers cull bulls as shown in Table 14. Besides all farmers involved in dairy production get their initial dairy foundation stock in form of two cow

units[1] and this tends to increase the proportion of female cattle in the khola.

TABLE 14.: Proportion of dairy farmers by type of dairy cattle that is culled in the Lilongwe milkshed area, 1987/88.

Type of cattle culled	Proportion of farmers culling
	Percentage[a]
Bulls	68.5
Old milkers	46.6
Poor milkers	12.3
Other[b]	26.0
Total	-
n	**73**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include sick, injured and deformed cattle.

The mean number of dairy cattle of the dairy farmers was 4.8 animals per household while the means for female and male cattle

[1] I.H. Proverbs, "Smallholder Beef and Dairy Production in Malawi", paper presented at the 1977 SARCCUS meeting, 1977.

were registered at 3.9 and 1.8 animals per household, respectively. In Table 15 data on the proportion of dairy farmers by number of dairy cattle kept in the study area is presented. A large proportion (70.0%) of the farmers had 1-4 animals while very few (2.0%) had over 10 animals. This is mainly because of the need to cull unproductive dairy animals to maintain profitability of the enterprise not to mention the imposed restriction of two dairy cows per farm in loan from the government till the loan is completely honoured. Besides it has

TABLE 15.: Proportion of dairy farmers by number of dairy cattle kept in the Lilongwe milkshed area, 1987/88.

Number of dairy cattle	Percentage of farmers
1-2	35.0
3-4	35.0
5-6	16.0
7-8	9.0
9-10	3.0
Over 10	2.0
Total	**100.0**

been reported that family labour can cope with a two cow unit[2] and

[2] D. Lines and H.M. Luteijn, The Smallholder Dairy Scheme in Malawi : Project MLW 75/020, Assistance to Livestock Development (Lilongwe: Extension Aids Branch, 1988), p. 10.

so for farmers with land and labour shortages it is generally advisable to maintain a two cow unit.

In the 1987/88 season the average number of dairy cows which were producing milk in the Lilongwe milkshed area was 2.55, giving a total of 255 dairy cows in milk. Most of the farmers (93.0%) in the study area had improved dairy cattle (Table 16). All these improved dairy cattle were the Malawi Zebu-Friesian crossbreds mainly

TABLE 16.: Proportion of dairy farmers by type of stock kept for dairy production in the Lilongwe milkshed area, 1987/88.

Type of stock	Percentage of farmers
Improved	93.0
Unimproved	7.0
Total	**100.0**

due to the fact that smallholder dairy farmers are provided with the 50% bred or 75% bred Friesian crosses for milk production. These crosses are recommended to smallholder farmers because they are reputed for having a combination of hardy characteristics of the Zebu, such as resistance to diseases that make it adaptable to Malawi conditions, with those of the Friesians like high milk production. As a result these crosses are expected to survive under the smallholder environment.

The most common method of acquiring these improved dairy cattle was through loan (76.3%) while inheritance and gift accounted for 4.3% and 1.1% of the households, respectively (Table 17). This observation is mainly because dairy cattle are acquired from government stations on loan (Table 18) and inheritance could be uncommon because one needs to wait till the death of the source

TABLE 17.: Proportion of dairy farmers by method of acquiring improved dairy cattle in the Lilongwe milkshed area, 1987/88.

Method	Proportion of farmers using
	Percentage[a]
Loan	76.3
Purchase	24.7
Gift	1.1
Inheritance	4.3
Total	-
n	**93**

a. Total percentage is greater than 100 because of multiple responses.

TABLE 18.: Proportion of dairy farmers by source of improved dairy stock in the Lilongwe milk-shed area, 1987/88.

Source	Proportion of farmers
	Percentage[a]
Government station	92.5
Relative	4.3
Friend	5.4
Other[b]	1.1
Total	-
n	**93**

a. Total percentage is more than 100 because of multiple responses.

b. "Other" include purchase from middlemen.

(mostly a relative) and this may take time. It is also very rare for one to give out an animal one has acquired through loan or purchase for dairy production as a gift. Furthermore, there is a restriction on the number of dairy cows one can get from government stations and to this effect it is unlikely that farmers will give out dairy cattle as gifts hence the low proportion of dairy cattle acquired

via gift (Table 17). For those farmers who acquired their dairy cattle through purchase the main source of capital was sales of crops (100.0%). (See Table 19.) Very few farmers (4.3%) relied on credit (from individuals other than the government) for purchase of dairy cattle possibly because credit packages are already available

TABLE 19.: Proportion of dairy farmers by source of capital used for purchasing dairy cattle in the Lilongwe milkshed area, 1987/88.

Source of capital	Proportion of dairy farmers
	Percentage[a]
Sales of crops	100.0
Income from sales of other livestock	30.4
Credit	4.3
Employment in Malawi	21.7
Employment outside Malawi	26.1
Other[b]	17.4
Total	-
n	**23**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include carpentry and son who is working.

from the government. The loan from the government is generally honoured over a period of time and is recovered from monthly milk sales. (See Appendix A.) As a result the farmer does not really (directly) feel it!

Important Source of Income for Dairy Farmers

Generally dairy farmers deemed dairy production as their major source of income during the rainy season and, on average, all the year round (Table 20). This can be attributed to the vital exuberant growth of grass during the rainy season which is the essential prerequisite for dairy production. In the wet season the dairy cattle have more feed than they require leading to high milk yields that result in high incomes realised by the farmers from milk sales. During this rainy season farmers have generally nothing in terms of crops to offer to the Agricultural Development and Marketing Corporation (ADMARC) or to the market and some farmers act as net food buyers during this season.

However, during the dry season the picture for dairy is grimmer as compared to the wet season (Table 20). This is particularly because during the dry season there is little green grass available for animals to feed on and most of the grass is dry and fibrous. Consequently, animals are in poor condition leading to depressed milk production with the end result of low income realised from

TABLE 20.: Proportion of dairy farmers by the most important source of income in the dry season, wet season and all year round in the Lilongwe milkshed area, 1987/88.

Enterprise	Proportion of farmers		
	Dry season	Wet season	All year round
	Percentage[a]	Percentage[a]	Percentage[a]
Crop	57.0	10.4	6.0
Dairy cattle	36.0	77.1	86.0
Beef cattle	1.0	-	-
Sheep	-	-	-
Goat	-	-	-
Pig	1.0	1.0	-
Fish farming	-	1.0	-
Other[b]	9.0	10.4	10.0
Total	-	-	-
n	100	96	100

a. Total percentage may not be equal to 100 because of multiple responses or rounding.

b. "Other" include pension money, poultry, aid from salaried sons, timber sales, ox-cart business and employment.

milk sales. During the dry season farmers have plenty of crops which have just been harvested. As a result they are able to get more income during this season from crop sales than from dairy production. When looking at the whole year the dairy farmers consider dairy production as the most important source of income possibly because of the regular flow of income plus the better milk yields during the rainy season.

Herdboys

Herdboys are central to the success of any dairy industry in the sense that they are responsible for feeding the dairy cattle, a precondition to fruitful milk production. Any laxity on the part of the herdboy can have disastrous consequencies in dairy production.

In the study area the sample households had most herdboys aged 11-20 years (61.9%). (See Table 21.) This may be because this is the age for formal education and once a person has passed this age (due to various reasons, lack of fees being one), the person looks for alternative occupation or activity. One of the most lucrative and available jobs within the village is that of herding animals. The proportion of herdboys in the 21-40 age category is low (7.9%) and there are none in the category greater than 40 years of age (Table 21). People in the age categories 21-40 and greater than

TABLE 21.: Proportion of sample households by age of herdboy in the Lilongwe milkshed area, 1987/88.

Age of herdboy (years)	Proportion of dairy farmers
	Percentage
≤10	30.2
11-20	61.9
21-40	7.9
>40	-
Total	100.0

40 usually go for jobs in crop production or anything else other than cattle herding.

On the whole the sample households mostly employed herdboys who had no family ties with them (Table 22). This is because of the need for seriousness in execution of duties related to dairy production which generally tends to be silent among relatives. The relationship between employer and employee is principally centred around the principle of "hire and fire". As such any substandard performance by the employee may attract dismissal. For relatives

they may be dismissed as a result of failing assigned duties but due to the extended family system they can continue to enjoy the benefits accruing from the enterprise.[3]

TABLE 22.: **Proportion of dairy farmers by relationship to herdboy in the Lilongwe milkshed area, 1987/88.**

Relationship	Proportion of farmers
	Percentage
Uncle	-
Brother	3.8
Son	8.9
Nephew	5.1
Employee	74.7
Grandson	6.3
Other[a]	1.3
Total	**100.0**

a. "Other" include niece.

[3] D.H. Ng'ong'ola, "An Economic Analysis of Smallholder Farm Expenditure in Thiwi/Lifidzi, Malawi" (M.Sc. dissertation, University of Wales, 1979), p. 57.

Level of Education of Herdboy

An incredible proportion of the herdboys in the study area was illiterate (Table 23). Only 6.3 percent of the households indicated that their herdboys had attended at least senior primary school education (Standard 6-8) while 18.8 percent of the farmers employed herdboys who dropped out at junior primary school level (Table 23). These

TABLE 23.: Proportion of households by level of formal education of herdboy in the Lilongwe milk-shed area, 1987/88.

Level of formal education	Proportion of farmers
	Percentage
None	73.8
Standard 1-5	18.8
Standard 6-8	6.3
Form 1-2	-
Form 3-4	-
Other[a]	1.3
Total[b]	**100.0**

a. "Other" include 'do not know'.

b. Total for percentage is greater than 100 because of rounding.

herdboys were no doubt school dropouts due to various social and economic reasons. As a result of depressed job opportunities at such levels of educational attainment they went cattle herding.

It is very unlikely, as the data in Table 23 depicts, that those with secondary school education would take up cattle herding as an occupation for status reasons and because the job attracts low wages. The mean payment for a herdboy from the sample households was estimated at K5.30/month. However, as more lucrative job opportunities in the urban areas dry up due to supply of school leavers outcompeting demand in the labour market, one can envisage that in the distant future even secondary school leavers may take up herding cattle as a profession. But these prospects are as yet only hypothetical.

In addition to the monetary payments disbursed to herdboys every month, the sample households also paid herdboys in kind. The most common payments in kind being food (87.5%) and accommodation (76.3%). (See Table 24.) It can also be noted in Table 24 that clothes were rarely given out in payment for the services of labour of a herdboy. This is because the farmers needed the clothes themselves and while the clothes given out were generally second hand[4] the farmers possibly passed them on to the herdboys when the household had no use for the clothes.

[4]Field survey, November 1988 to February 1989.

TABLE 24.: Proportion of dairy households by type of payment in kind offered to herdboys in the Lilongwe milkshed area, 1987/88.

Type of payment	Proportion of households
	Percentage[a]
Food	87.5
Clothes	45.0
Accommodation	76.3
Other[b]	10.0
Total	-
n	**80**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" includes soap and school fees.

Cattle Grazing Systems

Improved dairy cattle are recommended to be zero or paddock grazed[5] to avoid spread of diseases from local breeds (Zebu) to

[5]Michael Sorensen, "The Role of Artificial Insemination in the Improvement of Livestock Productivity in Malawi : National Artificial Insemination Scheme", the Veterinary Department Seminar, Malawi, 1988, pp. 7-9.

the crossbreds. Besides the objective of dairy industry is milk production and as such cows are recommended not to travel long distances to avoid energy wastage that can depress milk production or yield. In the following Table 25 data on proportion of dairy farmers by place where cattle are grazed is presented. These results show that the proportion of farmers grazing their dairy cattle in the

TABLE 25.: Proportion of dairy farmers by place dairy cattle are grazed during dry and wet seasons in the Lilongwe milkshed area, 1987/88.

Place	Proportion of farmers grazing	
	Dry season	Wet season
	Percentage[a]	Percentage[a]
Khola	49.0	51.0
Gardens	38.0	-
Dambo	29.0	37.0
Dryland	4.0	9.0
Hills	3.0	5.0
Planted pasture	13.0	26.0
Total	-	-
n	100	100

a. Total percentage is greater than 100 because of multiple responses.

khola and on planted pasture was greater in the rainy season than in the dry season (Table 25). This is because green grass is more scarce in the dry season than in the rainy season. To this effect it is easier to graze the dairy cattle in gardens, dambos and other places in the dry season than to zero graze them.

However, the results on paddock and zero grazing are not convincing as far as grazing improved dairy cattle is concerned. Only 49.0 percent and 51.0 percent of the sample households zero grazed their dairy cattle during the dry and wet seasons, respectively (Table 25). Therefore in the Lilongwe milkshed area free grazing is very common and this coupled with the presence of East Coast Fever give indications that profitable dairy production is insustainable in the area.[6] However, in the Lilongwe milkshed area the most common feeds were madeya, grass, groundnut residues and maize stover (Table 26). These were readily available in the farmers' fields, homes, dambos, hills and other places. But it is disappointing to note that very few farmers fed silage (12.0%) and hay (22.0%) to dairy cattle during the studied period. This therefore implies that the majority of the sample households did not conserve feed in form of hay and silage for use during the dry season.

For those farmers who conserved feed in form of hay and silage

[6] Ibid.

TABLE 26.: Proportion of farmers by type of feed provided to dairy cattle in the Lilongwe milkshed area, 1987/88.

Type of feed	Proportion of farmers providing
	Percentage[a]
Maize stover	69.0
Groundnut residues	73.0
Silage	12.0
Hay	22.0
Root crops	3.0
Madeya	84.0
Grass	83.0
Legume pasture	22.0
Other[b]	35.0
Total	-
n	**100**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include dairy ration, banana stems and leaves.

it is interesting to note that the proportion of those who conserved silage was about half of those who used hay (Table 26). This can be attributed to the technological (managerial) difficult of conserving silage as compared to hay. Consequently, many farmers choose the easy way of feed preservation - hay. Legume pasture and root crops were also rarely provided as feeds by the smallholder dairy farmers in the study area (Table 26). This is possibly due to lack of awareness about or to inavailability of these feeds. In case of dairy ration, of the 100 farmers interviewed only 66 used the ration which was mostly bought from Grain and Milling Company and KK Millers through bulking groups. For those farmers who never used dairy ration in 1987/88 season the main reason for the move was that the ration was expensive (48.4%). (See Table 27.) The other important reason was that these rations were not readily available to the farmers (Table 27). Therefore it can be inferred that almost all farmers are aware of the importance of using dairy ration but some farmers may not use it because it is expensive and not readily available.

Concluding Summary

The sample dairy households had more female than male dairy cattle because farmers get their initial dairy foundation stock in two cow units and culling of bulls is quite common in the Lilongwe milkshed area. The female dairy cattle were mostly acquired via loan from government stations and only rarely acquired through inheritance and gift.

TABLE 27.: Proportion of dairy farmers by reason for not using dairy ration in the Lilongwe milkshed area, 1987/88.

Reason	Proportion of farmers giving
	Percentage[a]
Availability	32.3
Expensive	48.4
Do not know about them	3.2
Other[b]	19.4
Total	-
n	**31**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include availability of local concentrate (madeya) and no proper management in terms of acquisition of the dairy ration.

Some farmers obtained their dairy cows on cash basis and their important source of income for this purchase was sales of crops. However, dairy farmers deemed dairy production as their most important source of income in the wet season and on average throughout the year.

A large proportion (73.8%) of the herdboys was illiterate and had generally no family ties with the household heads. The average wage of the herdboys was estimated at K5.30 per herdboy/ month in the study area. These herdboys were mostly involved in free grazing of cattle in dambos, hills, gardens and other places obviously at the directive of their employers. Improved dairy cattle are recommended to be zero grazed and the prevalence of free grazing of these animals points to the fact that dairy production is not sustainable in the Lilongwe milkshed area. Although the majority of the farmers used dairy ration, some farmers never fed it to cattle in the study area because it was expensive and not readily available.

CHAPTER VI

INVESTMENT IN AND MANAGEMENT OF DAIRY ENTERPRISE

Introduction

This chapter focuses on investment in dairy production as well as on management practices of dairy cattle by sample dairy households in the Lilongwe milkshed area. On investment the chapter will specifically look at the major hindrances to investment in dairy production for both dairy and non-dairy farmers apart from testing the hypothesis that the matriachal type of social organization discourages investment in dairy production in the village of marriage.

In case of management practices, the chapter will only look at khola management; pasture management; supplementary feeding; frequency of feeding, watering and dipping; culling and heat detection. Dairy extension services as well as availability of land and labour to both dairy and non-dairy households in the study area will also be discussed in the chapter.

Reasons for Keeping Dairy Cattle

As noted earlier in Chapter I, some researchers[1] for many

[1] E.B. Makumba, "An Economic Analysis of the Factors Affecting Smallholder Farm Income in South West Mzimba", p. 57; and D.H. Ng'ong'ola, "An Economic Analysis of Smallholder Farm Expenditure in Thiwi/Lifidzi", p. 57.

years have labelled smallholder farmers as having social status as one of the prime objectives for keeping livestock. As a response to this, a question in this study was administered to the dairy households in the Lilongwe milkshed area in order to establish the dimension of this objective amongst the smallholder dairy farmers. Table 28 summarises the results. As can be noted in the table the major objective of a smallholder dairy farmer for keeping dairy cattle was income (98.0%). The farmers also kept dairy cattle for

TABLE 28.: Proportion of dairy farmers by objective of keeping dairy cattle in the Lilongwe milkshed area, 1987/88.

Objective	Proportion of farmers giving
	Percentage[a]
Social status	6.0
Source of income	98.0
Source of milk	59.0
Source of manure	63.0
Source of meat	2.0
Total	-
n	**100**

a. Total percentage is greater than 100 because of multiple responses.

the sake of manure (63.0%) and milk for the family (59.0%). From Table 28 rearing dairy cattle for social status and as a source of meat were therefore rare objectives of the dairy households in the Lilongwe milkshed area. This is mainly because, as noted in previous chapters, dairy farmers keep mostly improved dairy cattle (crossbreds) which are generally obtained on credit basis from government stations for commercial production.

Investment in Dairy Production

Attractiveness of investment in dairy production is determined by the price of the milk at the market.[2] However, although the price on the market may look very lucrative, other factors like availability of the dairy foundation stock and land scarcity also play a fundamental role. An attempt was therefore made in this study to establish the factors that detracted non-dairy farmers in the Lilongwe milkshed area from investing in dairy production. As can be noted in Table 29 the main factors that were responsible for lack of investment in dairy production by the non-dairy farmers were inavailability of dairy foundation stock (34.0%) and lack of land (27.0%). As far as the non-dairy farmers were concerned the price of milk and the distance to the market were not major problems to dairy production.

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[2] S.G. Mbogoh, "Dairy Development and Dairy Marketing in Sub-Saharan Africa : Some Preliminary Indicators of Policy Impacts", ILCA Bulletin NO. 19, Working Paper No. 5 (1984), 16.

TABLE 29.: Proportion of non-dairy farmers by reason for not keeping dairy cattle in the Lilongwe milk-shed area, 1987/88.

Reason	Proportion of non-dairy farmers giving
	Percentage[a]
Lack of foundation stock	34.0
Low milk prices	3.0
Labour demanding	15.0
No place to feed them (Lack of land)	27.0
Market far away	3.0
No interest	14.0
Other[b]	17.0
Total	-
n	**100**

a. Total percentage is more than 100 because of multiple responses.

b. "Other" include lack of knowledge on procedure for acquiring dairy cows, fear of thieves, extension workers fail to fulfil their promises to farmers on the waiting list, old age, diseases and fear of loan.

Coupled with this table is Table 30 below which shows the major factors that prevent people from investing in dairy production as perceived by both dairy and non-dairy farmers in the Lilongwe milkshed area. Table 30 more or less depicts the same picture portrayed

TABLE 30.: Proportion of respondents (dairy and non-dairy) by main factor preventing people from investing in dairy production in the Lilongwe milkshed area, 1987/88.

Main factor	Proportion of respondents giving
	Percentage[a]
Lack of foundation stock	19.0
Labour demanding	7.5
Lack of land	27.5
Chikamwini	7.0
Ignorance	26.0
Lack of capital	5.5
Other[b]	23.0
Total	-
n	**200**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include laziness, lack of interest, no bulking group, fear of loan, low milk prices and diseases.

by Table 29 in that again the main factors surfacing as deterrents to investment in dairy production are land shortage and lack of dairy foundation stock together with ignorance. Ignorance comes in mainly because of lack of awareness about the relative profitability of the dairy enterprise. Capital was not a setback to investment in dairy production since input packages for dairy production are obtained on credit if the farmer so wishes. This is an attempt to make up for the lack of capital. However, as already discussed dairy foundation stock is not always available.

Impact of Matriachal Social Organization on Location of Investment in Dairy Production (Hypothesis 1)

In a matriachal society men must feel secure in order to develop any business.[3] The uncertainty is based on access to land that is enough for subsistence and for the business in the village of marriage. At the same time the fear of divorce and hence loss of land use right may encourage men to condemn the idea of developing a business in the village they live by marriage. This is so because "in a matrilineal society divorce tends to be easy and common."[4]

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[3] Engberg and Gluckman, cited by G.A. Banda, "Smallholder Aquaculture Development in Malawi : A Preliminary Socio-Economic Study of Smallholder Fish Farming in Mwanza and Zomba Districts", Project No. ICLARM/AAP87/1, (Zomba : Chancellor College, 1987), pp. 13-14.

[4] Ibid.

In the Lilongwe milkshed area both dairy and non-dairy households were requested to indicate where a man would normally locate his dairy cattle investment in a chikamwini social organization. The results of the investigation are summarised in Table 31 below. It is apparent from the table that the majority of the households (64.5%) preferred the man's parents home to wife's home for locating investment in dairy production. Those preferring the wife's home were about half of those who opted for the man's parents home as the ideal place for locating investment in dairy production. Chi-squared

TABLE 31.: Proportion of households by preferred location of investment in dairy production in chikamwini in the Lilongwe milkshed area, 1987/88.

Location	Proportion of farmers preferring		
	Dairy farmers	Non-dairy farmers	Total[a]
	Percentage	Percentage	Percentage
Wife's home	33.0	34.0	33.5
His parents' home	67.0	62.0	64.5
Other[b]	-	4.0	2.0
Total	**100.0**	**100.0**	**100.0**

a. Total = Dairy plus Non-dairy.

b. "Other" include either wife's or man's parents home (indifferent between the two locations).

test revealed a highly significant ($P \leq 0.01$) difference in preference between the man's parents home and the wife's home. This result, therefore, shows that there is a high degree of preference for the man's parents home for running dairy production business in this matriachal social grouping.

The main reasons for keeping dairy cattle in "his parents home" were security and distrust of wife's relatives which scored a total percentage of 48.1 and 43.4, respectively (Table 32). These results agree very well with those found from a study on "Smallholder Aquaculture Development in Malawi" carried out in Zomba and Mwanza. In these two matriachal districts it was discovered that some farmers who had developed their fish farms in their maternal or paternal villages rather than in the villages of their spouses, lived in villages close to such homes, while others actually brought their spouses to live with them patrilocally under certain conditions agreed upon by the two families.[5] The uncertainty here was based mainly on fear of divorce and hence loss of land use rights.[6] This fear prevented men from developing fish ponds in the villages they lived by marriage.[7]

Thus the foregoing tests and discussions have resulted in the acceptance of the hypothesis that the matriachal social organization discourages locating investment in dairy production in the wife's

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[5]Ibid. [6]Ibid. [7]Ibid.

TABLE 32.: Proportion of respondents by reasons encouraging a man to keep dairy cattle in his parents home in the Lilongwe milkshed area, 1987/88.

Reason	Proportion of farmers giving		
	Dairy farmers	Non-dairy farmers	Total
	Percentage[a]	Percentage[a]	Percentage[a]
Security	59.7	35.5	48.1
Distrust of wife's relatives	40.3	46.8	43.4
Other[b]	14.9	25.8	20.2
Total	-	-	-
n	**67**	**62**	**129**

a. Total percentage exceeds 100 because of multiple responses.

b. "Other" include not enough land at wife's home.

home. The main reasons for this behaviour being security and distrust of wife's relatives.

Availability of Land and Labour to both Dairy and Non-dairy Farmers

Resources are often called factors of production.[8] These factors of production are defined to be land, labour, capital and management. Firms or enterprises combine these factors of production in various ways to produce an annual flow of goods and services which is available for the satisfaction of human wants.

Land and labour are the twin factors of production that are of immense importance in smallholder agriculture because farmers in this subsector are characterised by an enhanced use of these factors and very little capital. This is mostly as a result of land being provided free to members of the community under the customary land tenure arrangement and labour being generally drawn from the household pool (family labour). Furthermore, considerable saving is required to amass capital and this may not be easy to come by amongst the smallholder farmers.

Land consists of natural resources provided free by nature, examples of which are mineral deposits, forests and water in form of rivers and natural lakes.[9] If the area of land is small it becomes

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[8] David T. Johnston, The Business of Farming : A Guide to Farm Business Management in the Tropics (London: The Macmillan Press Limited, 1982), p. 29.

[9] D.C. Rowan, Output, Inflation and Growth : An Introduction to Macroeconomics, 3rd ed. (London: Macmillan Education Limited, 1983), p. 20.

necessary to intensify the farming system by using more labour and capital on the limited area. Determination of available land is therefore necessary for the formulation of enterprise combinations suitable for intensive use of labour and capital for the farmer.

In the study area, the estimated mean land area available per dairy farmer was 3.27 hectares with a range of 0.94 to 10.03 hectares (Table 33). For non-dairy farmers the range was 0.27 to 9.21 hectares giving a mean of 2.53 hectares. The differences in

TABLE 33.: Mean holding sizes for sample households in the Lilongwe milkshed area and national average holding size, 1987/88.

Category of farmer	Mean holding size	
	ha	(SE)[a]
Dairy farmer	3.27	(± 0.19)
Non-dairy farmer	2.53	(± 0.17)
National average farmer[b]	1.10	NP[c]

a. SE = Standard Error.

b. World Bank, "Malawi Smallholder Agricultural Credit Project: Staff Appraisal Report" (Washington D.C.: World Bank, 1987), p. 3.

c. NP = Not Provided.

the mean holding sizes were highly significant ($P \leq 0.01$) implying that the dairy farmers had relatively more land available for various farm endeavours than non-dairy farmers. These mean holding sizes were also higher than the country average of 1.10 ha (Table 33).

Labour is defined as the group of productive services rendered by human physical effort, skill and mental power. Capital and managerial skills produce profit from land with the aid of labour. However, labour is not homogeneous although sometimes it becomes necessary to refer to labour as if it were homogeneous.[10]

The most common measures for expressing the work input of labour are man-days and man-hours. These stand for the work input of an average man in a working day[11] or hour. There are some agricultural activities such as pig production that need little land but labour is a requirement for all enterprises. Labour is like time but different from capital and land in the sense that it cannot be stored. Therefore if labour is not used at the time it is available it will be lost forever because labour that has been wasted does not collect together in heaps just as garbage does.[12]

Estimation of available labour is important because it gives an indication of potential labour supply from the household under consideration. Labour supply also becomes useful in Linear

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[10] Johnston, p. 30. [11] Ibid. [12] Ibid.

Programming[13] when major concern is optimum combination of enterprises under given constraints. Again, when introducing a new enterprise to the farmer considerations need to be placed on the labour constraint of the household since the new enterprise would also bring in its own labour demand.

In Table 34 data on labour supply and demand is presented. As is evident from the table, dairy households had relatively more labour available than non-dairy households. The difference in the mean labour supplies between the two household categories were also significant ($P \leq 0.05$). However, comparison of labour supply and labour demand on per capita basis revealed that both dairy and non-dairy farmers had more annual labour supply than labour demand (Table 34). This observation can be explained by the more widely spread ownership of oxen, thus making possible a reduction in the time required for land preparation and transportation of produce from field to homestead.[14] Furthermore, there is generally a slack period in crop production which lasts from July to October in the Lilongwe milkshed area.[15] Therefore, during the trough periods farmers could indulge in other activities such as feeding dairy cattle in

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[13] Linear Programming = a mathematical technique for determination of optimum combination of enterprises under given constraints.

[14] "Smallholder Milk Producers in the Lilongwe milkshed", Working Paper No. 28 MLW 75/020, p. 11.

[15] Ibid.

TABLE 34.: Annual household labour supply and annual labour demand by various enterprises in the Lilongwe milkshed area, 1987/88.

Type of farmer	Labour supply	Labour demand by enterprise					Total demand[c]
		Dairy[a]	Maize[b]	Tobacco[b]	G/Nuts[b]	Sweet potato[b]	
	man-hours/year	man-hours/ha/year					man-hours/year
Dairy	5416.8	1802.0	681.0	1375.3	1099.8	886.4	4100.4
Non-dairy	4670.2	-	681.0	1375.3	1099.8	886.4	2915.8

SOURCE: a. "Smallholder Milk Producers in the Lilongwe milkshed", Working Paper No. 28, MLW 75/020, p. 12, Figure 1.

b. Own calculation based on Nothale, pp. 80-85.

c. Based on mean enterprise farm sizes for the respective farmer categories.

order to improve milk production. Another reason for the larger potential labour supply than demand is growth in population which has increased the available labour to families on an annual basis. For non-dairy farmers, therefore, labour is not a serious constraint to dairy production on an annual basis.

Dairy Extension

Extension workers are central to the dissemination and propagation of new and improved technologies through the use of practical demonstrations. Research on one end of the continuum is responsible for the generation of new ideas which farmers on the other end can use. The farmer has to be aware of the possibilities of improving his productivity and researchers have to be well informed about the farmer's problems. This therefore requires the existence of a communication channel between farmers and researchers. Government agricultural extension services are expected to provide the link between farmers and researchers.[16]

An attempt was therefore made to establish the number or proportion of dairy farmers who were advised by extension workers in the Lilongwe milkshed area as well as the frequency of visits of the extension workers to farmers. Of the 99 farmers who responded

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[16] Tony Killick, Policy Economics : A Textbook of Applied Economics on Developing Countries (London : Heinemann Educational Books Ltd., 1981; reprint ed., New Hampshire: Heinemann Educational Books Inc., 1983), p. 228.

to the question 81 reported that dairy extension staff did advise them on dairy production while the remaining 18 indicated that they had no interaction with the dairy extension staff (Table 35).

TABLE 35.: Proportion of dairy farmers by frequency of visit of extension workers to the farmers in the Lilongwe milkshed area, 1987/88.

Frequency of visit	Proportion of farmers visited
	Percentage
Never	18.2
Twice a week	5.1
Once a week	20.2
Twice a month	30.3
Other[a]	26.3
Total	**100.0**

a. "Other" include once a month, only when cow is on heat, and three times a month.

The farmers who were visited by the extension workers were generally taught the following topics: feeding, housing, milking,

calf rearing and heat detection among other topics.[17] However, although the number of sample households visited by extension workers was significantly ($P \leq 0.01$) larger than that of those who were never visited, the picture looks grimmer when one looks at how the extension personnel inequittably distributed their contacts (visits) among the farmers (Table 35). It can be noted in the table that the farmers were visited at varied frequencies with only 5 being visited twice a week while 18 farmers were not being contacted at all. Thus, a small proportion of the dairy farmers was frequently visited by the field dairy extension personnel. These results tally very well with the findings of some researchers who reported as follows:-

> ...with respect to the distribution of extension services ... little of the available advice goes to those who need it most.... Moreover, since he himself (the extension worker) is usually poorly paid and without adequate transportation, the availability of a meal and transport when he visits the large farmers is an inducement that he can ill afford to ignore. Lastly...medium and large farmers are prepared to undertake the procedures that are being suggested![18]

Besides in Malawi progress of field staff is based on the results of or the performance of farmers. Therefore the extension worker, whose major means of transport is trekking, tends to go to only those farmers who are ready to take up his advice and produce

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[17] Field survey, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

[18] Gotsch, cited by Tony Killick, Policy Economics : A Textbook of Applied Economics on Developing Countries (London: Heinemann Educational Books Ltd., 1981; reprint ed. New Hampshire: Heinemann Education Book Inc., 1983), p. 242.

good results that the extension worker can report and be assessed on when the Ministry of Agriculture is considering promoting him.[19]

Apart from farm visits by the dairy extension workers, field days and demonstrations are also important in dairy production because they act as forums during which a farmer learns through exchange of ideas with other farmers and field staff, to say nothing of the stock of knowledge the farmer gains through observation. Field extension workers are expected to organise field days and demonstrations for farmers to attend. In the study area only 59 farmers out of the 98 who responded to the question indicated that field days and demonstrations were conducted. The remaining 39 said that they were not conducted. There was also a significant ($P \leq 0.05$) difference in the two responses.

In the case of agricultural training almost all the dairy farmers had attended the training as shown by 90 out of the total sample of 100 farmers. The proportion of the farmers who had attended agricultural training was significantly ($P \leq 0.01$) different from that of those who had never attended the course. This result is expected because one of the preconditions for take-off into the dairy production venture is that the prospective farmers go through a training programme in pasture management, calf rearing, record

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[19] Interview with Field Staff, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

keeping, housing, feeding, milking, heat detection and other management practices.[20]

Management Practices of Small-holder Dairy Farmers

Kraal Management

Good kraals in dairy cattle production are an essential part of good management practice because they provide protection to the cattle from inclement weather. It is also true that well constructed kholas that do not have slippery floors and broken pieces of wood protruding from the sides or lying about minimise risk of injury to the cattle kept therein. Cows should be housed in comfort with adequate light and protection from the rain. Where animals are not housed or are improperly (poorly) housed exposure to rain and other harsh conditions raise the amount of maintenance feed requirement and milk production therefore suffers.[21]

In the study area, only 54 of the 100 farms (54.0%) visited had good kholas. The other kholas were in poor condition characterised by floors that looked like seas of mud especially in the rainy season. Roofs had either inadequate thatch or the thatch was missing altogether, not to mention the absence of bedding in the kholas.[22] In some instances

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[20] Ibid.

[21] K. Russell, The Principles of Dairy Farming, rev. and trans. Kenslater (Ipswich : Farming Press Ltd., 1981), p. 131.

[22] Field survey, November 1988 to February 1989.

the kholas were sinking and the majority of the rails were completely detached from vertical poles. Seriousness on khola maintenance was therefore lacking among 46.0 percent of the sample households, yet animal comfort is expedient for successful dairy production (Table 36). It is also apparent from Table 36 that the highest number of poor kholas was found in Lilongwe North East RDP and the

TABLE 36.: Proportion and number of good and poor kholas among sample households in the Lilongwe milkshed area, 1987/88.

Condition of khola	Proportion and number of kholas representing							
	Lilongwe North East RDP		Lilongwe RDP		Thiwi/ Lifidzi RDP		Lilongwe milkshed area	
	No.	%	No.	%	No.	%	No.	%
Good kholas	31	46.3	5	50.0	18	78.3	54	54.0
Poor kholas	36	53.7	5	50.0	5	21.7	46	46.0
Total	**67**	**100.0**	**10**	**100.0**	**23**	**100.0**	**100**	**100.0**

least in Thiwi/Lifidzi RDP probably because Lilongwe North East RDP is a relatively new project.[23] However, the high proportion of poor kholas in the Lilongwe North East project indicates that farmers in the project are not serious about the welfare of dairy

[23] Interview with Field Staff, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

cattle compared to their counterparts in the other projects. The proportions of good and poor kholas in the study area were not significantly different.

Pasture Management

In order to be assured of enough feed for livestock especially dairy cattle careful management of pasture is important. Weed infestation, diseases and pests, uncontrolled grazing and other bad practices can induce very serious reductions in the grass and legume populations in a pasture land. In the study area, of the 100 dairy farmers interviewed only 82 grew improved pasture for their dairy cattle. Table 37 shows data on how the 82 interviewees managed their pasture. It can be noted from Table 37 that a good proportion of the farmers used most of the recommended pasture management practices such as fencing, weeding and fertilizing. However, it is interesting to observe that disease and pest control as a management practice was not employed by the sample housheholds (Table 37). This is either because farmers in the Lilongwe milkshed area do not perceive pasture as a crop like tobacco or disease and pest problem is not pronounced in the milkshed.

In case of rotational grazing the data in Table 37 also portrays that it was not a common practice in the area as it just spread to only 7.3 percent of the sample dairy households, possibly because farmers resorted to free grazing in dambos, gardens and

TABLE 37.: Proportion of dairy farmers by method of managing pasture in the Lilongwe milkshed area, 1987/88.

Method	Percentage[a]
Fencing	51.2
Weeding	57.3
Fertilizing	40.2
Disease and pest control	-
Rotational grazing	7.3
Other[b]	20.7
Total	-
n	**82**

a. Total percentage is greater than 100 because of multiple answers.

b. "Other" include shading to maintain green colour, trimming the grass and employing a boy to scare other livestock species away from the pasture land.

other places or because some of the farmers were zero grazing their dairy cattle (Table 25). As noted earlier 26.0 percent and 13.0 percent of the households grazed their dairy cattle directly on planted pasture in the rainy and dry seasons, respectively (Table 25) and these are the farmers who did not practice rotational grazing since in the communally grazed areas rotational grazing is unheard of. Therefore rotational grazing is rarely practiced in the Lilongwe milkshed area.

Supplementary Feeding of Dairy Cattle

Supplementary feeding is essential to enable dairy cattle especially cows to have enough energy for their maintenance and also some for production of milk. Sometimes supplementary feeding is done in order to keep the dairy cows docile during milking. Data in the table below shows the proportion of dairy farmers who provided supplementary feed to their dairy cattle. An important point emerging from Table 38 is that most farmers offered supplementary feed to their dairy cattle and the frequency of these farmers was significantly ($P \leq 0.01$) different from those who did not.

TABLE 38.; Proportion of dairy farmers by whether farmer provided supplementary feed to dairy cattle in the Lilongwe milkshed area, 1987/88.

Type of response	Proportion of dairy farmers
	Percentage
Provided supplementary feed	85.0
Did not provide supplementary feed	15.0
Total	**100.0**

Supplementary feeding amongst these households was mostly carried out all the year round and in the dry season as the following

table illustrates. It is evident from Table 38 that slightly more than 50 percent of the dairy farmers realised the importance of supplementary feeding dairy cattle throughout the year. A very small proportion of the farmers provided supplements to dairy cattle in the rainy season as compared to dry season (Table 39). There was also a significant ($P \leq 0.01$) difference in the frequencies of farmers for supplementary feeding for the various seasons.

TABLE 39.: Proportion of dairy farmers by season in which supplementary feeding was done to dairy cattle in the Lilongwe milkshed area, 1987/88.

Season in which supplementary feed was given	Proportion of farmers giving
	Percentage
Rainy season	5.9
Dry season	38.8
All year round	55.3
Total	**100.0**

Dry season supplementary feeding was more common than wet season supplementary feeding because feed is scarce in the dry season on grazing areas and there is plenty of crop residues available in this season as can be seen in Table 40 below. Furthermore, in wet season there is a lot of feed for cattle and the farmer is very

TABLE 40.: Proportion of dairy farmers by reason for supplementary feeding dairy cattle in the dry season in the Lilongwe milkshed area, 1987/88.

Reason for supplementary feeding in dry season	Proportion of farmers providing
	Percentage[a]
Feed is scarce	58.8
A lot of crop residues available	18.8
To increase milk yield	17.5
Other[b]	7.5
Total	-
n	**80**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include bait during milking, to keep cattle healthy, as a routine for dairy cattle and to ensure that cattle are full.

busy with crop enterprises hence the observed low frequency of farmers feeding supplements to dairy cattle in this season (Table 39).

The most common feeds provided as supplements to dairy cattle were crop residues as can be seen in Table 41. Hay and silage were rarely used as supplementary feeds for the simple reason that most

TABLE 41.: Proportion of dairy farmers by type of supplementary feed given to dairy cattle in the Lilongwe milkshed area, 1987/88.

Type of supplemetary feed	Proportion of farmers giving
	Percentage[a]
Crop residues	52.9
Hay	10.6
Silage	7.1
Madeya	20.0
Banana stems and leaves	21.2
Other[b]	17.6
Total	-
n	**85**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include dairy ration, fig tree leaves, leucaena and grass.

farmers do not conserve feed in form of hay and silage (Table 26). Again, the observed low frequency of farmers using hay and silage as supplementary feeds may be because farmers are not aware of the

conservation procedure (or the need) or because conservation of hay and silage has to be done in the rainy season when the farmer is fully occupied with other enterprises mostly crops.

Frequency of Feeding Dairy Cattle

Dairy cattle have to be fed over and above maintenance requirements with good quality feed if they are to realise their genetic potential for milk production. One way of ensuring that the dairy cattle have sufficient feed is to increase the frequency of feeding them per day. Table 42 shows the frequency of feeding dairy animals in the Lilongwe milkshed area. It can be seen from the table that most of the farmers (46.0%) were feeding their cattle three times

TABLE 42.: Proportion of dairy farmers by frequency of feeding dairy cattle in the Lilongwe milkshed area, 1987/88.

Number of feeding times per day	Percentage of farmers feeding
Once	4.0
Twice	17.0
Thrice	46.0
>Three	33.0
Total	**100.0**

a day and very few (4.0%) were feeding them once a day. While the frequencies of feeding were significantly ($P \leq 0.01$) different, it is pleasing to note that 33.0 percent of the farmers were feeding their cattle more than three times a day. This therefore implies that in the Lilongwe milkshed area, dairy farmers realise the importance of feeding their dairy cattle frequently.

However, it is to be noted that the frequencies of feeding given were mostly dominated by feeding of crop residues and roughages mostly grass pasture as indicated earlier in Tables 26 and 41. The concentrate commonly used by the households was madeya (Table 26) and although concentrates were used it is unlikely that these were fed in sufficient quantities because for those who did not use them the main reasons given for not feeding them to dairy cattle were that these were expensive and not readily available (Table 27). Besides madeya is an important human food especially during the hunger months of December and January.[24] As a result it is obvious that madeya could be rationally used to save human life as opposed to feeding it to cattle at a time when there is plenty of green grass for the cattle and human life is at stake.

Watering Dairy Cattle

Water is paramount in the life of the dairy animal in that its body consists of about 75 percent water while milk contains

[24] Interview with Field Staff, Lilongwe ADD, Lilongwe, 29 January 1989.

87 percent. Water aids digestion by dissolving the feed and acts as a carrier of the feed and waste. Apart from maintenance of osmotic pressure of the body, water prevents excessive changes in temperature.[25] Therefore, any interference with the normal amount of water in the animal body can bring about distasteful results. It is for this reason that as a component of good management farmers are advised to supply dairy cattle with large quantities of water ad libitum.

In Table 43 the data shows that very few farmers (21.2%) were watering their dairy cattle more than three times a day. Those who were providing water three times a day were doing it in the morning, noon and in the afternoon because they were engaged in other farm activities in between. As a result during the monitoring segment of the survey it was observed that the water troughs were dry and begging in the interim periods. Since a good number of farmers practice free grazing (Table 25) it seems therefore that the farmers relied on the water the cattle drunk while grazing in the dambos or places like that. The observed watering frequencies were also significantly ($P \leq 0.05$) different. Therefore from Table 43 it can be noted that generally water was not provided ad libitum to the dairy cattle.

Dipping Frequency of Dairy Cattle

The economic importance of ticks is mainly because they

[25] Lines and Luteijn, p. 38.

TABLE 43.: Proportion of dairy farmers by frequency of watering dairy cattle in the Lilongwe milk-shed area, 1987/88.

Frequency of watering per day	Proportion of farmers watering
	Percentage
Once	15.2
Twice	24.2
Thrice	39.4
>Three	21.2
Total	**100.0**

act as carriers of certain parasites of diseases, although a heavy tick infestation may itself cause considerable loss of production due to loss of blood and secondary infection of the bites. The most important diseases which are transmitted by ticks are East Coast Fever, Anaplasmosis, Heart Water and Red Water.[26]

In Malawi cattle are recommended to be dipped once a week and as can be noted in Table 44 below 89.9 percent of the farmers were dipping their dairy cattle once a week. Very few farmers (2.0%)

[26] Ibid., p. 61.

were dipping their cattle once a month mainly because of laziness or dipping tank being far away or dipping facilities being infrequently available. Therefore it is apparent that the majority of the dairy farmers realised the importance of following the recommended dipping frequency. The observed dipping frequencies were also significantly different at 1 percent level of significance using Chi-squared test.

TABLE 44.: Proportion of dairy farmers by dipping frequency of dairy cattle in the Lilongwe milkshed area, 1987/88.

Dipping frequency	Proportion of farmers dipping
	Percentage
Once a week	89.9
Twice a month	-
Once a month	2.0
Other[a]	8.1
Total	**100.0**

a. "Other" include twice a week.

The dipping tank was also in good working condition for a greater portion of the year (Table 45). Again, the frequencies for the period of year the dipping tank was in good condition were

TABLE 45.: Proportion of dairy farmers by period during which dipping tank was in good working order in the Lilongwe milkshed area, 1987/88.

Period of time	Proportion of farmers reporting
	Percentage
All year round	68.0
¾ of the year	29.0
½ of the year	-
Other[a]	3.0
Total	**100.0**

a. "Other" include less than a month.

significantly ($P \leq 0.05$) different. Most of the farmers were therefore able to dip their cattle at the recommended frequency of once a week because the dip tank was in good working condition for a greater part of the year.

Culling Dairy Cattle

Culling is the removal of unprofitable animals in order to maintain or improve production. In dairy production, any animal not producing milk at acceptable levels as laid down by the farmer or farmer's advisor is a target candidate for elimination. As noted

earlier in Table 14 farmers in the Lilongwe milkshed area are particular about withdrawal of bulls and old milkers from the dairy herd mainly because they are interested in elimination of unproductive stock as can be seen in Table 46 below. Limitation imposed by the khola in terms of space is not an important reason for culling dairy cattle

TABLE 46.: Proportion of dairy farmers by reason for culling dairy cattle in the Lilongwe milkshed area, 1987/88.

Reason for culling	Proportion of farmers giving
	Percentage[a]
Eliminate unproductive stock	90.4
Limited space in khola	6.8
Other[b]	26.0
Total	-
n	**73**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include source of cash, limited pasture land, and to eliminate deformed animals.

because extension of the khola can easily be implemented by the farmer to house the extra cattle. Besides farmers as noted in chapter 4

get their foundation stock in two cow units hence khola space may not be a limitation in the short term.

Heat Detection

Ideally dairy cows should calve down every 12 months in order for the farmer to get regular milk production. It is therefore imperative for the farmer to recognise when cows are on heat and to get them inseminated at the right time.[27] This is so because no insemination means no pregnancy and no pregnancy results in no calf and milk.

In the Lilongwe milkshed area 92.5 percent of the sample dairy households reported that they did not find it difficult to detect heat while only 1.1 percent indicated that sometimes they found it difficult to tell if the cows were on heat. The households that found it difficult to detect heat represented only 6.5 percent of the total. It is to be noted that frequencies of the above attributes were significantly ($P \leq 0.01$) different indicating that heat detection was not a problem to the majority of the farmers.

For those who found it difficult to detect heat, the main reason for this problem was silent heat (Table 47) which is not a management problem. Therefore from the overall low proportion

[27] Ibid., p. 74.

TABLE 47.: Proportion of dairy farmers by reason for finding heat detection difficult in the Lilongwe milkshed area, 1987/88.

Reason	Proportion of farmers giving
	Percentage
No advice given	20.0
Silent heat	80.0
Total	**100.0**
n	**5**

of dairy farmers finding problems in detecting heat one can conclude that heat detection was not a serious management problem in the study area as most farmers were well versed with the practice. This is mainly because the greater proportion of farmers were given advice on heat detection (Table 47).

When cows have shown signs of heat, the next step is to have them inseminated. Artificial insemination is the most common means of serving improved dairy cows in Malawi. Most farmers perceived this technique of serving the cows as satisfactory (Table 48) mainly because it reduced the trouble of keeping bulls, not to mention the successes experienced with artificial insemination. Artificial

TABLE 48.: Attitude of dairy farmers to artificial insemination in the Lilongwe milkshed area, 1987/88.

Farmer's attitude	Proportion of farmers having
	Percentage
Satisfactory	70.7
Not satisfactory	28.3
Other[a]	1.1
Total[b]	**100.0**

a. "Other" include artificial insemination being only good for improved stock but not local Zebu.

b. Total percentage is greater than 100 because of rounding.

insemination is also a path convenient for prevention of diseases that can be passed on from bulls to cows and vice versa. About 28.0 percent of the dairy households deemed artificial insemination unsatisfactory mainly because of silent heat (Tables 47 and 48) and unreliability of the veterinary assistants who sometimes failed to report at the farms for cow insemination although the farmers previously made an effort to inform them about a cow on heat.[28] However,

[28] Interview with farmers, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

the frequencies of farmers for the various responses on attitude to artificial insemination were significantly different at 1 percent level.

Concluding Summary

Dairy cattle in the study area were mostly kept for commercial purposes and not for social status. The dairy farmers also kept dairy cattle for the sake of manure and milk.

The major setbacks to investment in dairy production by non-dairy farmers were inavailability of dairy foundation stock and lack of land for growing pasture. Combined results from both dairy and non-dairy farmers also depicted that lack of dairy foundation stock and inadequate land for growing pasture plus ignorance were prominent hindrances to investment in dairy production.

The matriachal social organization was found to be effective in discouraging men from investing in dairy production in the village of marriage but not investment in dairy production as such. Men were discouraged to locate their investment in the wife's home because they felt insecure and did not trust the wife's relatives apart from lack of adequate land at the wife's home for dairy production.

Indeed, dairy households in the study area had significantly ($P \leq 0.01$) more land available per household than non-dairy households.

The mean holding sizes for both household categories were also higher than the country average of 1.1 ha. Therefore the sample households had relatively more land available per household than the average farmer in Malawi for agricultural production.

Dairy households had also significantly ($P \leq 0.05$) more labour available per household than non-dairy households. However, both households had more annual labour supply than annual labour demand because of the widespread ownership of oxen that has reduced the time required for doing certain operations, presence of slack periods and growth of population that increases available labour.

In terms of extension services, an inequittable distribution of contacts amongst the dairy farmers by extension workers was observed. A small proportion of the farmers was visited twice a week while other farmers were not visited at all. Coupled with this was the presence of poor dairy cattle management practices in the study area characterised by poor kholas, free grazing and inavailability of high quality feed such as dairy ration. However, heat detection was not a major problem in the study area.

CHAPTER VII

RETURNS TO DAIRY ENTERPRISE

Introduction

In this chapter milk yields obtained in Lilongwe and Blantyre milkshed areas will be compared. Furthermore, relationship between years as dairy farmer (proxy for experience) and average milk yield per cow will be tested using correlation analysis.

Milk marketing including distance to market, types of markets, milk transportation modes, problems of milk marketing and bulking groups will also be explored in the chapter. Finally incomes of dairy farmers will be compared to those of non-dairy farmers using Student's t-test with the aim of testing the hypothesis that incomes of dairy farmers are higher than those of non-dairy farmers.

Milk Production Levels

The production levels of milk used in the analysis excluded milk consumed by calves. In the study area, the average milk yield per cow per year for 255 cows on 95 farms was estimated at 826.8 kg (SE ± 73.5 kg with a range of 85.8 kg/cow/year to approximately 2831.5 kg/cow/year. The reported mean milk sales based on eight different strata with a total of 102 farms and 328 cows in the Blantyre

milkshed area[1] was approximately 1406.3 kg/cow/year with the sales varying from 700 kg/cow/year to about 2000 kg/cow/year.[2] The low average milk yields in the Lilongwe milkshed area are mostly due to inavailability of high quality feeds because of considerable concentration on free grazing management practice which deprives the farmers of the benefits of zero grazing. These benefits range from 600-800 kg/cow/year for cow herds in the dry areas as well as in the wet areas.[3] Furthermore, farmers in Malawi are provided with top grades of dairy cows ($\frac{3}{4}$, $\frac{7}{8}$ and pure bred friesians) as management of dairy cattle improves on their farms. Farmers in Blantyre milkshed area are reported to have better management practices of dairy cattle than their counterparts in Lilongwe milkshed area. Consequently, in Blantyre milkshed area there are more top grades of dairy cattle and hence higher average milk yields than in Lilongwe milkshed area.[4]

Relationship between Years as Dairy Farmer (proxy for experience) and Average Milk Yield per Cow (Hypothesis 2)

Experience in any production endeavour is necessary because it enables an individual to learn by doing. As a result of this, in the case of farmers they come to know why things have to be done

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[1]Sorensen, p. 6.

[2]Own calculations based on Sorensen, p. 6, Figure 1.

[3]Sorensen, p. 6.

[4]Interview with James Banda, Bunda College of Agriculture, Lilongwe, 13 September 1988.

as recommended by researchers and other field staff such as extension workers. It is therefore expected that with experience farmers can perfect themselves in management skills by capitalizing on their earlier mistakes leading to increased yields as was discovered in burley tobacco industry in Malawi.[5]

Correlation analysis is a useful tool for assessing whether two measurements taken from a population or sample are related but does not assume any cause-effect relationship. From the sample dairy farms in the Lilongwe milkshed area data on average milk yield per cow (Y) and number of years as dairy farmer (X) were taken to assess if there was a significant positive linear relationship between the two variables. The correlation test gave a correlation coefficient (r) of +0.04 from a total of 81 dairy households. This was not significant so that the hypothesis that there was a significant positive correlation between number of years as dairy farmer and average milk yield per cow was rejected.

These results contradict with those found for burley tobacco in Malawi where a significant ($P \leq 0.01$) relationship between experience and yield of burley tobacco was reported.[6] This apparent contradiction

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[5] J. Sinoya Nankumba, "Tenure Systems in the Estate Subsector of Malawi : The case of Tenancy Arrangement", report to Winsock International, Rural Development Department, Bunda College of Agriculture, University of Malawi, June 1988.

[6] Ibid.

may be because of the nature of the enterprises. In dairy production cows pass through three stages in terms of milk production: uphill, plateau and downhill. If a cow after producing milk for years gets to the downhill stage (beyond peak yield) experience then cannot contribute to increased yield. Actual feeding and implementation of other management practices in terms of the other stages are more important to enable the cow achieve its genetic potential than just merely keeping dairy cattle for many years. It is also possible that farmers who have been keeping dairy cattle for many years become complacent as noted from the increased use of free grazing contrary to the recommendations for feeding dairy cattle (Table 25).

With tobacco as the farmer gains experience he also gains on timeliness and other crop management practices that pay off dividends within a short time. In addition farmers in Malawi emphasise more on crop as opposed to livestock to the extent that livestock can be left to scavenge on grazing areas with herdboys while the farmer is busy with crop production.[7] This could be because for many years the government policy has tended to favour and to emphasise more on crop than livestock production.[8] Therefore since farmers tend to spend more time on crops than on livestock it is most likely

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[7] John Sinoya Nankumba, "Socio-economic Constraints to Beef/Dairy Production in Malawi : Some Experiences", paper presented at the 1st National Workshop on Livestock Production in Malawi, University Great Hall, Chancellor College, Zomba, 3 to 9 January 1988; and Interview with Field Staff, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

[8] Ibid.

that they will learn more by doing in crops such as tobacco thereby benefiting from experience than in dairy production. Furthermore, as cited earlier in Chapter 1 farmers who do not spend much time on their dairy business are likely to experience depressed yields from their dairy cows.

Milk Marketing

Dairy farmers have a wide choice of markets for their milk. The national giant in the dairy marketing business is the Malawi Dairy Industries Limited (MDI) which enjoys a large market share and has therefore a higher degree of concentration for milk than any other buyer. Other buyers are middlemen, villagers within a village of a dairy farmer, grocers and Indians.

The interesting feature about all these markets is that the majority of the farmers selling milk there are located within 10 kilometres (km) radius of each market (Table 49). There are very few farmers who have to trek or cycle long distances to get to the market. The frequency of farmers coming from within either 10 km or 6 km of the markets was significantly ($P \leq 0.01$) different from that of the farmers travelling longer than 10 km or 6 km to the market, respectively.

The main reasons for selling at these markets are summarised

TABLE 49.: Proportion of responses of dairy farmers selling milk at existing markets by distance from market in the Lilongwe milkshed area, 1987/88.

Distance	Type of market				
	MDI	Middlemen	Within village	Other[a]	Total[b]
	Percentage[c]	Percentage[c]	Percentage[c]	Percentage[c]	Percentage[c]
≤1 km	3.8	-	1.0	4.8	9.5
1.1-3 km	35.2	-	1.0	3.8	40.0
3.1-6 km	28.6	-	-	3.8	32.4
6.1-10 km	13.3	-	-	-	13.3
Over 10 km	2.9	1.0	-	1.0	4.8
Total[b]	-	-	-	-	-
n					100

a. "Other" include groceries and Indians.

b. Total percentage may be less than 100 because of multiple responses.

c. Percentages are based on grand total for responses (105).

in Table 50. It can be noted that the majority of the farmers preferred to sell their milk to MDI market principally because MDI offered better prices. The other important reason was that MDI offered direct cash payment at the end of each month and so the farmer felt he was more like those in paid employment (Table 50).

For those selling to middlemen the most important reason was that these offered very direct cash payment, i.e., the farmer did not have to wait till the end of the month, he got his money the same time the middlemen took over the ownership of the milk. From Table 50 it is also apparent that for those farmers who were selling their milk in other markets such as groceries and Indians, the main reasons were that these markets offered better prices and that there was no milk collection point for MDI. Therefore for those selling in other markets than MDI the main reasons for this move were better prices, direct cash payment and no collection point or MDI available.

Milk in the Lilongwe milkshed area is exclusively harvested from the udder using the hand milking method but the most popular means of transporting the milk to the market is trekking (Table 51). This mode of transport was used by 55 dairy farmers who represented 56.1 percent of the respondents. Second to this mode was the bicycle which was used by 38 of the sample dairy households giving a percentage of 38.8. Ngolo (farm cart) was never used for transporting

TABLE 50.: Proportion of responses of dairy farmers by reason for selling milk at the markets chosen in the Lilongwe milkshed area, 1987/88.

Reason	Type of market				
	MDI	Middlemen	Within Village	Other[a]	Total
	Percentage[b]	Percentage[b]	Percentage[b]	Percentage[b]	Percentage[b]
Better prices	33.3	0.9	-	3.4	37.6
No MDI	-	-	0.9	4.3	5.1
Does not want to travel long distance	1.7	-	-	0.9	2.6
More urgently needed	0.9	0.9	-	-	1.7
Direct cash payment	12.8	0.9	-	1.7	15.4
Other[c]	33.3	-	0.9	3.4	37.6
Total	-	-	-	-	-
n					100

a. "Other" include groceries and Indians.

b. Total percentage may be less than 100 because of multiple responses. Percentages are based on grand total for responses (117).

c. "Other" include only good market available, to feed urban population, and loan repayment through deductions.

TABLE 51.: Proportion of dairy farmers by milk transportation mode in the Lilongwe milkshed area, 1987/88.

Transport mode	Proportion of farmers using
	Percentage
Bicycle	38.8
Trekking	56.1
Farm cart	-
Truck	2.0
Other[a]	3.1
Total	**100.0**
n	**98**

a. "Other" include buses.

milk to the market possibly because it is the slowest of all the transport modes while trucks were used by only 2 farmers. Other farmers used buses and these also represented a small proportion of the total (Table 51).

The main reason for the observed low proportion of farmers using buses and trucks for transporting milk to markets is that

these represent expensive means of transport, the use of which can not be justified by the price of milk as can be seen in Table 52 where the problems of dairy marketing are presented. From this table the major reported problems to milk marketing were low milk prices (42.0%), sour milk (23.0%), poor transportation network (21.0%), few milk markets (9.0%) and delayed payments (5.0%).

TABLE 52.: Proportion of dairy farmers by major problem in dairy marketing encountered in the Lilongwe milkshed area, 1987/88.

Main problem	Proportion of farmers reporting
	Percentage[a]
Low milk price	42.0
Poor transportation network	21.0
Few milk markets	9.0
Sour milk	23.0
Delayed payments	5.0
Other[b]	21.0
Total	-
n	**100**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include fluctuating prices, unsold milk during absence of milk collector, unknown or unregistered deductions and farmer's milk records not matching with those of milk collector's.

Souring of milk was experienced by most dairy respondents to be a problem because of frequent breakdown of the cooling machine at cooling centres. As a result of this breakdown milk tended to sour during processing and the farmers lost their milk yield for the day yet the milk had already passed through the alcohol and other field tests and was recorded against the supplier's name. Coupled with this was the farmers' belief that the milk collectors, who were also dairy farmers, were taking advantage of the poor machines and announced sour milk anytime they wanted to and recorded the milk yield from all the farmers against their (the collectors') names.[9]

Transport was deemed a problem because as indicated in Table 51 most farmers walk with their milk to cooling centres. This could be because there are few milk collection centres (few markets) (see Table 52) and so the farmers found it difficult to walk to the nearest cooling centre. For delayed payments the main problem here was that farmers were, for unexplained reasons, forced to wait for more than a month before they could get their monthly payment for a particular previous month. Some farmers reported having waited for even 2 or 3 months before getting their payment for the first month of the series.[10] As a result the delayed payments tended to be at major variance with the farmers' expectation of getting a

[9] Interview with dairy farmers, Lilongwe ADD, Lilongwe, November 1988 to February 1989.

[10] Ibid.

regular (monthly) income from the milk delivered to the cooling centres of MDI.

Bulking Groups

Reasons for encouraging farmers to form bulking groups are presented in Appendix A. However, on the part of the Malawi Dairy Industries Limited making individual payments each month to the smallholder suppliers of milk attracts a lot of administrative detail, inertia and costs that can eat into the profit of the company. Therefore having several farmers teaming up to form a bulking group enhances administration and cuts down on cost of production since administration details are based on one supplier (bulking group) as opposed to individual members of the group.

Of the 100 dairy farmers interviewed in the Lilongwe milkshed area, 85 were members of bulking groups while the others were not. The following Table 53 shows data on reasons given by the non-members for not being members of bulking groups. It is clear from the table that the major reasons were absence of MDI service in their areas hence no bulking groups available (50.0%) and distant location of collection centres (25.0%). The other minor reasons were lack of interest in bulking groups and low milk prices which scored 16.7 percent apiece.

In case of absence of MDI service it appears that without

TABLE 53.: Proportion of dairy farmers by reason for not being members of bulking groups in the Lilongwe milkshed area, 1987/88.

Reason	Proportion of farmers giving
	Percentage[a]
Do not want	16.7
No MDI service	50.0
Collection centre far away	25.0
Other[b]	16.7
Total	-
n	**12**

a. Total percentage is greater than 100 because of multiple responses.

b. "Other" include low prices.

MDI farmers may not be interested in forming bulking groups. MDI is therefore the brain behind the formation of bulking groups because the other buyers such as middlemen and villagers are unlikely to buy milk in bulk.

Gross Margin Analysis

As earlier stated, four crops namely: maize, tobacco, groundnuts and sweet potatoes were grown in the study area. These crops which were regarded as non-dairy enterprises, were used for comparison with dairy enterprise. In Table 54 mean Gross Margins (GM) per hectare of the various enterprises for both dairy and non-dairy farmers are presented. It can be seen from the table that dairy production enterprise gave the highest mean Gross Margin/ha than any other enterprise. In fact the mean Gross Margin/ha for dairy production was 16.5 percent higher than that arising from tobacco enterprise for dairy farmers and this difference was significant ($P \leq 0.05$). This is mainly because of the regular flow of income

TABLE 54.: Mean Gross Margins of dairy enterprise and selected non-dairy enterprises in the Lilongwe milkshed area, 1987/88.

Type of enterprise	Mean Gross Margin (GM)/hectare	
	Dairy farmers	Non-dairy farmers
	---------- Kwacha/ha ----------	
Dairy	461.32	-
Maize	313.46	248.23
Tobacco	396.02	241.66
Groundnuts	165.69	193.78
Sweet potatoes	218.23	177.38

throughout the year from milk delivered to the dairies as well as sales of cattle and meat. Besides in tobacco production there is a restriction on the land area one can have by the quota system, therefore tobacco farmers are bound to get low yields if they do not practice intensive production methods.

Reference to Table 54 also reveals that maize and tobacco enterprises for dairy farmers gave higher mean Gross Margins/ha than the same enterprise under non-dairy farmers and the differences in the respective mean Gross Margins were highly significant ($P \leq 0.01$). This may be because dairy farmers had significant ($P \leq 0.05$) more labour available than non-dairy households (Table 4 and 34). Therefore the dairy farmers might have gained on timeliness in field operations. In case of use of manure Table 55 shows that although dairy farmers applied more manure than non-dairy farmers and the differences in the respective mean quantities applied were not significant, both household categories applied more manure to maize and tobacco. This can therefore explain the relatively low Gross Margins/hectare for groundnuts and sweet potatoes apart from producer prices and agronomic reasons. Furthermore, all dairy and non-dairy farmers who used fertilizer applied it to only maize and tobacco and if the other crops benefited from fertilizer application it was because they were in mixed stands with one or both crops.

Dairy production was not the only source of manure. Even non-dairy farmers used manure because they kept other livestock

TABLE 55.: Mean quantities of manure applied to selected crop enterprises in the Lilongwe milkshed area, 1987/88.

Crop enterprise	Mean quantity of manure applied	
	Dairy farmers	Non-dairy farmers
	kg/ha	
Maize	8796.3	7155.1
Tobacco	39535.3	34304.1
Groundnuts	-	291.5
Sweet potatoes	-	-

species such as beef cattle, poultry, pigs and goats. They also used compost manure in their gardens as Table 56 illustrates. It is evident in Table 56 that dairy cattle was the most important source of manure for dairy farmers while beef cattle was the prime source for the non-dairy households. Non-dairy farmers used no manure from dairy cattle but used more compost manure than dairy farmers (Table 56).

Income Differences between Dairy and Non-dairy Farmers (Hypothesis 3)

Using Gross Margins to compare incomes arising from dairy and non-dairy enterprises has already been presented in Table 54

TABLE 56.: Proportion of dairy and non-dairy farmers by source of manure used in crop production in the Lilongwe milkshed area, 1987/88.

Source of manure	Proportion of farmers using		
	Dairy farmers	Non-dairy farmers	Total
	Percentage[a]	Percentage[a]	Percentage[a]
Dairy cattle	88.8	-	47.0
Beef cattle	42.5	78.9	59.6
Poultry	2.5	1.4	2.0
Sheep	1.3	-	0.7
Pig	-	2.8	1.3
Goat	1.3	2.8	2.0
Compost manure	3.8	21.1	11.9
Total	-	-	-
n	**80**	**71**	**151**

a. Total percentages are greater than 100 because of multiple responses.

where the Gross Margin/ha for dairy enterprise was found to be significantly ($P \leq 0.01$) higher than that of any other crop enterprise either from dairy farmers or non-dairy farmers. On the whole the GM/ha

for dairy enterprise was found to be 16.5 percent higher than that of the second highest enterprise (tobacco), which incidentally was also from the dairy farmers. Therefore in terms of Gross Margin analysis the dairy enterprise is more lucrative than the other enterprises assessed in the Lilongwe milkshed area.

Table 57 shows the Total Gross Margin (proxy for income) for dairy and non-dairy households. These Gross Margins for dairy farmers were assessed and compared to those of non-dairy farmers at two levels: (1) dairy (crops only) and (2) dairy (dairy enterprise + crops). The differences in the mean Total Gross Margins for crop

TABLE 57.: Mean Total Gross Margins (TGM) for dairy and non-dairy farmers in the Lilongwe milkshed area, 1987/88.

Type of farmer	Total Gross Margin
	Kwacha
Non-dairy	731.84
Dairy (crops only)	869.98
Dairy (dairy enterprise included)	1271.33

enterprises only between the two farmer categories were highly significant ($P \leq 0.01$) and when the dairy enterprise was added to the crops

Total Gross Margin for the dairy households, the mean Total Gross Margin for the dairy households was 42.4 percent higher than that of non-dairy farmers. As a result of this analysis, the hypothesis that incomes of dairy farmers are higher than those of non-dairy farmers was accepted because even the differences in the mean holding sizes between the two categories of farmers were also found to be significant (Tables 4 and 33).

It appears therefore that the present land holdings with the subsequent increase in marginal lands, due to poor land husbandry practices, that lead to depressed crop yields permit dairy production to outcompete other enterprises in terms of income generation. Dairy cattle can be raised on pasture grown on marginal lands and produce high value product, milk.

Concluding Summary

Milk production levels in the Lilongwe milkshed area were lower than those reported for Blantyre milkshed area. This was mostly because of poor management of dairy cattle in the Lilongwe milkshed area and the presence of top grades of dairy cattle in the Blantyre milkshed area.

Unlike burley tobacco, there was no correlation between years as dairy farmer (proxy for experience) and average milk yield per cow because milk yield per cow depends on whether the cow is

approaching the peak or is beyond the peak in her lactation history. Also actual feeding and implementation of other management practices are more important when the cow is moving towards the peak yield than just merely keeping the cow for many years.

Milk is mostly sold to MDI though some of the milk from the farmers finds its way to other markets like middlemen, Indians and groceries. The main problems to the marketing of the milk were low milk prices, sour milk, poor transportation network, few milk markets and delayed payments.

Dairy production enterprise had a higher Gross Margin per hectare than any other enterprise considered (maize, tobacco, groundnuts and sweet potatoes). Furthermore, the dairy households had a higher Total Gross Margin (TGM) than the non-dairy households even when dairy enterprise was excluded. The differences in the mean Total Gross Margins were also highly significant ($P \leq 0.01$).

CHAPTER VIII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

In Chapter I of this thesis background information to Malawi including location, contribution of agriculture to Malawi's economy, livestock production and agricultural development strategy geared towards improving agricultural production in Malawi has been presented. The chapter has also discussed the rationale for the study by summarising the importance of dairy production to Malawi as a developing country. These advantages included provision of milk and meat to the people both in rural and urban areas; prevalence of low competition between man and dairy cattle since milk can be produced by the animals from crop residues and roughages which are nonutilizable by man; role of meat and milk in international trade to earn foreign exchange to a country, and the unseasonality of dairy enterprise which enables participating farmers to earn regular incomes unlike other enterprises such as tobacco.

Chapter I has also outlined the Malawi Government's policy objectives in dairy production and the extent to which the policy objectives have been achieved. These objectives are (1) to achieve self-sufficiency in milk and milk products, (2) to provide nutritious food to the population, and (3) to provide a ready market for the

milk produced in the country and to export profitably any surplus that may arise. It was established in Chapter I that these policy objectives have not been achieved as a lot of milk products have still got to be imported. Besides, there is a high rate of malnutrition of 49 percent to over 60 percent of the population of underfive children not to mention Malawi's high infant mortality rate of 165 deaths/1000 livebirths which was rated at number five in the world in 1986. Coupled with these problems in Malawi are the limited work on socio-economic problems related to dairy production and the depressed level of manpower assigned to livestock production at 12 percent compared to crops at 38.4 percent. Realising the importance of dairy production and the preceeding problems the study was felt paramount and had the following objectives: (1) to assess the impact of the matriachal type of social organization in Central Region on location of investment in dairy production; (2) to estimate the availability of land and labour to both dairy and non-dairy farmers in the milkshed area; (3) to evaluate smallholder dairy production in the Lilongwe milkshed area through appraisal of management practices, assessment of production levels of milk and estimation and comparison of gross margins arising from dairy enterprise to those of selected non-dairy enterprises; (4) to estimate Total Gross Margins for both dairy and non-dairy farmers; and (5) to suggest solutions to the identified problems with respect to smallholder dairy production.

Furthermore, in Chapter I hypotheses to be tested were given. These hypotheses were: (1) matriachal type of social organization discourages investment in dairy production in the village of marriage; (2) there is a significant positive linear relationship between years as dairy farmer (proxy for experience) and average milk yield per cow; and (3) incomes of dairy farmers are higher than those of non-dairy farmers because the present average land holding per family does not allow profitable crop production. Chapter II concentrated on review of related literature in order to put into perspective the existing state of affairs of dairy production in Malawi.

In Chapter III the methodology of the study was presented while in Chapter IV a description of the study area and the first set of results were presented. This chapter has established that dairy farmers have an upper hand in terms of attendance of informal education but no significant differences were observed between the two categories of farmers as regards level of formal education. Most dairy farmers attended farmer training courses on dairy and general crop production.

In case of social status 66.0 percent of the dairy farmers and 69.0 percent of the non-dairy farmers were nzika. The proportions of mkamwini who were dairy and non-dairy farmers were 6.0 and 14.0 percent, respectively while the proportions of mtengwa for the

two farmer categories were registered at 2.0 percent apiece. This is because mkamwini is a direct opposite of nzika and the frequency of mtengwa was low possibly as a result of few female household heads who were interviewed.

All interviewees had gardens but the dairy households had a significantly ($P \leq 0.01$) larger mean holding size than non-dairy farmers. The land the households were cultivating was mostly acquired via inheritance and very few respondents acquired their land through marriage and rent. Marriage was one of the most uncommon means of acquiring land because dairy production requires heavy investment in terms of land and as such dairy business was mainly carried out on land acquired through inheritance from parents for security reasons.

The farmers in the study area grew more than twenty crops out of which tobacco, maize, groundnuts and sweet potatoes were reported as major crops. These crops were mostly grown in mixtures with other crops and were cultivated using indigenous tools/implements. All households had hoes but the ownership of the other tools was variable with cultivators and ridgers being the most uncommon tools. Cultivators and ridgers were owned by few households because they are expensive.

Chapter V concentrated on aspects of dairy production in

the Lilongwe milkshed area. This chapter has established that dairy farmers tend to have more female than male dairy cattle because the farmers get their initial dairy foundation stock in two cow units through mostly loans from the government. The farmers also generally cull bulls (males) from their kholas. For those farmers who purchased their cows on cash basis their important source of income for the purchase was sale of crops. Also in the Lilongwe milkshed area as established in Chapter V a large proportion of the herdboys was illiterate and had no family relationship to the household heads. These herdboys who were paid an average of K5.30 per herdboy per month were mostly involved in free grazing of dairy cattle obviously in response to the recommendations of their bosses. This practice of free grazing is against the recommendations for feeding improved dairy cattle. As a result of the prevalence of free grazing, dairy production seems to be insustainable in the Lilongwe milkshed area because feeding of crop residues is also very common.

Chapter VI was concerned with investment in and management of dairy enterprise. As regards investment in dairy production the identified problems were inavailability of dairy foundation stock, lack of land for growing pasture and ignorance. The matriachal type of social organization was found to discourage the location of investment in dairy production in the village of marriage as

opposed to investment in dairy production as such. This was generally due to lack of security and land in the village of marriage.

Chapter VI has also established that dairy farmers in the Lilongwe milkshed area had significantly more labour ($P \leq 0.05$) and land ($P \leq 0.01$) available than non-dairy farmers. These were possibly some of the inducements for these dairy farmers to go dairying. In case of dairy extension services, an inequittable distribution of contacts amongst the dairy farmers by extension workers was observed ranging from twice a week to none at all for some of the farmers. On management, only 54 farms visited had good kholas while the rest of the kholas (46) were in poor condition. Disease and pest control as well as rotational grazing were rarely or not practiced on pasture lands by the dairy farmers in the study area. However, heat detection as a management practice was not a major problem as the majority of the farmers were able to detect heat.

In Chapter VII milk yields for Lilongwe milkshed area were compared to those reported for Blantyre milkshed area. This comparison showed that Lilongwe milkshed area's average milk yield/cow was lower than that reported for Blantyre milkshed area mainly because of inavailability of high quality feeds; concentration on free grazing management practice and generally poor khola management in the Lilongwe milkshed area. Also, due to improved management of dairy cattle many farmers in the Blantyre milkshed area are

given top grades of dairy cows as compared to their counterparts in the Lilongwe milkshed area. Thus the difference in the average milk yields/cow between the two milkshed areas can partly be explained by the greater number of top grades of dairy cows in the former than in the latter.

There was no significant positive linear correlation between years as dairy farmer and average milk yield per cow because milk yield depends on stage of lactation, dam parity (lactation number) and management. After peak yield is reached milk yield from the cows may not increase even though the farmer gains experience with each passing year. Besides, farmers in Malawi leave cattle to scavenge under the herdship of herdboys in fields, hills, dambos and other communal grazing areas while the farmers are busy with crop production. Therefore, the farmers are likely to learn more by doing in crops than in dairy production.

The major problems to milk marketing in the study area were low milk prices, sour milk, poor transportation network, few milk markets and delayed payments. However, dairy production enterprise had the highest mean Gross Margin per hectare than any other enterprise considered mostly because of (1) the regular flow of income throughout the year; (2) the better annual yields than the second highest enterprise (tobacco) and (3) the income realised from sales of cattle and meat. Total Gross Margin (TGM) for dairy households

was also significantly ($P \leq 0.01$) larger than that of non-dairy farmers mainly because of the significantly ($P \leq 0.01$) larger holding sizes for the former than for the latter and the inclusion of dairy production enterprise in the dairy household category.

Conclusions

From the the foregoing chapters it is evident that the study was undertaken with the core objective of identifying the major socio-economic constraints to smallholder dairy production. It can be concluded from the survey that the main constraints are lack of land, lack of dairy foundation stock, ignorance and management.

Land was viewed as a setback because one of the requirements for entering into the dairy industry is enough land for growing pasture to feed the improved dairy cattle. A farmer is expected to have at least 1.21 ha (3 acres) of land for growing pasture before being entrusted with the improved dairy cows. Therefore those farmers with inadequate land were perpetually kept outside the milk production equation. That is why dairy farmers had a significantly ($P \leq 0.01$) larger mean holding size than non-dairy farmers. Thus it appears that regardless of other feeding sources or alternatives, possession of adequate land is the major driving force for embarking on dairy production enterprise.

On the point of lack of dairy foundation stock, it can

be concluded that the research or breeding stations in Malawi entrusted with the mandate of producing half-bred friesian cows are not meeting demand for these cows from farmers. This excess demand for dairy cows has transpired into condemnation of many prospective dairy farmers to waiting lists for many years resulting in few farmers who are involved in dairy production.

Ignorance is mostly in relation to lack of awareness on the part of the farmers on the relative importance and/or profitability of dairy enterprise. Besides, farmers in the Lilongwe milkshed area were not conversant with the right mixes of feeds for high milk production as well as the matching of feed quality to milk production level of the cow as dictated by the cow's stage of lactation. Regardless of stage of lactation feeding of crop residues and roughages was common in the Lilongwe milkshed area. Ignorance leads to or supplements poor management. Poor management as depicted by about half of the kholas of the dairy farmers, housing improved dairy cattle being in poor state, was one of the key constraints to dairy production in the Lilongwe milkshed area. These kholas were mostly characterised by muddly floors, no thatch on the roof and detached rails. Free grazing on communal grazing areas such as hills, dambos and gardens was also used by the dairy farmers and this is symptomatic of poor management of dairy cattle. To worsen the situation, the dairy extension workers in the Lilongwe milkshed area inequittably distributed their contacts amongst the farmers. Some farmers were

visited twice a week while others were not visited at all. As a result of all these constraints, average milk yields in the Lilongwe milkshed area were lower than those reported for Blantyre milkshed area. This difference cannot be accounted for by differences in climate only.

As regards the price of milk it did not feature high as a constraint amongst the non-dairy farmers as it did with the dairy households. However, the Gross Margin for dairy production enterprise was significantly ($P \leq 0.01$) higher than the gross margins of the major crop enterprises considered. Also the mean Total Gross Margin (TGM) for dairy households was significantly ($P \leq 0.01$) higher than that of non-dairy farmers. From this it can be concluded that dairy production is relatively more remunerative than the other enterprises resulting into higher mean incomes for dairy farmers than non-dairy farmers.

In spite of this apparent profitability of the dairy enterprise the study has also established that there are few milk markets in the Lilongwe milkshed area coupled with poor transportation network, sour milk and delayed payments. All these conspire to sap dairy production in the study area thereby creating excess demand which is met through imports of dairy products.

The survey results have also revealed that the matriachal

social organization discourages investment in dairy production in the village of marriage because of insecurity, distrust of wife's relatives and lack of land at wife's home. However, this type of social organization does not discourage investment in dairy production as such because the akamwini could invest in dairy production in their parents' home.

Although there are relationships reported for tobacco between years as burley tobacco farmer and yield of tobacco there was no significant positive linear relationship established by this study between years as dairy farmer (proxy for experience) and average milk yield per cow. This is because milk yield is a function of stage of lactation, dam parity (lactating number) and management for a particular breed apart from keeping dairy cows for many years.

Dairy farmers had significantly ($P \leq 0.05$) more labour available than non-dairy farmers because the dairy farmers had larger families and employed more labourers for crop and dairy production than non-dairy households. It is possible that labour can be a constraint to agricultural production during some peak periods such as weeding and planting in the wet season but this study has established that for the five enterprises considered labour is not a binding factor to dairy production on an annual basis to both dairy and non-dairy farmers. This is because of presence of trough periods during some months of the year and the widespread ownership of oxen in the milkshed area.

Recommendations and Policy Implications

Land is, and will always be, a constraint to dairy production because of rapid population growth and other factors. Therefore concerted effort should be placed on how to increase the productivity of the already existing land in order to meet the demands of dairy cows and also the need to produce crops such as maize. Bought feed could be one of the alternatives to solving the land problem for pasture production. However, there is need for further studies in this direction to establish the benefits arising from reliance on bought feed. Such studies should pool together and bring meaningful contacts or interaction between milk producers, the milk processors (MDI) and the feed manufacturers.

The other path to going round the land problem could be production of own feed through such methods as undersowing and alley cropping. Undersowing as a technique of establishing pasture under a cover crop is convenient to situations where land, labour and capital resources are constraining. Research in Malawi has already shown success on pure or mixed swards of pasture under maize without causing significant reduction in maize yield.[1] This therefore needs to be developed further to assess feasibility under smallholder condition.

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[1] G.Y. Kanyama and O.T. Edje, "Effects of Undersowing Maize with Stylo on Seed and Dry Matter Yields", Bunda College of Agriculture Research Bulletin No. VII (1976), 57-58.

Alley cropping is a technique of growing a legume tree in between rows of an arable crop such as maize. Leucaena as a legume tree that is suitable for alley cropping has the advantage of providing protein to animals through its leaves. The leaves of leucaena also make good fertilizer for arable crops. This technique needs to be assessed so that solid results for application to small-holder farmer conditions are obtained to remedy the land and the feed problem alike. All these to go along with zero grazing management practice.

Farmers through extension staff and farmer training courses should be taught through practice how and when to conserve feed in form of hay and silage for dry season feeding. There is also need for research on the implications of conserving hay and silage toward the end of the rainy season, when the farmers are relatively free, on the nutritive value of the conserved feed. Accumulation of crop residues during harvesting as well as irrigation of pasture wherever technically and economically feasible could also be welcome avenues in rectifying the feed problem as originating from inadequate land.

However, dry season feeding to be taken with a pinch of salt. In this season feeding of dairy cows should be matched with production level of the cows. It may not pay to feed the cows

a lot of good quality feed when they have reached a stage of declining milk yield (beyond peak production) because it may cost more in feed than in what the farmer realises from milk sales. Good quality feed to be given to the cows only when it is profitable to do so otherwise maintenance feed will be relevant. Besides, depending on resource endowment of the farmer, it would be appropriate to encourage the farmers to cull dairy cattle regularly so that they are restricted to two cows because, as noted in earlier chapters, family labour can cope with this size of dairy herd. However, as holding sizes continue to shrink due to burgeoning population and expansion of estate land the condition that a farmer at least possesses 1.21 ha (3 acres) of land for growing pasture before he is selected for dairy production will be at major variance with the objective of achieving self-sufficiency in milk and milk products in the long run because fewer and fewer farmers would be meeting the condition as years pass by. Therefore the alternative would be to relax the regulation by allowing farmers with less than 1.21 ha required for dairy production acquire dairy cows as long as pasture is well established and have other feed alternatives.

Since demand for dairy foundation stock is outsripping supply, it is recommended that breeding stations should expand their breeding programmes to cater for demand which can be obtained via the ADDs in the country. Besides, there is need for assessment of the technical and economic feasibility of using other livestock

species such as goats and sheep which can be kept as backyard animals for dairy production. It may also be relevant to involve interested private breeders in order to increase supply of dairy stock. The government should also encourage farmers with more than 2 dairy cows to sell some of their cows to prospective dairy farmers in order to relieve pressure on their limited lands.

In the case of ignorance and management, it is recommended that the intensity of extension services on kraal and general management be increased as well as the competence of extension staff through recruitment of additional staff, training, provision of transport services and incentive remuneration. Follow-ups should also be intensified on extension workers to discover the extent to which they execute their assigned duties. The farmers should also be taken for refresher courses more often in order to update them on recent advances in dairy production.

On infrastructure there is need to increase the number of milk markets especially outside the milkshed area to catch extra farmers. Cost-benefit type of studies should be carried out to assess the worth of locating cooling centres in places outside the milkshed area with milk collection being carried out at regulated times to cut down on transport cost and increase milk supply to the dairies. Furthermore, the possibility of establishing small scale rural processing plants should be investigated in order to

reduce souring of milk. Petty traders could also be involved in milk marketing in order to provide a supplementary milk market for the farmers especially outside the milkshed area. To facilitate delivery of milk to the dairies, road improvements could be implemented locally during community self-help programmes such as youth week. Local and party leaders need to be incorporated in such projects if they are to be successful.

The expansion of milk production will also be affected by changes in the relative profitability of other enterprises that could be introduced or already exist on the farms in the area surveyed. Therefore producer prices for milk should be adjusted upwards taking into consideration changes in cost of production as is done for crop enterprises every year. It is therefore recommended that surveys that are geared toward establishment of estimates of cost of production for purposes of upward price adjustment be undertaken every year. MDI should also assure dairy farmers of regular monthly incomes for milk delivered to the factory. If implemented this will be a definite incentive for the dairy farmers.

APPENDICES

A P P E N D I X A

SOME GENERAL CHARACTERISTICS OF MALAWI

APPENDIX A

SOME GENERAL CHARACTERISTICS OF MALAWI

Topography[1]

Malawi has three distinct topographic regions: the Hill Zones, the Middle Plateau and the Rift Valley Floor. The Hill Zones embrace all areas lying between 1370 and 1540 metres above sea level. Generally in this zone agricultural production is carried out in moderate slopes as well as in those places where deeply weathered soils prevail.

The Middle Plateau has high agricultural potential mostly in places endowed with well drained ferruginous soils. In some parts of this topographic region crop production is arrested by water logging, leached sands and lateritic horizons. Ranging from 750 to 1370 metres above sea level, the Middle Plateau constitutes the most densely populated and important of all the agricultural lands in Malawi. Finally, the Rift Valley Floor stretches from an altitude as low as 35 metres above sea level in the Lowershire Valley in the south and along the low land areas of the western side of the Lakeshore (Lake Malawi) to an altitude of 760 metres.

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[1] S. Agnew and M. Stubbs, Malawi in Maps (London: University of London Press, 1972), cited by J. Nzima, "An Economic Evaluation of the Main Constraints of Animal Health and Production of Smallholder Dairy Cattle in Malawi" (M.Phil. thesis, University of Reading, 1985), pp. 4-6.

Climate

Malawi enjoys a tropical continental climate and has four seasons, namely: hot dry spring (September to early November), hot wet summer (mid November to March), cool moist autumn (April to May), and cool dry winter (June to August).[2] The temperatures in Malawi vary from an average maximum daily temperature of 26-28°C in October and November to less than 15°C in June and July.[3] Depending on the altitude and distance from the lake, the mean maximum temperatures range from 12.5 to 33°C in winter and 15 to 35°C in summer.[4]

Generally in Malawi the main rains occur between December and April with the early rains coming around October and November. The country experiences considerable variation in rainfall between regions ranging from 800 mm in Kasungu to over 2350 mm on Zomba plateau.[5] Distribution of rainfall is determined by proximity to the lake, altitude and the relationship of the area in question to the rain bearing winds. The majority of the rainfall in Malawi is convectional in the form of thunderstorms and local showers.[6]

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[2] J. Nzima, "An Economic Evaluation of the Main Constraints of Animal Health and Production of Smallholder Dairy Cattle in Malawi" (M.Phil. thesis, University of Reading, 1985), p. 6.

[3] J. Sinoya Nankumba, "Progress in Agrarian Reform and Rural Development in Malawi: Country Report for 1980-1985/86" (Lilongwe: Ministry of Agriculture, 1987), p. 5.

[4] Nzima, p. 6. [5] Nankumba, p. 5. [6] Nzima, p. 6.

Population

According to the 1987 population census children under 15 years are responsible for about 46 percent of the total population (8.0 million persons) in Malawi and those between 15 and 64 years account for 50 percent while only 4 percent of the total population comprises individuals aged 65 and above.[7] The 1987 population census revealed a rise in the dependency ratio from 0.97 in 1977 to 1.01 in 1987 while life expectancy was estimated at 47 years.[8]

In terms of spartial distribution the 1987 population census shows that 50 percent of the population of Malawi is in the Southern Region, 39 percent in the Central Region and 11 percent in the Northern Region (Table A.1). The most densely populated district is Blantyre with 292 persons/km^2 then Chiradzulu (275), Thyolo (252), Mulanje (185), Zomba (170) and Lilongwe (160).[9] The least densely populated district is Rumphi with only 16 persons/km^2.[10]

Land Tenure and Holding Sizes

Land tenure is the right people have to the acquisition and use of land. Malawi has a dual land tenure system where land is held under customary or leasehold and public tenure systems. The majority of the land in Malawi is held under customary land

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[7] Ibid [8] Ibid

[9] Malawi Government, NSO, Malawi Population and Housing Census, 1987: Preliminary Report, 1987 (Zomba: Government Printer, December, 1987), pp. xiii-3.

[10] Ibid.

TABLE A.1: Population distribution and densities of Malawi by region, 1977 and 1987.

Region	Area[a] km²	Population[b] 1977 Persons	Population density[b] 1977 Persons/km²	Population[b] 1987 Persons	Population density[b] 1987 Persons/km²	Growth rate[b] 1977-87 % per annum
Northern	26,874	648,853	24	907,121	34	3.37
Central	35,519	2,143,716	60	3,116,038	83	3.76
Southern	31,686	2,754,891	87	3,959,448	125	3.65
Total	**94,079**	**5,547,460**	**59**	**7,982,607**	**85**	**3.66**

SOURCE: a. Malawi Government, National Statistical Office (NSO), Malawi Statistical Yearbook, 1980 (Zomba: Government Printer, December, 1981), p. 9.

b. Idem, Malawi Population and Housing Census, 1987: Preliminary Report, 1987 (Zomba: Government Printer, December 1987), pp. xiii-3.

tenure system although the amount of land under public and leasehold has been increasing over the years (Table A.2).

In the customary land tenure system, the land is the property of the community and not the individuals. The chiefs and village headmen are charged with the responsibility of distributing the land to the various persons in the community. In the patrilineal

TABLE A.2: Land Tenure in Malawi ('000 hectares), 1964-1984

Year	Customary land	Public land	Freehold land	Leasehold land	Total
	Thousand hectares				
1964	8113.8	1097.3	166.3	71.4	9448.8
1979	7483.5	1659.9	51.7	253.6	9448.7
1984	7445.3	1639.9	52.1	301.4	9438.7

SOURCE: Nankumba, p. 10, Table 4.

society of the Northern Region of Malawi rights to the ownership of the land are held by the male line while in the matrilineal societies of the Central and Southern Regions, the female line is the determinant of land ownership. On the whole the customary land is characterised by scattered and fragmented gardens as a result of population pressure and other socio-economic factors.

In Malawi of the total land area, only 37 percent is classified as suitable for cultivation of arable crops and 86.7 percent of the suitable land was already under cultivation in 1977.[11] The average holding size was estimated at about 1.1 ha in 1987 and 55 percent of the holding sizes were less than 1.0 ha and 95 percent were less than 3.0 ha.[12] Maize and root crops are predominantly grown by farm families with the smallest average holdings while those with relatively larger holdings produce groundnuts, maize and root crops with some for the market besides home consumption.[13]

Agriculture in Malawi

Malawi's GDP in 1987 was estimated at MK2657.8[14] million at current market prices and the major export crops were tobacco, tea and sugar which accounted for 50, 21 and 9 percent of the total value of domestic export earnings in 1987, respectively.[15] As already stated, in 1987 agriculture contributed 36.9 percent of the Gross Domestic Product in Malawi. Of this total contribution of agriculture to

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[11] Chimimba David Phiri, "An Application of Risk and Uncertainty Analysis to Smallholder Farming Systems in Malawi : Reality and Policy Considerations" (M.Sc. dissertation, University of Wales, 1984), p. 10.

[12] World Bank, "Malawi Smallholder Agricultural Credit Project: Staff Appraisal Report" (Washington D.C. : World Bank, 1987), p. 3.

[13] Ibid.

[14] US $1.00 = MK2.84; MK = Malawi Kwacha.

[15] Malawi Government, Office of the President and Cabinet (OPC), Department of Economic Planning and Development, Economic Report 1987 (Zomba : Government Printer, 1987), p. 112.

GDP, livestock production accounts for about 8 percent on an annual basis. The contribution of livestock to GDP has been stationary at 3 percent per annum[16] implying that the livestock sector has not been expanding over the years.

In Malawi cattle are the most important of all livestock. However, Malawi has a small population of cattle numbering 838471 herd in 1987 (Table A.3) compared to 1422600 herd in 1981.[17] In 1977 the majority of the cattle were Malawi Zebu kept in the rural areas under an extensive system of communal grazing. The remaining proportion comprised exotic breeds mostly Friesians and their crosses.[18]

In terms of livestock development this key responsibility has been at the heart of the Department of Animal Health and Industry (DAHI) in the Ministry of Agriculture. This department establishes dip tanks where cattle are expected to be dipped every week. The department also operates breeding centres for the supply of cross-bred animals and encourages stall feeding of cross-bred dairy and beef animals aimed at the affluent Blantyre and Lilongwe markets.[19]

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[16]Arup Atkins International Limited, "National Livestock Development Study : Final Report" (Cambridge, UK: Arup Atkins International Limited, 1988), pp. 7-8.

[17]Own calculations, based on NSO, National Sample Survey of Agriculture, 1980/81 Vol. III (Zomba: Government Printer, 1984), p. 18.

[18]Arup Atkins International Limited, "National Livestock Development Study : Final Report", pp. 8-10.

[19]Ibid.

TABLE A.3: Livestock population by Agricultural Development Division (ADD) in Malawi, 1987.

Agricultural Development Division	Livestock population							
	Cattle	Goats	Sheep	Pigs	Poultry	Horses	Donkeys	Dogs
Karonga	84041	9025	4299	7106	146114	-	6	15653
Mzuzu	126678	66870	8831	14932	345572	-	-	25022
Kasungu	129308	132296	9341	47274	305197	-	94	31976
Salima	59224	83688	8524	13964	286386	-	37	20146
Lilongwe	198218	224997	11539	76435	498604	6	1284	57927
Liwonde	53572	66130	21138	3608	810848	-	25	11911
Blantyre	93811	160494	8220	52604	755680	25	11	52283
Ngabu	93619	55560	4060	22379	113802	-	6	9959
Total	**838471**	**799060**	**75952**	**238302**	**3262203**	**31**	**1463**	**224877**

SOURCE: Department of Animal Health and Industry, 1988

The main feed supplier in Malawi is Grain and Milling Company Limited (GRAMIL), a subsidiary of the Agricultural Development and Marketing Corporation (ADMARC). This company has failed to solve the feed problem in the country mainly due to problems in acquiring raw materials and in formulating the feed.[20] It has also been fraught with management inefficiencies.[21]

[20] Ibid. [21] Ibid.

The Dairy Industry in Malawi[22]

The Dairy Industry as laid down by the government has been geared towards the supply of milk to the population of the major cities and to "bring prosperity to the surrounding areas." Business minded dairymen started importing high producing European dairy cattle breeds since 1920's mainly to produce milk for markets initiated by successful plantations in the Southern Region. After independence (1964) the government established modern dairy farms and processing facilities in Blantyre and at Mikolongwe in 1969. Later the New Capital Dairy was openend in Lilongwe in 1973 and in 1980 an expanded Blantyre Dairy came into being. Mzuzu is the most recent milkshed area which made a real start in the late 1970's.

Between 1979 and 1983 three modern dairy farms were established by the Malawi Canada Dairy Cattle Development Project (MCDCD). These are now accounting for 30 percent of the raw milk supply to the dairy industry.

Before 1987 milk collection from farmers, processing and distribution of the packaged milk and milk products were carried out by the Malawi Milk Marketing Board (MMM), which was a subsector of the Department of Animal Health and Industry. However, later it was realised that MMM was unprofitable as it was running loss-making schemes for instance provision of cheap milk to poor households,

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[22]Ibid., pp. 97-110.

a kind gesture which the board itself was unable to finance. The Malawi Milk Marketing Board was making an overall annual loss to the government of about MK350,000. It was also discovered that the Milk Marketing Board had no status and was not fully involved in policy formulation. Inefficiency as a result of poor management information service and lack of accounts for establishment of the board's financial position were part of the malaise of MMM.[23]

In 1987, therefore, a change in its status from government to parastatal was implemented in order to remedy the existing state of affairs[24] by mergering the dairy industry operation of DAHI, MMM, with the MCDCD under the umbrella of one management which came to be known as the Malawi Dairy Industries Limited (MDI). As a result of this transformation, efficiency and profitability have been reported as the outstanding achievements of the new MDI.[25] However, the government still plays a greater role in lending money to smallholder dairy farmers through Agricultural Development Divisions (ADDs) for purchases

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[23] J. Empson, "The Organization and Planning of the Dairy Industry of Malawi", draft report on UNDP/FAO Project MLW/80/002 Assistance in the Establishment of a Milk Marketing Board (Rome: FAO/UNDP Project, 1983), pp. 4-5.

[24] J. Nzima, "Current Constraints in Buying Liquid Milk, Processing and Marketing of Milk and Milk Products: Strategies for Profitability", paper presented at the 1st National Workshop on Livestock Production in Malawi, University Great Hall, Chancellor College, Zomba, 3-9 January 1988.

[25] Arup Atkins International Ltd., "National Livestock Development Study : Final Report", p. 97.

of dairy cattle and in distribution of monthly milk cheques, after deductions of loan repayments, to smallholder dairy farmers.[26]

Smallholder dairying. This is relatively new to Malawi. Friesian crossbreds which seem to be relatively adapted to Malawi are used. Each farmer starts off with two halfbred Friesian-Malawi Zebu cows which may be obtained for cash or credit. Training is an important component of Smallholder Dairy Development Scheme and prospective farmers are given short courses before receiving their cows and close supervision is done thereafter.[27] Before getting his cows a farmer must prove his interest by:-

(a) building a thatched khola and a milking shed with a hard floor, and

(b) planting sufficient area (1.21 ha or 3 acres) of pasture and fencing it if in East Coast Fever area.[28]

Having done this from his own resources the farmer is then eligible to get the following items on credit:-

(a) Two dairy cows,

(b) One hand spray pump,

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[26] Ibid.

[27] I.H. Proverbs, "Smallholder Beef and Dairy Production in Malawi", paper presented at the 1977 SARCUS meeting, 1977.

[28] Interview with Field Staff, Lilongwe Agricultural Development Division, Lilongwe, 29 November, 1988.

(c) Five litres of approved acaricide,

(d) Two rolls of barbed wire for fencing, and

(e) Insurance premium for the first year.[29]

As already mentioned, the dairy cows are bred at Veterinary Department Livestock centres and issued by extension staff in designated milkshed areas through which milk collection runs are made (Table A.4). Farmers are encouraged to form bulking groups to facilitate milk collection, to enable farmers pool their milk at collection

Table A.4: Bulking groups, farmers and farms with crossbred dairy cattle by milkshed area who are subject to extension services, 1987.

Milkshed	Radius	Bulking groups	Average number of farmers in group	Farms with crossbred
Lilongwe	60	20	15	298[a]
Blantyre	65	19	34	650[b]
Mzuzu	20	5	19	97
Total		**44**	**24**	**1045**

SOURCE: Agricultural Development Divisions (ADDs), cited by Arup Atkins International Limited, "National Livestock Development Study : Final Report", 1988, p.114.

a. Includes 59 farmers selling all milk retail.

b. Excludes Mangochi.

[29] Proverbs, p. 3.

centres, to allow them develop a spirit of communal work and self help, to act as medium for distribution of feed, medicines and equipment and to allow farmers receive extension and artificial insemination services. A price premium in the form of quantity bonus is offered to the farmers who form a bulking group. Each bulking group has a chairman, a secretary and a treasurer.

Repayment of credit is done by deduction from farmer's monthly milk cheque at a fixed proportion of his income until the credit is repaid.[30] The current rate of repayment is 50 percent of the monthly milk sales value.[31]

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[30] Ibid.

[31] D. Lines and H.M. Luteijn. The Smallholder Dairy Scheme in Malawi : Project MLW 75/020 Assistance to Livestock Development, FAO, (Lilongwe : Extension Aids Branch, 1988), p. 80.

A P P E N D I X B

GROSS DOMESTIC PRODUCT AND TRADE IN AGRICULTURAL PRODUCTS

APPENDIX B

GROSS DOMESTIC PRODUCT AND TRADE IN AGRICULTURAL PRODUCTS

TABLE B.1: Origins of Gross Domestic Product (GDP) in 1987[ab].

Source	Percentage of total
Agriculture	36.9
Manufacturing	11.6
Utilities and construction	6.5
Government	14.0
Transport and distribution	18.6
Other	12.4
GDP at factor cost	100.0

SOURCE: Economist Intelligence Unit, Country Report No. 4, Zimbabwe, Malawi : Analysis of Economic and Political Trends Every Quarter, 1988 (New York and London: Economist Intelligence Unit Limited, 1988), p. 3.

a. Provisional.

b. Calculated on basis of 1978 prices.

APPENDIX B

TABLE B.2: Output and trade of selected agricultural commodities ('000 metric tons), 1984-1986.

Commodity	Production 1984/85	Imports 1985	Exports 1985	ADMARC purchase 1985/86
Maize	1473.0	-	46.0	271.6
Rice, Paddy	34.3	-	0.6	10.7
Potatoes	81.0	-	-	-
Cassava	209.3	-	-	-
Pulses	28.1	-	11.4	17.0
Groundnuts, confectionery	59.5	-	19.2	17.5
Tobacco, smallholder	17.5	-	17.5	20.2
Milk	96.7	17.8	-	-
Meat	6.4	-	0.6	-
Eggs	2.3	-	-	-
Fertilizers	-	112.2	-	64.9

SOURCE: Ministry of Agriculture, cited by Office of the President and Cabinet (OPC), Economic Planning and Development, Statement of Development Policies 1987-1996 (Zomba : Government Printer, 1987), p. 25, Table 4.3.

A P P E N D I X C

SAMPLE QUESTIONNAIRES

APPENDIX C

A SURVEY ON THE SOCIO-ECONOMIC CONSTRAINTS TO SMALLHOLDER DAIRY PRODUCTION IN THE LILONGWE MILKSHED AREA IN MALAWI : IMPLICATIONS FOR DAIRY PRODUCTION POLICY

QUESTIONNAIRE - 1

Enumerator's Name: _____

Name of Household Head: _____

Gender of Household Head: _____

Tribe of Household Head: _____

Village of Household Head: _____

District of Household Head: _____

Respondent (Household Head) Number: _____

Date: _____ Day: _____ Month _____ Year: _____

1. Household composition

Person Number	Name	Age	Gender	Relationship to Household Head	Availability
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

Codes of availability

0 Permanent resident
1 Permanent resident in local employment
2 Permanent resident in full education
3 Polygamist spending part of time in other households
4 Resident hired labour
5 Other (specify)

2. Marital status of respondent.

Single	0	.....
Married	1	.....
Polygamist	2	.....
Widowed	3	.....
Divorced	4	.....
Other (specify)	5	.....
Missing	99	.....

3. Social status of respondent.

Nzika	0	.....
Mkamwini	1	.....
Mtengwa	2	.....
Chief (T/A)	3	.....
Village Headman	4	.....
Pastor	5	.....
Other (specify)	6	.....
Missing	99	.....

4. Do you read and write Chichewa?

Yes	0	.....
No	1	.....

5. If yes, how far did you go with your education?

(a) Formal:

None	0	.....
Standard 1-5	1	.....
Standard 6-8	2	.....
Form 1-2	3	.....
Form 3-4	4	.....
High school and above	5	.....
Missing	99	.....

5. (b) Informal:

None	0	.....
Adult literacy	1	.....
Home craft	2	.....
Farmer training	3	.....
Other (specify)	4	.....
Missing	99	.....

LAND HOLDING

6. Do you have farms?

Yes	0	.....
No	1	.....
Missing	99	.....

7. If yes, how many farms do you have?

1-2	0	.....
3-4	1	.....
5-6	2	.....
Over 6	3	.....
Missing	99	.....

8. How did you get your land?

Allocated by village headman	0	.....
Bought	1	.....
Borrowed	2	.....
Inherited:		
(a) Matrilineal	3	.....
(b) Patrilineal	4	.....
Through marriage	5	.....
Other (specify)	6	.....
Missing	99	.....

9. What is the area of the land acquired in the following ways?

Allocated by village headman	0	.....
Bought	1	.....
Borrowed	2	.....
Inherited	3	.....

Through marriage	4	.....
Other (specify)	5	.....
Missing	99	.....

9b. What is the total area of your land?

_____

CROP PRODUCTION

10. Which crops did you grow last year?

Tobacco	0	.....
Maize	1	.....
Groundnuts	2	.....
Sweet potatoes	3	.....
Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

11. What was the farm size of each of the following crops you grew?

	0	1	2	3	4
	Less than 1 ha	1-2 ha	3-4 ha	5-6 ha	More than 6 ha
Tobacco					
Maize					
Groundnuts					
Sweet potatoes					
Beans					
Other (specify)					

12. Were the crops grown in association?

Yes	0	.....
No	1	.....

13. If yes, which crops were grown in association with the following crops?

		Crops in Association
Tobacco	0	.....
Maize	1	.....
Groundnuts	2	.....

		Crops in Association
Sweet potatoes	3	.....
Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

14. Indicate the operation in which you experienced the highest labour demand last year.

	0 Land Clearing	1 Tillage	2 Planting/ Sowing	3 Weeding	4 Fertilizer Application	5 Harvesting
Tobacco						
Maize						
Ground-nuts						
Sweet potatoes						
Beans						
Other (specify)						
Missing						

15. What was the yield of each of the following crops that you grew last year?

Crop	Ngolos	Bags	kgs
Tobacco			
Maize			
Groundnuts			
Sweet potatoes			
Beans			
Other (specify			
Missing			

16. What was the unit price (price/kg) of each of the following last year?

Crop		Unit Price (t/kg)
Tobacco	0	.....
Maize	1	.....
Groundnuts	2	.....
Sweet potatoes	3.	.....
Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

17. Indicate the variable costs incurred in the production of each of the following crops.

Crop	Type of variable cost													
	Seed		Fertilizer		Contract or casual labour		Wood		Trans-port		Chemi-cals		Other (specify)	
	Q	Unit Cost	Q	Unit Cost	Q	Unit Cost	Q	Unit Cost	Q	Unit Cost	Q	Unit Cost	Q	Unit Cost
Tobacco														
Maize														
Groundnuts														
Sweet potatoes														
Beans														
Other (specify)														
Missing														

18. What is the annual food availability of your family for each of the following crops (please specify units of measurement e.g. Ngolo, etc)?

Maize	1	.....
Groundnuts	2	.....
Sweet potatoes	3	.....
Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

19. Indicate the tools or implements that are most demanded.

Hoe	0	.....
Panga	1	.....
Axe	2	.....
Plough	3	.....
Ngolo	4	.....
Ridger	5	.....
Cultivator	6	.....
Other (specify)	7	.....
N/A	8	.....
Missing	99	.....

20. Did you use fertilizer last season?

Yes	0	.....
No	1	.....
Missing	99	.....

If No, go to question 23a.

21. To which crops did you apply fertilizer?

Tobacco	0	.....
Maize	1	.....
Groundnuts	2	.....
Sweet potatoes	3	.....

Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

22. What was the type of fertilizer used?

		Type of Fertilizer
Tobacco	0	.....
Maize	1	.....
Groundnuts	2	.....
Sweet potatoes	3	.....
Beans	4	.....
Other (specify)	5	.....
Missing	99	.....

Key:

0	D A P
1	20:20:0
2	Urea
3	C A N
4	Other (specify)

23a. Did you use any manure last season?

Yes	0	.....
No	1	.....
Missing	99	.....

If No, go to question 24.

23b. What was the source of the manure that you used?

Dairy cattle	0	.....
Beef cattle	1	.....
Poultry	2	.....
Sheep	3	.....
Pig	4	.....
Goat	5	.....
Other (specify)	6	.....
Missing	99	.....

23c. What was the quantity of the manure applied to each of the following crops?

	Ngolos	Baskets	Wheelbarrows	Other (specify)
Tobacco				
Groundnuts				
Sweet potatoes				
Beans				
Other (specify)				
Missing				

24. Why didn't you use any manure last season?

Not available	0	.....
Don't like	1	.....
Too expensive	2	.....
Was not aware of its use	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

25. Are you a dairy farmer?

Yes	0	.....
No	1	.....
Missing	99	.....

For non-dairy farmers go to questions 84-86 then question 99.

26. If yes, how many dairy animals do you have?

Number of Cattle

1-2	0	.....
3-4	1	.....
5-6	2	.....
7-8	3	.....
9-10	4	.....
Over 10	5	.....
Missing	99	.....

27. How many of your dairy cows were producing milk last year?

_____

28. How many of your dairy cattle are:

Male	Female
.....	.....
.....	.....

29. Do you have improved stock of dairy cattle?

Yes	0	.....
No	1	.....
Missing	99	.....

30. If yes, how many are they by sex?

Male	Female
.....	.....
.....	.....
.....	.....
.....	.....

If no, go to question 32.

31. What was the source of the improved stock?

Government station	0	.....
Relative	1	.....
Friend	2	.....
Other (specify)	3	.....
N/A	90	.....
Missing	99	.....

32, What was the important source of income in the dry season, wet season, all the year round?

Enterprise	Code	Dry season	Wet season	All year round
Crop	0			
Dairy cattle	1			
Beef cattle	2			
Sheep	3			
Goat	4			
Pig	5			
Fish farming	6			
Other (specify)	7			
Missing	99			

33. When did you start rearing?

(a) Zebu cattle	.....
(b) Improved dairy cattle	.....

34. How did you acquire the improved dairy cattle?

Inheritance	0	.....
Gift	1	.....
Purchase	2	.....
Loan	3	.....
Other (specify)	4	.....
Missing	99	.....

35. How many of the local cattle did you acquire in the following ways?

		Number
Inheritance	0	.....
Gift	1	.....
Loan	2	.....
Purchase	3	.....
Other (specify)	4	.....
Missing	99	.....

36. How many of the improved dairy cattle did you acquire in the following ways?

		Number
Inheritance	0	.....
Gift	1	.....
Loan	2	.....
Purchase	3	.....
Other (specify)	4	.....
Missing	99	.....

37. Specify the source if the improved dairy cattle were inherited.

Mother	0	.....
Uncle	1	.....
Father	2	.....
Sister	3	.....
Brother	4	.....
Wife	5	.....
Husband	6	.....
Other (specify)	7	.....
N/A	90	.....
Missing	99	.....

38. Were the improved dairy cattle acquired before or after the death of the source?

After	0	.....
Before	1	.....
N/A	90	.....
Missing	99	.....

39. If the improved dairy cattle were purchased, what was the source of capital?

Sales of crops	0	.....
Income from other livestock sales	1	.....
Credit	2	.....
Employment in Malawi	3	.....
Employment outside Malawi	4	.....
Other (specify)	5	.....
N/A	90	.....
Missing	99	.....

40. Give the number of each of the following breeds of cattle you are keeping.

		Number
Zebu	0	.....
Zebu-Friesian cross	1	.....
Pure Friesian	2	.....
Holstein	3	.....
Jersey	4	.....
N/A	90	.....
Missing	99	.....

41. Do you own all the cattle in the khola?

Yes	0	.....
No	1	.....
Missing	99	.....

42. If No, indicate who the other owners are:

Uncle	0	.....
Brother	1	.....
Sister	2	.....
Cousin	3	.....
Nephew	4	.....
Niece	5	.....
Friend	6	.....
Other (specify)	7	.....
N/A	90	.....
Missing	99	.....

43. How many does each one of them own?

		Number
Uncle	0	.....
Brother	1	.....
Sister	2	.....
Cousin	3	.....
Nephew	4	.....
Niece	5	.....

Friend	6	.....
Other (specify)	7	.....
Missing	99	.....

44. What were the terms of agreement?

Pay herd boy	0	.....
Khola owner to collect milk	1	.....
Other (specify)	2	.....
N/A	90	.....
Missing	99	.....

45. What is the age of your herd boy?

Less than 10	0	.....
11-20	1	.....
21-40	2	.....
Above 40	3	.....
Missing	99	.....

46. What is the relationship?

Uncle	0	.....
Brother	1	.....
Son	2	.....
Nephew	3	.....
Employee	4	.....

Grandson	5	.....
Other (specify)	6	.....
Missing	99	.....

47. Indicate the herd boy's level of education:

None	0	.....
Standard 1-5	1	.....
Standard 6-8	2	.....
Form 1-2	3	.....
Form 3-4	4	.....
Other (specify)	5	.....
Missing	99	.....

48. How much do you pay him?

K...../month

49. If in kind what do you pay him?

Food	0	.....
Clothes	1	.....
Accommodation	2	.....
Other (specify)	3	.....
Missing	99	.....

50. Where do cattle graze during the dry season?

Khola	0	.....
Gardens	1	.....
Dambo	2	.....
Dry land	3	.....
Hills	4	.....
Planted pasture	5	.....
Other (specify)	6	.....
Missing	99	.....

51. Where do cattle graze during the rainy season?

Zero grazing	0	.....
Gardens	1	.....
Dambo	2	.....
Dry land	3	.....
Hills	4	.....
Planted pasture	5	.....
Other (specify)	6	.....
Missing	99	.....

52. What do you feed your dairy cattle?

Maize stover	0	.....
Groundnut residues	1	.....
Silage	2	.....

Hay	3	.....
Root crops (specify)	4	.....
Brewers	5	.....
Madeya	6	.....
Grass	7	.....
Legume pasture	8	.....
Other (specify)	9	.....
Missing	99	.....

53. Do you grow improved pasture?

Yes	0	.....
No	1	.....
Missing	99	.....

54. How much land do you have for growing feed for your cattle?

<1 ha	0	.....
1-2 ha	1	.....
2.1-5 ha	2	.....
>5 ha	3	.....
Missing	99	.....

55. How do you look after your pasture?

Fencing	0	.....
Weeding	1	.....

Fertilizing	2	.....
Disease and pest control	3	.....
Rotational grazing	4	.....
Other (specify)	5	.....
Missing	99	.....

56. Do you use concentrates?

Yes	0	.....
No	1	.....
Missing	99	.....

57. If Yes, where are concentrates obtained?

Grain and Milling Company	0	.....
KK Millers	1	.....
Bulking Group	2	.....
Other (specify)	3	.....
Missing	99	.....

58. If No, why do you not use concentrates?

Availability	0	.....
Expensive	1	.....
Do not know about them	2	.....
Other (specify)	3	.....
Missing	99	.....

59. Do you provide supplementary feed to cattle?

Yes	0	.....
No	1	.....
Missing	99	.....

If Yes, go to question 61.

60. If No, please give reasons.

Availability	0	.....
Expensive	1	.....
Do not know about it	2	.....
No labour	3	.....
Other (specify)	4	.....
N/A	5	.....
Missing	99	.....

61. In which season do you provide supplementary feed to your dairy animals?

Rainy season	0	.....
Dry season	1	.....
All year round	2	.....
Missing	99	.....

62. Why do you provide supplementary feed in the dry season?

Feed is scarce	0	.....
A lot of crop residues	1	.....
Other (specify)	2	.....
Missing	99	.....

63. What do you provide to your dairy animals as supplementary feed?

Crop residues	0	.....
Hay	1	.....
Silage	2	.....
Banana stems and leaves	3	.....
Other (specify)	4	.....
Missing	99	.....

64a. What major problems in dairy production have you experienced?

Disease	0	.....
Insufficient grazing area	1	.....
Housing	2	.....
Heat detection	3	.....
Predators	4	.....
Feed and feeding	5	.....
Market far away	6	.....
Labour	7	.....
Lack of improved breeds of cattle	8	.....
Other (specify)	9	.....
Missing	99	.....

64b. How do you look after your cattle?

Provision of bedding	0	.....
Cleanliness in khola	1	.....
Feeding	2	.....
Disease and tick control	3	.....
Provision of clean water	4	.....
Other (specify)	5	.....
Missing	99	.....

65. Do you find it difficult in knowing whether the cow is "on heat"?

Yes	0	.....
No	1	.....
Sometimes	2	.....
Missing	99	.....

66. If Yes, or sometimes, give reasons:

No advice given	0	.....
Silent heat	1	.....
Other (specify)	2	.....
Missing	99	.....

67. If No, how do you know that the cow is on heat?

Vulva is swollen	0	.....
Mucus from vulva	1	.....
Cow lets other cows mount her	2	.....

Milk production falls	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

68. What is your attitude to Artificial Insemination?

Satisfactory	0	.....
Not satisfactory	1	.....
Other (specify)	2	.....
Missing	99	.....

69. Where do you sell your milk?

MDI	0	.....
Middlemen	1	.....
Within village	2	.....
Other (specify)	3	.....
Missing	99	.....

70. What is the distance between market and your farm?

	0 Less than 1 km	1 1.1-3km	2 3.1-6km	3 6.1-10km	4 Over 10km	5 N/A
MDI						
Middlemen						
Within village						
Other (specify)						
Missing						

71. What are the reasons for selling milk at these markets?

	0	1	2	3	4	5	6	7
MDI								
Middlemen								
Within village								
Other (specify								
Missing								

KEY FOR REASONS:

0 = Better prices
1 = No MDI
2 = Does not want to move long distances
3 = More urgently needed
4 = Direct cash payment
5 = Lack of customers
6 = Nothing wanted
7 = Other (specify)

72. What means of transport do you use for sending milk to the market?

Bicycle	0	.....
Trekking	1	.....
Ngolo	2	.....
Truck	3	.....
Other (specify)	4	.....
Missing	99	.....

73. What is the transport cost for milk? K.....

74. What is the market fee for milk? K.....

75. What method of milking do you use?

Machine milking	0	.....
Hand milking	1	.....
Other (specify)	2	.....
Missing	99	.....

76. Length of milking .....

77. Times of milking .....

78. How much milk in total was produced by your cows last year?

Code Month	0 J	1 F	2 M	3 A	4 M	5 J	6 J	7 A	8 S	9 O	10 N	11 D	Total
Milk yield (kg)													

79. What was the price of milk per litre K...../litre.

80. Indicate the monthly milk consumption of your family in each of the following months.

Code Month	0 J	1 F	2 M	3 A	4 M	5 J	6 J	7 A	8 S	9 O	10 N	11 D
Milk requirements (kg)												

81. How much did you spend on dairy cattle on each of the following last year?

Type of variable cost	Quantity	Unit cost	Total cost
Animal Feed			
Chemicals			
Casual or contract labour			
Maintenance			
Transport			
Other (specify			

82. What do you think are the main problems to dairy marketing in Malawi?

Price of milk is low	0	.....
Poor transportation network	1	.....
Few milk markets	2	.....
Sour milk	3	.....
Delayed payment	4	.....
Other (specify)	5	.....
Missing	99	.....

83. Why do you keep dairy cattle?

Social status	0	.....
Source of income	1	.....
Source of milk	2	.....
Source of manure	3	.....
Source of meat	4	.....
Other (specify)	5	.....
Missing	99	.....

BOTH DAIRY AND NON-DAIRY FARMERS

84. In "Chikamwini" if a man wanted to invest in dairy production, where would he keep the dairy animals?

Wife's home	0	.....
His parents' home	1	.....
Other (specify)	2	.....
Missing	99	.....

85. If in his parents' home, give reasons.

Security	0	.....
Distrust of wife's relatives	1	.....
Other (specify)	2	.....
Missing	99	.....

86. What do you think are the main factors that prevent people from investing in dairy production in Central Region?

Chikamwini	0	.....
Lack of capital	1	.....
Ignorance	2	.....
Lack of land	3	.....
Other (specify)	4	.....
Missing	99	.....

DAIRY FARMERS ONLY

Extension

87. Are you a member of farmer's bulking group?

Yes	0	.....
No	1	.....
Missing	99	.....

88. If not a member, give reasons.

Do not want	0	.....
Membership fee too high	1	.....

Do not qualify	2	.....
Other (specify)	3	.....
Missing	99	.....

89. Do extension workers advise you on dairy production?

Yes	0	.....
No	1	.....
Missing	99	.....

90. If yes, tell us the topics you have covered concerning dairy production.

Feeding	0	.....
Housing	1	.....
Calf rearing	2	.....
Milking	3	.....
Heat detection	4	.....
Other (specify)	5	.....
Missing	99	.....

91. How often do extension workers visit you?

Every week	0	.....
Twice a week	1	.....
Twice a month	2	.....
Never	3	.....
Other (specify)	4	.....
Missing	99	.....

92. Do extension workers conduct field days and demonstration on dairy production?

Yes	0	.....
No	1	.....
Missing	99	.....

93. If yes, tell us some of the topics covered.

Pasture management	0	.....
Milking	1	.....
Heat detection	2	.....
Other (specify)	3	.....
Missing	99	.....

94. Have you ever attended any agricultural course/training?

Yes	0	.....
No	1	.....
Missing	99	.....

95. If yes, what were the topics you covered concerning dairy production?

Calf rearing	0	.....
Record keeping	1	.....
Housing	2	.....
Feeding	3	.....
Milking	4	.....
Heat detection	5	.....
Other (specify)	6	.....
Missing	99	.....

96. Do you integrate crops with dairy production?

Yes	0	.....
No	1	.....
Missing	99	.....

97. If yes, what crops do you integrate with dairy production?

Maize	0	.....
Groundnuts	1	.....
Sweet potatoes	2	.....
Other (specify)	3	.....
Missing	99	.....

98. If no, why don't you integrate crops with dairy production?

To save labour	0	.....
Do not know	1	.....
Land availability	2	.....
Other (specify)	3	.....
Missing	99	.....

FOR NON-DAIRY FARMERS ONLY

99. Why are you not keeping dairy animals?

Lack of dairy foundation stock	0	.....
Low milk prices	1	.....

100.	Labour demanding	2	.....
	No place to feed them (lack of land)	3	.....
	Market far away	4	.....
	Other (specify)	5	.....
	Missing	99	.....

FOR ENUMERATORS ONLY

101. Make a general comment about the standard of the farmer's khola.

_____

_____

_____

APPENDIX C

A SURVEY ON THE SOCIO-ECONOMIC CONSTRAINTS TO SMALLHOLDER DAIRY PRODUCTION IN THE LILONGWE MILKSHED AREA

QUESTIONNAIRE - 2

Enumerator's Name: _____

Name of Dairy Farmer: _____

RDP: _____

Date: _____

A. DAIRY CATTLE INVENTORY VALUE

1. What was the opening value of all your dairy cattle at the beginning of last growing season (1987/88)? K _____

2. What was the closing value of all your dairy cattle at the end of the last growing season (1987/88)? K _____

B. CATTLE SALES AND PURCHASES

3. Did you sell any dairy cattle last year?

Yes	0	.....
No	1	.....
Missing	99	.....

4. If yes, how many did you sell and what was the total value?

   (a) Number _____

   (b) Total value _____

5. Did you slaughter any dairy cattle last year?

Yes	0	.....
No	1	.....
Missing	99	.....

6. If yes, how much did you get from the meat sold? K _____

7. Did you purchase any dairy cattle last year?

Yes	0	.....
No	1	.....
Missing	99	.....

8. If yes, how many did you buy and what was the total cost?

(a) Number _____

(b) Total cost K _____

C. DAIRY CATTLE MANAGEMENT

(a) Feeding

1. Who feeds the animals?

Household head	1	.....
Spouse	2	.....
Children	3	.....
Employee	4	.....
Other (specify)	5	.....
N/A	90	.....
Missing	99	.....

2. How often do you feed your dairy animals in a day?

Once a day	1	.....
Twice a day	2	.....
Three times a day	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

3. Who waters the animals?

Household head	1	.....
Spouse	2	.....
Children	3	.....
Employee	4	.....
Other (specify)	5	.....
N/A	90	.....
Missing	99	.....

4. How frequently do you water your animals?

Once a day	1	.....
Twice a day	2	.....
Three times a day	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

(b) Diseases/Disorders

1. How often do you dip your animals?

Once a week	1	.....
Twice a month	2	.....
Once a month	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

2. What is the reason for the dipping frequency given above?

Recommended frequency	1	.....
Dipping facilities infrequently available	2	.....
Dipping tank far away	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

3. For what period is the dip tank in good working order?

All year round	1	.....
3/4 of the year	2	.....
1/2 of the year	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

(c) Culling

1. Which animals are culled?

Bulls	1	.....
Old milkers	2	.....
Poor milkers	3	.....
Other (specify)	4	.....
N/A	90	.....
Missing	99	.....

2. Why do you cull your animals?

To eliminate unproductive stock	1	.....
Limited space in khola	2	.....
Other (specify)	3	.....
N/A	90	.....
Missing	99	.....

3. At what age do you cull your milkers?

Less than 4 years	1	.....
4-5 years	2	.....
6-8 years	3	.....
9-10 years	4	.....
More than 10 years	5	.....
N/A	90	.....
Missing	99	.....

A P P E N D I X D

ENTERPRISE GROSS MARGINS

APPENDIX D

TABLD D.1: Dairy cattle enterprise budget

Gross Output	Kwacha
Milk yield (milk consumed and milk sold out)	790.59
Decrease in cattle inventory	-268.29
Sales of cattle	260.38
Sales of meat	138.00
Gross Income	920.68
Variable Costs	
Dairy cattle feed	87.75
Salt	41.13
Cattle spray chemicals	46.85
Casual/contract labour	51.15
Building materials for maintenance	27.84
Transport	40.11
Insurance	120.20
Fertilizer	54.22
Pasture seed (Napier and Rhodes grass)	22.50
Miscellaneous materials (soap, blue seal, etc.)	27.58
Total Variable Costs	519.33
Gross margin/dairy enterprise	401.35
Gross margin/dairy animal	83.61[a]
Gross margin/hectare	461.32[b]

a. Based on 4.8 cattle herd

b. Based on 0.87 hectares

APPENDIX D

TABLE D.2: Smallholder dairy farmers crop budget

Item	Unit	Enterprise			
		Maize	Tobacco	Groundnuts (Chalimbana)	Sweet potatoes
Area (Average)	ha	1.87	0.44	0.49	0.13
Yield (Average)	kg/ha	2625.40	662.34	410.61	3727.13
Price	t/kg	16.6	130.2	75.0	14.4
Gross Income	K/crop	814.98	379.44	150.90	69.77
Variable Costs	K/crop				
Fertilizer	K/crop	93.57	100.64	-	-
Wood	K/crop	-	12.60	-	-
Transport	K/crop	21.00	7.31	3.51	12.14
Chemicals	K/crop	11.50	2.17	1.04	-
Seed	K/crop	30.85	-	38.86	1.26
Labour (casual)	K/crop	71.89	82.47	26.30	28.00
Total Variable Costs	K/crop	228.81	205.19	69.71	41.40
Gross margin/crop	K/crop	586.17	174.25	81.19	28.37
Gross margin/hectare	K/crop	313.46	396.02	165.69	218.23

APPENDIX D

TABLE D.3: Smallholder nondairy farmers crop budget

Item	Unit	Enterprise			
		Maize	Tobacco	Groundnuts (Chalimbana)	Sweet potatoes
Area (Average)	ha	1.67	0.79	0.46	0.21
Yield (Average)	kg/ha	2312.12	366.21	355.90	2299.80
Price	t/kg	16.6	130.2	75.0	14.4
Gross Income	K/crop	640.97	376.68	122.79	69.55
Variable Costs	K/crop				
Fertilizer	K/crop	81.13	59.45	-	-
Wood	K/crop	-	25.66	-	-
Transport	K/crop	23.25	11.02	1.98	1.30
Chemicals	K/crop	17.97	2.10	-	-
Seed	K/crop	27.27	-	12.84	5.00
Labour (casual)	K/crop	76.81	87.54	18.83	26.00
Total Variable Costs	K/crop	226.43	185.77	33.65	32.30
Gross margin/crop	K/crop	414.54	190.91	89.14	37.25
Gross margin/hectare	K/crop	248.23	241.66	193.78	177.38

A P P E N D I X E

UNITS OF MEASUREMENT

APPENDIX E

UNITS OF MEASUREMENT

Weight

1 kilogram (kg) = 2.20 pounds (lb)

Length

1 centimetre (cm) = 2.54 inches

1 metre (m) = 1.09 yards

1 kilometre (km) = 0.62 miles

Area

1 hectare (ha) = 2.47 acres

Other Equivalents

1 ox-cart (maize) = 318.50kkg

1 ox-cart (sweet potatoes) = 452.52 kg

1 ox-cart (manure) = 510.20 kg

1 kilogram shelled groundnuts (Chalimbana) = 1.42 kg unshelled groundnuts (Chalimbana)

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