

**THE IMPACT OF DAIRY PRODUCTION ON FOOD SECURITY  
AMONG SMALLHOLDER FARMERS: A CASE STUDY ON LAND O'  
LAKES INC. IN THE SOUTHERN PROVINCE OF ZAMBIA.**

A Research Report Presented to the Department of Agricultural Economics and  
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BY  
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## TABLE OF CONTENT

Acknowledgements.....	I
Table of content .....	ii
list of Tables .....	iv
list of figures.....	V
list of Abbreviations .....	vi
Abstract.....	vii
 Chapter 1:Introduction.....	 1
1.1 Background.....	1
1.2 Problem Statement.....	3
1.3 Rationale of Study .....	4
1.4 General Objective.....	4
1.5 Specific Objectives.....	4
1.6 Hypotheses .....	4
1.7 Structure of the Report.....	5
 Chapter 2:Literature Review .....	 6
2.1 Introduction. ....	6
2.2 Impact of Dairy Production on Incomes .....	6
2.3 Dairy Production and Food Security And Employment .....	7
2.4 Marketing of Dairy Products .....	9
2.5 Dairy Income Generation and Cost Control.....	14
 Chapter 3:Research Methods and Procedures .....	 17
3.1 Introduction .....	17
3.2. Study Site.....	17
3.3. Data Collection Methods.....	17
3.4 Sample Size and Sampling Method .....	18
3.5 Data Analysis .....	18
 Chapter 4:Results and Discussions. ....	 20
4.1. Introduction .....	20
4.2 Profile of the Smallholder Dairy Farmers. ....	20
4.2.1 Age .....	20
4.2.2 Gender .....	20
4.2.3 Education Level by Participation. ....	21
4.3 Other Characteristics of Beneficiaries. ....	22
4.4 Main Factors Affecting The Impact of Dairy Production. ....	22
4.5 Project's Impact on Incomes and Food Security.....	27
 Chapter 5:Conclusion and Recommendations. ....	 29
5.1 Introduction .....	29
5.2 Conclusion.....	29
5.3 Recommendations .....	30

**References ..... 31**

**Appendices ..... 32**

**Appendix 1: Questionnaire..... 33**

## **LIST OF TABLES**

<b>Table 1: Double Difference Matrix Tabulation .....</b>	<b>18</b>
<b>Table 2: Education Levels of Participants .....</b>	<b>22</b>
<b>Table3: Determinants of The Project's Impact on Food Security .....</b>	<b>23</b>
<b>Table 4: Double Difference Matrix.....</b>	<b>25</b>

## **LIST OF FIGURES**

<b>Figure 1: Gender of Beneficiaries and Non-Beneficiaries. ....</b>	<b>21</b>
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## **LIST OF ABBREVIATIONS**

L.O.L INC	-	Land 'O' Lakes Incorporation
FAO	-	Food and Agriculture Organization
UNZA	-	University of Zambia
U.S.A	-	United States of America
HIV	-	Human Immune Virus
USAID	-	United States of America International Development
GART	-	Golden Valley Research Trust
CFU	-	Cooperative Farmers Union
ZACA	-	Zambia Commodity Agency
ZDPA	-	Zambia Dairy Processors Association
CSAFE	-	Consortium for Southern Africa Food Security Emergency
A.I	-	Artificial Insemination
MACO	-	Ministry of Agriculture and Cooperatives
DD	-	Double Difference
ZMK	-	Zambian Kwacha

## **ABSTRACT.**

### **The Impact of Dairy Production on Food Security among Smallholder Dairy Farmers: A Case Study of Land O' Lakes in Zambia.**

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**University of Zambia, 2007.**

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The dairy industry is an important sector in the household food security of many Zambian families. In this study, the impact of dairy of dairy production on food security among smallholder dairy farmers in Monze and Choma under Land O' Lakes (lol) is a case under consideration.

The study used survey data collected using a structured questionnaire from a sample of 80 farmers which included 50% of beneficiaries and another 50% non beneficiaries of the same geographical location. The sample was drawn randomly from lol baseline survey sample conducted in 2001. Four indicators of food security namely off farm income, income earned from dairy sales, and types of protein foods consumed were tested and found reliable as the overall of food security.

Both Analysis of Variances (ANOVA) and the Double Difference (DD) were used to determine the impact of the project on food security. The results showed that for beneficiaries, off farm incomes were not significant at 70%, meat consumed was not significant at 38%, fish consumed was significant at 5%, and the amount earned from dairy sales was not significant at 61%, while for non beneficiaries off farm incomes were significant at 9%, meat consumed was significant at 24%, fish consumed was significant at 18% and incomes earned from dairy sales were significant at 24%.

The study concluded that the project intervention had an impact on improved incomes and food security. The project beneficiaries' households had higher incomes from dairy sales and that the differences between them had widened. This was especially true for the value of assets, food security, meat and fish consumed. It is recommended that further research be conducted on marketing and pricing of dairy products, and accessibility of micro loans for project sustainability. More women must also be involved in the project to meet the 30% participation requirement.



# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Background**

The dairy sector in Zambia provides an interesting case-study for various reasons. First, Zambia's dairy sector has recently become a battleground for two of the world's ten largest global dairy processors. Parmalat of Italy entered the Zambian market through a direct investment in 1998 which made it the majority shareholder in Parmalat Zambia, Zambia's largest dairy processor. Danone of France has an indirect presence in Zambia through its joint venture with clover of South Africa, which in 2004 entered into a strategic partnership with Finta, Zambia's second largest dairy processor. Second, the emergence and growth of large scale processors and an existing surplus milk supply from smallholder cattle producers in Zambia attracted numerous private and public sector initiatives to facilitate smallholder participation in the formal dairy supply chain

According to Fanta (2005), food security refers to individuals having access to adequate food at all times for a health, productive and active life. USAID, defined food security in three components, accessibility, utilization and availability. Utilization in food security refers to the individual's biological capacity to make use of food for a productive life. Household food access is defined as the ability to acquire sufficient quality and quantity of food to meet all household members' nutritional requirements for productive life

According to FAO (1998), Food security is when all the people at all times have physical, social economic access to significant, safety and nutrition food over a given period of time to meet the dietary needs and preferences for an active and health life. Food insecurity is an absence of complete food security, which is achieved when all people at all times have access to sufficient nutritious food for a healthy and productive life.

Most of the farmers in Southern Province of Zambia own cattle. About 90% of these are small holder farmers who are still using, poor local breeds of cattle to produce milk for sale and consumption. (FAO: 1998). These local breeds of cattle have low raw milk output and this exposes small holder dairy farmers to high incidences of food insecurity due to low incomes realized from dairy.

Another problem the small holder dairy farmers have been facing is the marketing problems of milk and its product in Zambia. This prompts them to sell the milk they produce locally at reduced prices. The marketing problems have been accelerated due to low prices being offered on local markets. Long distances that exist and the poor storage facilities are also a problem faced by small scale dairy farmers. The sale of already small quantities of milk and at lower prices reduces the incomes and renders them vulnerable to household food insecurity. The grouping of these dairy farmers into co-operatives, establishment of milk collection centers would increase milk sales at competitive prices which would help to increase their incomes. This would improve their household food security.

To help mitigate the compounded problems failing these small holder dairy farmers in the southern province. Land 'O' Lakes incorporation, an American Non-Governmental Organization that deals with small holder dairy farmers, and strengthen the producer groups and processors to promote the growth of a competitive dairy sector to meet the growing local demand for dairy products.

Land O'Lakes Inc. in Zambia is implementing a Title II Development Activity Program from 2004 to 2008. This program consists of 3 components namely dairy industry development, dairy livestock development and commodity storage and marketing. The program is partly an expansion of existing activities of the Zambia Dairy Enterprise Initiative that was administered from 2001 to 2004 and will be implemented in 19 Districts and 6 Provinces in Zambia. The main objective of the program is to improve household food security among vulnerable populations in Zambia. This will be achieved through increased household income which will enable

better access to food.

Under dairy production, the primary program target group is the vulnerable households who are willing and have the potential to participate in dairy development program. The program is targeting 2000 or more vulnerable rural households over a period of 2004-2008. This will be achieved through Dairy livestock Development, by formation of producer associating establishment of milk collection centers, training in various aspects of dairy management, distribution of improved local dairy needs, provision of artificial insemination services, quality assurance and market linkages. Land 'O' Lakes incorporation provides a stable market for its primary beneficiaries. It also provides demand technical support to dairy processors through capacity building for the processors. LOL Inc started its operations in Zambia (Southern province) since 2001. This study proposes to evaluate how lol program has performed in terms improving food security among small scale dairy farmers through various assistance the organization has rendered to various societies in the province.

## **1.2 Problem Statement**

Through the years of project implementation, Land 'O' Lakes inc has provided improved dairy local breeds, established milk collection centers, trained farmers on dairy management skills, and has provided improved marketing of milk for the smallholder dairy farmers. All these efforts by lol Inc are aimed at improving productivity, which will increase the farmer's income levels. Increased income levels will lead to improved food security among the beneficiaries and improve the living standards of the community as a whole. The extent to which the project has impacted the livelihood of smallholder dairy farmers in terms of improved raw milk output, increased income levels, increased use of improved local dairy breeds, and improved marketing of milk, and hence improved incomes and household food security has not been determined, hence this research design.

### **1.3 Rationale of Study**

The findings of this research will be beneficial to many stakeholders both internal and external. The University of Zambia, school of Agricultural Sciences, will use it, and Management in future researches to fill the knowledge gaps. Students under the school of Agriculture will access the report as well for future references. Land 'O' lakes Inc will use the research findings to help reshape the project and formulate strategies to help the smallholder dairy farmers to increase their output so as to be food secure. It will also help the organization to improve on service delivery and identify areas that need more attention. The researcher will gain practical experience in conducting empirical research as well.

### **1.4 General Objective.**

To determine the impact of lol Inc intervention in smallholder dairy farmers on food security in the Southern Province.

### **1.5 Specific Objectives**

1. To identify the characteristics of smallholder dairy farmers in the southern province.
2. To determine the impact of lol Inc project on incomes of smallholder dairy farmers in the southern province.
3. To determine the extent to which increased incomes have resulted in improved dietary diversity in the southern province.

### **1.6 Hypotheses**

1. There is no significant difference in the farmers income levels received before and during the intervention of lol Inc for smallholder dairy farmers in the southern province.
2. Household diet among lol Inc beneficiaries has remained the same in the southern province.

## **1.7 Structure of the Report**

This report is divided into five chapters, each chapter has various sub – headings related to the main heading. Chapter ones deals with the introductions of the main topic on the impact of smallholder dairy farmer on food security. Chapter two is mainly about literature review that was collected as secondary data, while chapter three discusses the research methodology, data analysis and geographical areas of study. Chapter four looks at the study findings and discussions on findings. The last chapter highlights on conclusions and recommendations of the study based on the results. The report also has an attachment of the questionnaire, the data collection tool that was used in this research.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction.**

This chapter reviews relevant literature on the current situation on dairy production among small holder farmers, in least Developed countries found in the sub-Saharan Africa and Bangladesh. Dairy production is at the moment viewed as one of the most profitable business enterprise with little capital investment. A review of literature on dairy production activities with respect to economic and financial aspects shows that most of the authors have carried out both qualitative and quantitative analysis.

#### **2.2 Impact of Dairy Production on Incomes**

According to FAO report (2005), a study conducted in Bangladesh on small scale dairy production. It reviewed that the support of dairy farming by FAO and other international grants on veterinary services improved milk yield by 30%, live weight gain by 12%, income increased by US\$ 35 per household/ farmer. The project also improved women participation in dairy production by 10%.

IAEA program report published in (2000), on a research conducted in Bangladesh on milk production by small scale farmers, it reported that there was a 41.2ml/day per capita availability of milk compared to the dairy requirements of 250ml in Bangladesh. Milk production grew by 4.2%-5.6%/ year, meeting the increased demand of an expected 1.6% population growth. Farmers in Khutna-Satkhiva western region of Bangladesh used to produced 30000 litres of milk/ day, but no formal market were available and farmers were about to give up on dairy. FAO and IAEA organized them into associations and worked as pressure groups on the government and the government provided the producers with co-operative unions which were responsible for collection and marketing of milk and processing, this increased their incomes by 25% and job creation by 30%.

### **2.3 Dairy Production and Food Security and Employment**

Heifer international project report ( 2004), on a study conducted in Cameroon on the impact of dairy production on the livelihood of small scale farmers, it found that the project alleviated hunger by 30% among the rural communities through the provided appropriate livestock, training and related services to small scale farmers. In Cameroon milk production lead to an increase in sale of surplus foodstuffs by 20%, and milk production contributed the most to their income generation.

Huss-Ashmore (1992), conducted an impact evaluation study of the project on small holder dairy farmers in Kenya, he found that standards of living in Coast province (Kenya) were high in areas where dairy production was done and living standards were very low in central highlands without dairy production. Dairy projects were initiated by National Dairy Development Projects in the Coast province and dairy brought nutritional and economic benefits through increased incomes and high accessibility to nutritious food stuffs. More job opportunities were created in the coast highlands due to increased dairy activities. Studies in Kenya highlands have indicated that with increasing commercialization the control of income from milk sales shifted from women to men by 10%. Income accruing to women is more likely to be used to provide food for the households.

FAO report (2004), about the research conducted in Zambia on food security among the small scale farmers, it reviewed that most Zambians are food insecure. One major cause of this was the high annual rate of population growth in relation to the rate of growth of food production. This led to a decrease in per capita food intake. Between 1981 and 1988, the average calorie intake declined from 2115 to 2027. It also reported that livestock (cattle) industry accounted for about 35% agriculture output. Cattle were mainly for milk production beef and animal draft power. In 2000 milk production increased from 109.5 million liters to 136.3 million liters. Milk from the traditional sector was marketed raw via local markets or at roadsides. It further stated that dairy support initiative schemes would increase the participation of smallholder dairy farmers in the business, increase milk yields, marketing and household incomes of beneficiaries

and the community, but this failed in Zambia from 1972 because of dependence on the Government. Government dependence made small scale farmers food security worse off as world copper prices were declining.

FAO, dairy report (1994), the indigenous and small holder sector is in most African countries producing the major share of the milk consumed. However, only an insignificant portion of this is going through the formal market (10% in Tanzania and 25% in Kenya). The animals are of low genetic potential, however because of the high number of people and animals in the sector, it represents a huge potential for increase of total milk production and generation of employment. Despite this, the sector has been neglected in the past. It is recommended that more investment is directed towards the indigenous small holder production systems through: infra-structure improvements; assistance to establish milk collection points and access to markets; educational and training programmes; enhancement of women's' participation; establishment of realistic credit facilities.

Jorgen (1994), rural milk production can be significantly increased if access to market can be assured. It is a general experience that avenues for marketing the surplus milk provide the needed impetus for increased milk production. The dairy sector is very complex and concerted efforts are needed. It is recommended to establish a body, which can coordinate and promote dairy development. The body should be autonomous and represent all stakeholders in the dairy sector from the small holder, through the private middleman and vendor, to the large scale dairy plant. The National Dairy Development Board of India was presented as an excellent example of such a body. Producer co-operatives or associations are identified as being essential to dairy development. Dairy farmers need to organise themselves to overcome the problem of collection, transport, processing and marketing of milk. Organisation is also important to enhance the bargaining power of the individual small holder to achieve a strong economical and social influence to ensure a full exploitation of the profitability in their dairy enterprise.



Despite constraints on production, efforts to promote smallholder dairying in Northern Tanzania have had a positive impact especially in highland areas where tsetse flies are absent, heat stress is low, and ample rainfall give the potential for abundant fodder production. One such area is the highlands of Hai District in Tanzania where dairying has been expanding and intensifying over the last ten years or so, resulting in milk production above the amount that can be consumed locally in dairy producing villages (FAO corporate document 1998).

## **2.4 Marketing of Dairy Products**

According to Mdoe (1993), 87 percent of 120 dairy producing households interviewed in Hai District in 1990 reported milk surpluses above household requirements. The opportunity of selling the surplus milk directly to consumers in the dairy producing villages has been declining over time due to increase in the number of households keeping dairy cattle. Only 11 percent of the households interviewed District in 1990 were able to sell their milk directly to ultimate consumers (Mdoe 1993). Most of these households disposed off their milk through market intermediaries for sale to distant markets outside the dairy producing villages. The main intermediaries in the milk marketing system in Northern Tanzania are Tanzania Dairies Limited (TDL), dairy cooperative and small milk traders. Since milk is one of the most perishable products, an efficient milk marketing system is necessary to dispose off the surplus milk to distant markets. This paper compares the performance of the various milk marketing channels in Hai District using survey and secondary data collected in 1990.

Pro-poor livestock policy (2001), *ex-ante* assessments reveal that most interventions indeed raise dairy income and returns to labour, decrease the cost of milk production and increase the likelihood of achieving selected thresholds for the above parameters, thereby reducing the risk inherent in dairy farming. For example, improved animal feeding is likely to increase the return to dairy labour by an impressive 145 percent, lifting it above the regional wage level for unskilled labour, while reducing the risk of falling below the current level of returns from 0.45 to around 0.15. This implies that whichever family member stays on the dairy farm, s/he is likely to obtain a higher

notional wage than the family members working off-farm. With such an attractive outcome the question of why not more farmers are adopting better animal feeding practices arises.

The *ex-ante* assessment of the 'Dairy Development Ladder' shows that smallholder dairy farms have the potential to become competitive milk producers, reduce the risk inherent in farming and substantially improve household income. As a consequence of the sequence of interventions the farm develops in a gradual manner, which should present a realistic development path, as it draws on regional expertise and builds on local cases of competitive milk producers. Although large dairy farms represent a profitable enterprise in Andhra Pradesh, the vast majority of smaller farms is economically unattractive and would disappear as soon as farmers have better alternatives. This critical situation of small-scale farms persists in spite of numerous dairy development activities long in existence in the state. Therefore, the farm-level impact of over 40 potential dairy development interventions covering feeding, breeding, animal health and milk marketing on a typical 3-buffalo farm was assessed through an iterative process that combined detailed household and farm simulation with expert and farmers' opinions and feedback. Several of the most promising interventions were combined to a 'Dairy Development Ladder' to assess whether the dairy competitiveness of small farms can be brought up to that of the larger farms. The assessment paid particular attention to the risks associated with each of the programs by introducing stochastic variables into the simulations, and thus also provided estimates of probabilities of the programs leading to specified results.

University of Zimbabwe (1998), study report on dairy, established that small-holder dairying in Zimbabwe is overall hardly viable. The relatively poor gross margin analysis results for Gokwe can be attributed to the short establishment history and related high establishment costs, the use of expensive modes of transport for milk deliveries such as motor-cars and lack of dairy management experience. Marirangwe's success story is also exceptional since production is only limited to a few remaining committed farmers and producers who can be classified as real entrepreneurs.

Traditionally, small-holder farming is a way of life rather than a thriving business enterprise.

Another disturbing finding was that the average return and most of the individual returns in small-holder dairying were lower than those for competitive enterprises such as maize and cotton production where government and donor funding is virtually absent. Due to the dairy enterprise's higher intensity, the gross margin and returns to investment in dairy production are expected to be higher in comparison with other on-farm enterprises. A possible explanation for this gloomy outcome could be the effects of the Economic Structural Adjustment Programme and the lingering effects of the 1994/95 drought. These have resulted in a price squeeze for most dairy producers due to escalating production costs in the face of relatively static producer prices. Much of this price squeeze emanates from ever increasing feed costs given the fact that feed costs account for about 70 percent of total production costs for each produced litre of milk. The total absence and lack of proper record keeping by individual farmers also aggravates this crisis. With no records farmers cannot continuously monitor progress and assess past economic performances, which are essential management practices and the basis of future improvements. Poor record keeping then becomes both a production and viability constraint.

The study also established that viability in the small-holder dairy sector can be maximized with a herd size of 6 - 10 cows. In addition to more extra labour, higher feed costs, etc., bigger dairy units have higher costs due to what is assumed to be a loss of care and attention at the margin, particularly at milking (DANIDA 1995). However, this result also proves that there are viability problems for the poor or smaller farmers, who comprise the majority of small-holder dairy producers, who cannot afford more than five producing cows.

The basic implication of a non-viable small-holder dairy venture is that the largely expected higher incomes for poor rural households won't be forthcoming. Also to go down the drains are dreams of rural development and more equitable distribution of national wealth. Dairy board of Zimbabwe Limited (DZL), a former parastatal, was

privatized through a floatation of shares in line with recent World Bank initiated economic reforms. However, given the low viability status of small-holder dairying, the real feasibility of participation of small-holder farmers in the DZL Company is very small. Low viability also negatively affects re-investment, improvements of individual dairy units, and ultimately development in the larger small-holder dairy sector.

Endurance, equity and potential

Over 30 large-scale commercial dairy producers quit the industry during the 1995/96 production season (The Herald 1997). Small-holder dairy enterprises are also not viable and face a host of production and marketing problems. One would then wonder why small-holder dairy farmers are not quitting and why other emergent small-holder farmers are joining the band-wagon, adding to the numbers of farmers involved in a non-viable and sometimes loss making enterprise. In the study, it was established that the only reason why farmers continue to be involved in the enterprise is because of the pull of relatively regular and reliable incomes in the sector, which has been a welcome departure for most farmers compared to the traditional once-a-year return in crop production enterprises.

By involving small-holder farmers in dairying, one of the major assumptions was that such a move will achieve both economic efficiency and a high degree of equity in the process. However, the achievement of downright equity is far from achievable. This is because only the bigger and better farmers, comprising a small rural bourgeoisie class (elites), tend to be dairy farmers because they can afford the risk of a new venture. Either way, to begin dairying requires relatively huge capital outlays or the running of a dairy enterprise involves large financial outflows. Though such amounts are proportionally lower than in the more intensive large scale commercial sector, poorer rural farmers (including female-headed households) will not be in a position to participate in small-holder dairying, even at the most modest level. In other words, benefits from the Dairy Development Programme are circumventing the most vulnerable social groups.

Despite this gloomy outlook, small-holder dairy projects have managed to raise the amount of milk produced and marketed in small-holder areas, increase per capita milk consumption (and hence nutrition), generate employment, as well as improving rural living standards by raising and ensuring regular incomes in rural areas. Viability in the sector is also expected to change for the better given the recent privatisation of DZL and an expected stabilization of stock feed prices. There are also in existence several other factors which are expected to facilitate continuance and further development of small-holder dairying in Zimbabwe. According to Dube (1995) Zimbabwe's small-holder dairy projects have great potential because traditionally, small-holder farmers have always kept cattle, demand for milk in the rural communities is quite high, overhead costs for setting up small-holder dairies are lower compared to sophisticated commercial dairy set ups and donor support in the development of this sub-sector is still forthcoming.

University of Wisconsin (2004), small holder dairy farming report, an ongoing financial study of farms that use management intensive rotational grazing management intensive rotational grazing (MIRG), shows that generation of income is the main factor separating the farms with the best financial performance from those with the worst financial performance. The graziers with the best financial performance in this study had slightly higher operating expenses per cow, higher investment per cow, and much higher income per cow than those with a lower financial performance. Financial success is possible for operations set up as MIRG dairy farms and for confinement dairy farms that transition to grazing. But managing farm resources efficiently is the key to top financial performance on MIRG dairy farms, just like on confinement dairies.

Management is the single most important factor determining financial success on farms, and this study confirms that this holds true on MIRG dairy farms (Tom Kriegl, 1998). He has been working with UW-River Falls farm management specialists Stan Schraufnagel and Nate Splett and the UW-Madison Center for Integrated Agricultural Systems to collect and analyze four years of financial data from 21 MIRG dairy farms.

For the purposes of this study, the researchers defined a MIRG dairy farm as one large enough to potentially support a family primarily using family labor (but don't exclude farms with hired help). Dairy and forage are the major enterprises on MIRG dairy farms and cows graze at least half of the forage they consume, typically being rotated to new pastures daily.

One purpose of this study was to provide financial benchmarks for MIRG dairy farms to give dairy graziers some information to evaluate their farm's financial position. This study also served as a basis for comparison between grazing farms in the study (for example, seasonal calving versus non-seasonal calving herds) and between MIRG dairy farms and confinement dairy farms of similar size

## **2.5 Dairy Income Generation and Cost Control**

According to Kriegl (1998), graziers who were most financially successful were those who focused on optimizing the relationship between generation of income and control of operating expenses and investments. He said that Wisconsin graziers often emphasize operating cost and investment control out of proportion with income generation, while conventional dairy operators tend to emphasize income generation. Low input was not the same as low cost per unit of output. Spending money carefully can help profitability more than not spending at all. The graziers with the lowest costs per unit of milk sold used relatively high quantities of purchased fertilizer and grain. But the income generated by these inputs more than covers their costs.

Formerly International Livestock Research Institute Nairobi, (2005), welfare impacts of an intensive dairy technology package on women and their families are investigated on 32 smallholder crop-livestock farms in the sub-humid zone off Kilifi District, Coast Province, Kenya. Farms were stratified according to male or female extension contact. A female enumerator interviewed the wife or female head of household on each farm regarding her present and past household responsibilities and the affects of the intensive dairy enterprise on these duties and upon the welfare of the household. On three-quarters of the male contact farms, dairy operators were women. Across all farms, women performed half of all dairy-related activities, but only on female contact

farms did income from the dairy enterprise accrue to women in proportion to their labor input. The equitable return of benefits to labor corresponded with better dairy unit performance on female contact farms, where women also indicated greater access to and autonomy over household resources and decision-making. Irrespective of extension contact, there was broad consensus among the women interviewed that intensive dairying has led to improved household welfare, primarily through increased household income and milk consumption. There was also wide agreement, however, that these gains have been achieved at the expense of more work for women. Women on female contact farms were observed spending dairy income on food for the household and children's schooling more often than their counterparts on male contact farms. Based on these and other findings, the study concludes that gender of the extension contact, dairy operator and farm owner were determinants of the intra-household impacts of intensive dairying on the smallholder farms in this study. Recommendations for design and delivery of livestock technologies for crop-based farming systems, with special emphasis on how to minimize negative impact on vulnerable household members, are inferred from study findings.

Wisconsin dairy producers (2005), report, stated that, Wisconsin's dairy industry generates nearly \$20 billion a year for the state's economy, and \$5.5 billion of this is income from 128,000 dairy-related jobs. This multi-billion dollar economic impact of dairying is broadly dispersed throughout the state. Besides the direct economic contribution of farms and dairy-related companies, the dairy industry also uses machinery, trucks, fuel, financial services and other goods and services from local companies, generating additional "non-dairy" jobs and income in the state. So while people may not realize it, the dairy industry impacts all sectors of Wisconsin's economy. The state's dairy infrastructure also plays a critical role in the health of Wisconsin's economy. Some of the world's leading dairy-related companies – employing thousands of residents – are headquartered here in the Badger State, including Foremost Farms USA, ABS Global, Westfalia Surge Technologies, Alta Genetics, Hansen, Inc. and Holland Manufacturing. Thanks to the University of Wisconsin System, it's also home to some of the country's top dairy scientists,

researchers and technology experts. Because of Wisconsin's extensive farm base combined with agriculture's industrial and service contribution, the combined impact on Wisconsin's economy of farming is far greater than the sum of its parts.

There is a plan in Wisconsin's dairy industry for all sizes of farms. There are many technologies and management practices such as milking parlors, dairy herd production testing and rotational grazing that can improve profitability by increasing milk output and reducing the cost of production for any size dairy farm. It also is important to remember that most "large" Wisconsin dairy farms are small farms that have expanded over time, based on the decisions of the owners. Some economists believe the state must have a combination of large and small farms to maximize its potential as a modern dairy producing state.



## **CHAPTER 3**

### **RESEARCH METHODS AND PROCEDURES**

#### **3.1 Introduction**

This chapter reviews the relevant methods and procedures that were used to collect and analyse data. The study was aimed at determining the impact of dairy production on food security among small scale farmers (a case study of Land 'O' lakes), in Zambia. A cross sectional survey was conducted on smallholder dairy farmers, with and without the project intervention. Secondary data was collected through literature review from FAO and lol incorporation.

Data was collected using a questionnaire (see appendix), were coded and then entered on computer software, the statistical package for social sciences (SPSS), the tool used to analyse data then double difference a multiple regression was used to determine the impact of the project intervention.

#### **3.2. Study Site**

The study was conducted in the Southern Province of Zambia where lol has implemented its project on dairy promotion on house hold food security. The study was conducted in two Districts only, Choma and Monze. Choma district is 285km from Lusaka while Monze is 198km from Lusaka. The distance between Choma and Monze is 109km. All the milking villages and cooperatives were covered during the study.

#### **3.3. Data Collection Methods**

Quantitative method of data collection was used. Primary data was collected through the use of self and guided structured questionnaire. Secondary data was collected from lol Inc offices, milk collection centres and the ministry of agriculture.

3.4 Sample Size and Sampling Method

A sample size of 80 respondents was used. Fifty per cent (50%) of the sample size were lol Inc participants (treatment group), with the project and the other 50% were non-participant (control group), without the project, Monze and Choma, were used for the research study. 40 members were randomly selected from both the control and treatment groups-giving 20 members from each group respectively. The sample size for both the with and the without the project were randomized from the original baseline survey conducted by lol Inc.

3.5 Data Analysis

Data was analyzed using SPSS and an econometric mod, Double Difference, SPSS was used to calculate the mean difference between the after and before values of the outcome indicators for each of the treatment and the comparison groups. The mean difference between the two mean differences is the Double Difference which determines the impact of the project. Double Difference also considered the with and without the project. The means used were measurable variables called time variants such as output level or income levels between the groups. The mattresses below were used to determine the impact of the project.

Table 1: Double Difference Matrix Tabulation

Sample Population	After	Before	Mean Difference
Control Group (without)	$X^{cl}$	$X^{co}$	$D^c$
Treatment Group (With)	$X^{T1}$	$X^{To}$	$D^T$
Mean Difference	$D^1$	$D^o$	

Where: X is observable outcomes time variants e.g. income  
D is the mean Difference

DD is the Double Difference

P is participating (with the project)

NP is not participating (without the project)

C is the Control group

T is the treatment group

$$DD^P = \Delta X = X^{CT} - X^{CO}$$

$$DD^{NP} = \Delta X = X^{PT} - X^{PO}$$

$$DD = D^P - D^{NP}$$

**Or**

$$\left. \begin{aligned} DD &= D_T - D_C \\ DD &= D_1 - D_0 \end{aligned} \right\} \text{Are identical}$$

DD Double Difference measures the impact of the project

DD is a dependent variable

$$DD = F(X/X^1, X^2, \dots, X^n)$$

Where:  $X$  is time invariant variable such as age (fixed)

$X^1$  is time variant variable such as incomes, output levels.

The time invariant variables and time variant variables were regressed on dependent variable DD to determine their contributions in influencing the impact of the project, in terms of their gross margins and changes in incomes. To take care of the inflation pressure or time value of money from 2002 when the project took root to 2006, consumer price index (cpi) for both years were collected and converted to conversion factor (cf) which was used to discount base incomes earned in 2002 to the current for comparison with 2006 incomes. 2006 consumer price index was divided by consumer price index for 2002 and the conversion factor computed was 1.85. This c.f was multiplied by all base incomes earned before the project to convert them to the current values to be compared with the current incomes for 2006.

## **CHAPTER 4**

### **RESULTS AND DISCUSSIONS.**

#### **4.1. Introduction**

This chapter presents the results from both descriptive studies and the analysis of variance, econometric regression analysis. Descriptive analysis consisted of results from the pie and bar charts, which showed differences in incomes, dairy output, and food security indicators. The analysis showed the significant and insignificant variables in dairy production. Results were further analysed using the double difference matrix to determine the impact of the project on food security.

#### **4.2 Profile of the Smallholder Dairy Farmers.**

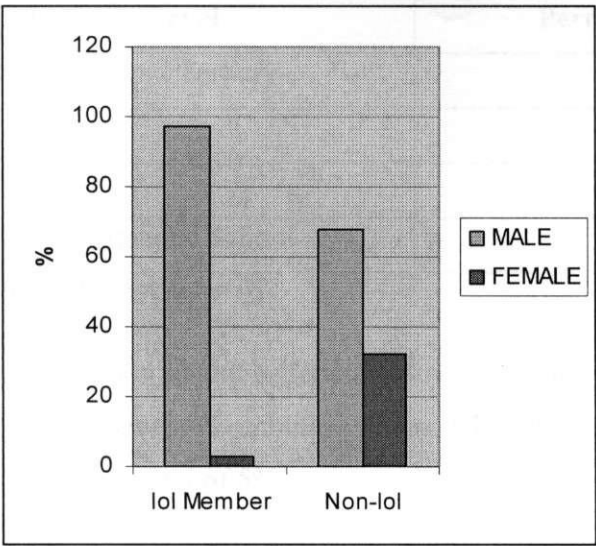
##### **4.2.1 Age**

The minimum age of the beneficiaries was 21 years whereas that for the non-beneficiaries was 25 years. The maximum age was 68 and 72 years for beneficiaries and non-beneficiaries, respectively. The average age for both groups was 46.5 years. 60 % of the households were active members of the cooperatives.

##### **4.2.2 Gender**

Figure 1 below shows the proportion of males to females by participation. This was done in order to assess whether gender has any effect on food security among smallholder dairy farmers.

**Figure 1: Gender of Beneficiaries and non-Beneficiaries.**



Source: Own Survey Data

From the figure above, beneficiaries constituted of 3% females and 97% males while non-beneficiaries were 32% and 68% females and males, respectively. This shows that the non-beneficiary sample was more balanced in terms of women participation in dairy production.

**4.2.3 Education Level by Participation.**

Education influences the level of understanding and assimilation of development issues. This means that the more educated a farmer, the better s/he is at assimilating the extension services provided and therefore, the more productive.

**Table 2: Education Levels of Participants.**

Education Level	Percentage
Grade 12 and Tertiary	5
Grade 9	45
Grade 7	46
Never Attended School	4

Source: Own Survey data.

The larger proportion of the beneficiaries were literate, with 45% reaching grade nine and 46% grade seven. Combining those who attained grade twelve and tertiary education came to a total of 5%.

**4.3 Other Characteristics of Beneficiaries.**

58% of the lol beneficiaries use dairy proceeds to purchase food and attain food security apart from growing their own. Their mean income from off-farm activities comes to ZMK4, 737,158.9 per year, whereas mean income from dairy sales comes to ZMK38,702,582.9 per year.

The mean frequency of consuming of meat consumption was 0.069 per day and 0.093 for fish per day. Average milk output was 10liters per day per household, with each milking on average, two dairy cows.

**4.4 Main Factors Affecting the Impact of Dairy Production.**

Table 3 below shows the significant variables affecting dairy production among the smallholder, and impacting on the beneficiaries in terms of their incomes, milk yields, living standards, food security, breeds used and the marketing channels in the southern province.

**Table3: Determinants of the Project's Impact on Food Security**

<b>Factors</b>	<b>F</b>	<b>Sig.</b>
Income Earned Past 12 months in ZMK by Beneficiary	0.2	0.696933979
Income Earned before 2002 in ZMK by Beneficiary	2.8	0.098535557
Meat Consumed 24hrs by Beneficiary	0.8	0.388219529
Meat consumed before 2002 by Beneficiary	1.4	0.242107732
Fish consumed 24hrs by Beneficiary	3.7	0.058061289
Fish consumed before 2002 by Beneficiary	1.8	0.188525826
Amount Earned from Dairy Sales past 12 Months in ZMK by Beneficiary	0.3	0.613356815
Amount Earned from Dairy Sales before 2002 in ZMK by Beneficiary	1.5	0.234128581

Source: survey data.

The table above highlights on a number of variables showing the significance and insignificance between the project beneficiaries and the non project beneficiaries. Off farm incomes earned in 2006, indicated that there was no significance between smallholder dairy farmers with the project and those without the project, the P-value was 70% which indicated insignificance. Off farm incomes earned before the project, 2002, showed a strong significance P-value of 9% between beneficiaries and the non project beneficiaries. This indicated a significant difference in incomes earned between beneficiaries and non project beneficiaries in terms of incomes earned before 2002.

Meat consumed, beef and poultry products in 2006 had a P-value of 39%, and it indicated an insignificant relationship between project beneficiaries and the non project beneficiaries concerning meat consumed in 2006. Meat consumed before the project took root before 2002, had a P-value of 24% which indicated a relatively

significant relationship between the smallholder dairy farmers with the project and those without the project. This significance value showed that there was a variation between the beneficiaries and the non-beneficiaries in terms of meat consumption before 2002. There was much significance in fish consumption in 2006, among smallholder dairy farmers with the project. This variable showed a significant P-value of 6%. This showed a big difference in fish consumption with farmers who were the project beneficiaries.

Fish consumed before 2002 had a P-value of 19%, it indicated that smallholder dairy farmers consumed less fish before the project started, hence showing a relatively moderate variable significance in fish consumption. There was no significance from the incomes earned from the sale of dairy in 2006; a P-value of 61% was computed. This indicated that there was no significant difference in incomes earned from dairy sales between the project beneficiaries and the non beneficiaries. The variable on incomes earned from dairy sale in 2006 was not significant. Meanwhile, there was a relatively significant variable of the incomes earned from dairy sales before 2002, with a P-value of 24%. This indicates that there was a relatively significant difference in incomes earned before the project started.



**Table 4: Double Difference Matrix.**

<b>Variables</b>	<b>Non-Beneficiary</b>	<b>Beneficiary</b>	<b>Mean Differences Between</b>
Income Earned Past 12 Months in ZMK	5284108.108	4737158.93	-546949.1779
Income Earned Before 2002 in ZMK	854792.5	371420.843	-483371.657
Meat Consumed Meat 24hrs	0.027027027	0.069767442	0.042740415
Meat Consumed before 2002	0.081081081	0.023255814	-0.057825267
Fish Consumed past 24hrs	0	0.093023256	0.093023256
Fish Consumed before 2002	0	0.046511628	0.046511628
Amount Earned from Sale of Dairy Past 12 Months in ZMK	19732183.78	38702582.86	18970399.07
Amount Earned from Dairy Sale Before 2002 in ZMK	168886.5	343650.7143	174764.2143
	<b>Mean Differences within</b>	<b>Mean Differences within</b>	<b>Double Difference</b>
Differences in Incomes Earned in ZMK	4429315.608	4365738.087	-63577.5209
Differences in Meat Consumption	-0.054054054	0.046511628	0.100565682
Differences in Fish Consumption	0	0.046511628	0.046511628
Differences in Incomes from Dairy Sales in ZMK	19563297.28	38358932.14	18795634.86

Source: Own Survey Data.

One of the anticipated direct impacts of the lol project was that it would improve household income through the concept of dairy farming as a business and promotion of off-farm business ventures. Interventions directly related to this objective included teaching the participants profitable dairy production, provision of extension services by the technical staff of lol, establishment of reliable dairy markets through well organized cooperatives and provision of dairy cross breeds.

The two Districts visited all affirmed the value of these interventions by lol in improving the livelihoods of the beneficiaries' food security through improved incomes. To test this affirmation, analyses of beneficiaries' income growth during the project period is important. This section presents the results of an assessment that takes

into account the fact that lol project participants and households were generally better off even before the project intervention. By using two reference periods (one during the programme and the other after the programme) and the difference-in-differences indicator, we explicitly take the initial conditions into account. This approach also takes into account the possibility that the programme could have just prevented beneficiaries from sliding down.

Table 4 above, presents the two categories of smallholder dairy farmers, the non beneficiaries and the beneficiaries before and after the project intervention. The mean values of income from dairy sales, off-farm business income, and meat consumed, and fish consumed, for the two periods – present time (2006) and the base period 2002. For each of these reference periods, the income estimates were arrived at using the respondent's recall, with strategic probing. As an aid to the recall process, the data collection process was disaggregated into the smallest unit possible (field, household member, asset type, etc). The differences in the values of the resultant income variables between lol household's beneficiaries (the experimental group) and non-households beneficiaries (the comparison group) are presented in the table above as well.

The first comparison was made within the non project beneficiaries in terms of off farm incomes earned, meat consumed, fish consumed and the incomes earned from dairy sales from the base year 2002 to the current year 2006. In 2006, non project beneficiaries earned higher incomes from off farm businesses than the base year in 2002. The difference in incomes within non-beneficiaries was ZMK4, 429,315.608, while meat consumption within non-beneficiaries shows that more meat was consumed during the base year 2002 than the current year of assessment 2006. The rate of meat consumption per day reduced by -0.054054054 or (5%). Non-beneficiaries consumed no fish in periods, the base year 2002 and the current year 2006. The value in difference within non-beneficiaries was 0, as shown in table 4. More incomes were realized from the dairy sales in 2006 than in the base year 2002, within non beneficiaries. The difference in amount was ZMK19,563,297.28.

The second comparison was made within the project beneficiaries in terms of off farm incomes earned, meat consumed, fish consumed and the incomes earned from dairy sales from the base year 2002 to the current year of assessment 2006. In 2006, beneficiaries earned higher off farm incomes than the base year 2002. Table 4 above shows an increased off farm incomes of ZMK4, 365,738.087. The rate or the frequency of meat consumption was also high in 2006 within the project beneficiaries, an increased difference of 0.046511628 or 5% was found. The rate of fish consumption increased as well by 0.046511628 or 5% within project beneficiaries from the base 2002 to 2006. There was an increased in incomes earned from dairy sales within the project beneficiaries from the base year to the year of study, 2006. The difference in increase was ZMK 38,358,932.14. The difference in differences (DD) suggests that the dominance of project beneficiaries with positive double differences indicated that the project had a positive impact on smallholder dairy incomes and food security.

#### **4.5 Project's Impact on Incomes and Food Security.**

To a larger extent, the project intervention did have an impact on incomes earned and improved household food security and self-reliance. The income distribution inequalities between the project beneficiaries and non beneficiaries was reduced and there was an average difference or gap of ZMK 63,577.5209, between the two groups, this is shown in table 4 above as (-63,577.5209). The income inequalities or the gap has been reduced by the project intervention.

It is also clear that the gap between the project beneficiaries and non-beneficiaries in meat consumption has widened due to the project intervention. Table 4 shows a positive value of 0.100565682, which indicates that the project has impacted on meat consumption. Meat consumption was increased due to increased incomes coming from the project intervention. Another widened gap between the two groups was shown in fish consumption. Project beneficiaries consumed fish frequently in their diets unlike the non beneficiaries who did not consume any fish. The double difference of

0.046511628 suggested that the project improved food security of smallholder dairy farmers and improved their diets. The project intervention also widened the gap of incomes earned from dairy sales by ZMK18,795,634.86 between the project beneficiaries and the non beneficiaries.

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATIONS.**

#### **5.1 Introduction**

This section brings out the main conclusion and recommendations of the study. These conclusions and recommendations were based on the study that was carried out on dairy impact study on food security among smallholder dairy farmers. Recommendations were made according to study findings.

#### **5.2 Conclusion**

There are clear differences in livelihood systems that have indicated that the lol project beneficiaries are relatively more entrepreneurial than non-project beneficiaries. A comparative analysis study conducted using double difference analysis technique all showed that the households in lol project tended to have higher off farm incomes, had higher rate of meat consumption, higher rate of fish consumption and had higher incomes earned from dairy sales than their counterparts in non-project beneficiaries. A finding that the targeted beneficiaries also earned relatively more income from various activities than with non-beneficiaries corroborates this. All these point to the conclusion that lol beneficiaries are relatively more self-reliant, more in charge of their micro-economies in businesses and food secure.

Lol household beneficiaries had relatively higher income from off farm incomes and dairy businesses. They also tended to be relatively more endowed with local improved dairy breeds and well trained in dairy production. Comparing 2002 and now 2006, it was further established that the differences in these outcome variables between the project beneficiaries and non-project households had widened, suggesting that lol project beneficiaries households have continued to improve themselves in dairy production micro-businesses. One can, thus, conclude that there is some evidence of the project intervention impact in improved incomes and food security.

### **5.3 Recommendations**

From this study the following have been recommended;

1. Further research must be carried out on marketing and pricing of dairy products for project sustainability.
2. Further studies to be conducted on accessibility of micro loans by smallholder dairy farmers in Zambia to be able to expand the dairy businesses.
3. Community extension staff should be trained adequately and should be given enough time to mature before serving the community.
4. This study reviewed that women's participation in dairy was 3%; this was not enough according to lol recommendation of women's participation of 30%. This actually calls for a study survey on the role and participation of women in dairy production projects.
5. Smallholder dairy farmers should be provided with loans, so that it could help them afford the inputs required to produce more milk for more incomes. Dairy product markets should be improved further, in which output price will be higher to attract more dairy farmers into the business.

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## APPENDICES



## APPENDIX 1: QUESTIONNAIRE

### 1. Household Identification

1.1 Province 

--	--	--

 Code Province Name:.....

1.2 District Code 

--	--	--

 District Name:.....

1.3 Block Code 

--	--	--

 Block Name:.....

1.4 Camp Code 

--	--	--

 Camp Name:.....

1.5 Village Name: \_\_\_\_\_

Chiefdom: \_\_\_\_\_

1.6 Name of household head \_\_\_\_\_

1.7 (a) Year household head was born 

--

(b) Sex of household head (0 = Female, 1 = Male) 

--

1.8 Is the household head the main respondent? 

--

0 = No

1 = Yes → to Qtn 1.10

1.9 Name of the main respondent? \_\_\_\_\_

Relationship of the respondent to the household head.

(See codes in DM06 tables 2.1)

--

1.10 Response status \_\_\_\_\_ Status 

--

(1 = Complete, 2 = Refusal, 3 = Non-contact)

1.11 Date of enumeration 

--	--	--

1.12 Name of enumeration \_\_\_\_\_

1.13 Date checked 

--	--	--

1.14 Name of field supervisor \_\_\_\_\_

## 2. Demographics

### 2.1 Information about each member of the household

Member Code	Member Name (start with the HH Head)	Sex of... D=Female 1=Male	Year and Month of birth of...		Marital Status of...	Whats the highest Education level of the.....	Whats the ...'s relationship to the HH head?	Is...an orphan 0=no 1=yes	Did... earn any income for the past 12 months? 0=no, 1=yes	Does... produce or sell milk or any other products? 0=No-Next Member 1 = Yes	Is...LO beneficiary 0=No, 1=yes	Which other organization support....'s dairy production and marketing.
			Month	Year								
		DM 01	DM02	DM03	DM04	DM05	DM06	DM07	DM08	DM09	DM10	DM11
1.												
2.												
3.												
4.												
5.												
6.												
7.												
8.												
9.												
10.												
11.												
12.												
13.												
14.												

#### DM 02 Codes

1 = Jan  
2 = Feb  
3 = Mar  
4 = Apr  
5 = May  
6 = Jun  
7 = Jul  
8 = Aug  
9 = Sep  
10 = Oct  
11 = Nov  
12 = Dec

#### DM04 Codes

1 = Single/under range  
2 = Married  
3 = Divorce / separated  
4 = Widowed

#### DM05 Codes

0 = None  
1 = G7  
2 = G9  
3 = G10  
4 = G12  
5 = College  
6 = Bachelors degree  
7 = Still schooling

#### DM 06 Codes

1 = Head  
2 = Spouse  
3 = Own child  
4 = Stepchild  
5 = brother / Sister  
6 = Nephew / Niece  
7 = Grandchild  
8 = Unrelated  
9 = Employee

#### DM 11 Codes

1 = Maco  
2 = Gart  
3 = Heifer International  
4 = Others Specify

10 = Son/daughter in law  
11 = Other relations specify

in the following table on income earned by HH members in the past 4 years. Includes all activities involving casual / salaried employment, business and farm

41 = Dairy products  
42 = Field crops  
43 = Gardening  
44 = Beef Cattle  
45 = Poultry products  
46 = Any other farm produce (specify)

36 = Fishing and selling fish  
37 = Sale of household goods  
38 = Remittances  
39 = Others specify

#### 4. Size of Dairy Operations

4.1 Provide information on the breeds of dairy animals kept.

Breeds kept	Does this HH use...cattle breeds for milk production? 0=No --Next breed 1= Yes	How many... breeds of cattle used for milk production does the HH own now? 0 =none	Which year did you adopt this ... breed?	Where did you get ..... this breed?	What is your reason for keeping this breed?	What major method do you use to increase milk yields? 0= none	What's the highest average amount of milk produced per day in litres?		What milking equipment does the HH use for this....Breed of cattle?	Has the HH used the modern milking ut for the past 12 mon 0=no, 1=yes	
							Dry season season	Rainy		BR 09	BR 01
	BR 01	BR 02	BR 03	BR04	BR 05	BR 06	BR 07		BR 08	BR 09	BR 01
1 = Local											
2 = Cross											
3 = Pure											
4 = other specify											

#### BR 04

- 1 = Cash purchased
- 2 = I.O.L. inc
- 3 = Gift from relative/friends
- 4 = Garth
- 5 = Heifer international
- 6 = Inheritance
- 7= Other Specify

#### BR 05Codes

- 1 = High milk yields
- 2 = Disease resistant
- 3 = Cheaper to keep
- 4 = Prolific
- 5 = Hardy animals
- 6 = ADP
- 7 = other specify

#### BR 06 Codes

- 1 = A.I
- 2 = Supplementation
- 3 =Hormone injection
- 4 = other specify
- 0 = None

#### BR 09 Codes

- 1 = Hand milking
- 2 = Machine milking
- 3 = other specify

## 5. Crops Produced

5.1 Provide information on the most important crops grown by the household

Crop Codes	Name of crop	What's the quantity in Kg produced the past 12 months?	What's the major use of the crop for the past 12 months?	Is the crop output enough through out the year? 0=No 1 = Yes -Next crop	How do you make up for the shortage (Codes below)	If cash purchased state the source of funds.(Codes below)
		<b>CR 01</b>	<b>CR 02</b>	<b>CR 03</b>	<b>CR 04</b>	<b>CR 05</b>
1						
2						
3						
4						

### *Codes for crops*

- 1 = Maize
- 2 = Sorghum
- 3 = Millet
- 4 = Cassava
- 5 = Sunflower
- 6= Cotton
- 7 = Groundnuts
- 8 = Sweet potatoes
- 9 = Vegetables
- 10 = Fodder crops
- 11 = Others (specify)

### *CR 02 Codes*

- 1 = Consumption
- 2 = Sale
- 3 = Livestock feed
- 4= Processing
- 5 = Others specify

### *CR 04 Codes*

- 1 = Cash Purchases
- 2 = Barter
- 3.= Relief food
- 4= Food for work
- 5 = Remittances
- 6 = Other specify

### *CR 05 Codes*

- 1 = Sale of dairy
- 2 = Salary
- 3 = Sale of livestock
- 4 = Gifts
- 5 = Sales of crops
- 6 - Others specify

## 6. Household Dietary Diversity Index

6.1 Provide the information about the household dietary currently and before 2002.

	Food types	Did your HH consume .....during the day or night yesterday? 0 = 1 1 = yes	Did your HH consume.....before 2002? 0 = No 1 = yes
Codes		HD 01	HD 02
1.	Nshima or nay other foods from millet, sorghum or maize		
2.	Rice, bread or nay other foods from wheat.		
3.	Pumpkins, carrots, S/potatoes, squash that are yellow or orange inside		
4.	Any Irish potatoes, cassava, or any other food from roots or tubers		
5.	Any vegetables		
6.	Any fruits		
7.	Any meat e.g beef, poultry, pork, game		
8.	Any eggs		
9.	Any fresh or dried fish		
10.	Any legumes e.g beans,		
11.	Any milk, sour, yogurt		
12.	Any oils, fat, butter		
13.	Any sugar / honey		
14.	Any beverages e.g tea, coffee, mahcu, chibwantu		
15.	Other specify		



## 7 Dairy Product Sales

7.1 Fill the table below with information on dairy sales.

Dairy Products		Did you sale.....during the past 12 months 0 = No – Next product 1 =yes	When did the sale of.....start?	On what are ....proceeds mostly spent?
<i>Codes</i>	<i>Products</i>	<i>DA 01</i>	<i>DA 02</i>	<i>DA 03</i>
1	Milk			
2	Livestock			
3	Manure			
4	Fodder /seeds			
5	Skins / Hides			
6	Other specify			

### DA 03 CODES

1=Food Purchases

2=School fees

3=Livestock management

4=Crop inputs

5=Medical bills

6=Home management

7=other (specify)

**7.2 Provide information on the buyer of the dairy products sold by the H.H in table 6.1**

Dairy products		What's the unit of .....sold?	What's the Qty of.... sold the past 12 months?	What's the amount earned from...sold the past 12 months in ZMK	Name the main buyer of...sold in 2002	What's the qty.....sold before 2002?	What was the amount earned from sale of....before 2002 in ZMK	Who was the main buyer of ..... before 2002?
<i>Codes</i>	<i>Product</i>	<i>BD 01</i>	<i>BD 02</i>	<i>BD 03</i>	<i>BD 04</i>	<i>BD 05</i>	<i>BD 06</i>	<i>BD 07</i>
1	Milk							
2	L/Stock							
3	Manure							
4	Fodder / seeds							
5	Skins / Hides							
6	Others(specify)							

***BD 04/07 CODES***

- 1 = Cooperative
- 2 = Local open market
- 3 = Intermediaries
- 4 = Neighbours
- 6 = Others (specify)

## 8. Access to Dairy Services

8.1 Provide information on the table below about services received by the H.H

Service Code	Services	Have you received professional service on...for the past 12 months 0= no – next service 1= yes	Which year did you start receiving..... service?	Which most important organization provided service for the past 12 months?	How frequent are you visited for...by the service provider?	Do you find the .....service helpful? 0=No, 1=Yes–next service	Did you use the .....service during the past 12 months 0 =No, 1 = yes.
		<i>SR 01</i>	<i>SR 02</i>	<i>SR 03</i>	<i>SR 04</i>	<i>SR 05</i>	<i>SR 06</i>
1	Vet advise / Animal health						
2	Pasture Management						
3	Milking techniques						
4	A.I						
5	Marketing Skills						
6	Cooperative Development						
7	Disease control						
8	Loans / credits						
9	Milking machine						
10	Dairy as a business						
11	Other specify						

### *SR 03 CODES*

- 1 = Maco
- 2 = LOL Inc
- 3 = Gart
- 4 = Heifer International
- 5 = Bank

### *SR 06 CODES*

- 0 = None
- 1 = Once a week
- 2 = Once after 2 weeks
- 3 = Once after 3 weeks
- 4 = Once in a month

6 = Intermediaries

7 = Neighbours

8 = others (specify)

## 9. House Hold Physical / Capital Assets

9.1 Fill the table below about the HH ownership of livestock

Asset Type		Did the HH ever owned....? 0= No, 1 = Yes	Which year did the HH acquired the....?	How many.....'s did the HH have in 2002? 0 =None	How much did the HH earn from sale of...in the past 12 months?(ZMK) 0=None	Does the HH have...now? 0=No-next assets, 1 = yes	How many ..... 's does the HH have now?	Estimate the current value of all.....'s in ZMK.
Code	Asset Name	AS 01	AS 02	AS 03	AS 04	AS 05	As 06	AS 07
1	Tractor							
2	Truck / pick up							
3	Tractor implement							
4	OX-Cart							
5	OX –drawn implement							
6	Yenga peas							
7	T.V Set							
8	Radio							
9	Sewing machine							
10	Cell phone							
11	Bicycle							
12	Treadle pump							
13	Bank account							
14	Cash at hand							
15	Oxen							
16	Other types of cattle							
17	Sheep							
18	Goats							
19	Pigs							
20	Poultry							
21	Grinding mill							
22	Other L/Stock specify							
23	Milking parlour							

24	Milking churn							
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**9.2 Dwelling Type**

9.2.1 What is the roofing material for the main farm house made of? hh 12   
1 = Iron Sheets      3 = Tiles      5 = Grass  
2 = Asbestors      4 = Iron / Metal      6 = other, specify \_\_\_\_\_

9.2.2 What is the wall material for the main farm house made of? hh 13   
1 = Burnt bricks      3 = Mud bricks      5 = Mud      7 = Iron sheets  
2 = Concrete blocks      4 = Poles/ bambo      6 = Grass      8 = Hard boards

9.2.3 What is the door material for the main farm house made of? hh 14   
1 = Std door frame and door      2 – Traditional

9.2.4 What is the floor for the main farm house made of? hh 15   
1 = Cement      3 = Mud      5 = Other specify \_\_\_\_\_  
2 = Concrete      4 = Earth

9.2.5 Does the household have running water / potable water in the house? hh 16   
0 =No, 1 = Yes

9.2.6 Is there electricity in the main farm house? hh 17   
0 = No, 1 = Yes

**END: THANK THE RESPONDANT**