Business Viability assessment study of small holder dairy farming in Zambia

Patrick Kawambwa[2], Guido Hendriksen[2], Emelly Zandonda[1] and Libati Wanga[1]
[1]Mulungushi University and [2]Wageningen UR

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Abstract
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Preface

The dairy sector has been indicated as a key business opportunity for smallholders in Zambia. In addition to providing a valuable source of regular income and nutrition to rural populations, it is a food product that has growing interest among consumers, including the growing middleclass in Zambia, a fairly urbanized country. Zambia has still a low average consumption of milk and milk products. The potential to grow is therefore recognised. To better understand the bottlenecks and possibilities to accellerate the development of the dairy sector is was therefore concluded by Agri-Pro-Focus and Musica that a field survey among small holder dairy farmers could bring facts to the surface. This initiative was welcomed by the Dairy Association of Zambia. To carry out the field survey the organizations used the student exchange programme between Wageningen UR and Mulungushi University to implement the field survey. We believe that this report on the field survey provides valuable information on the currrent situation and the opportunities for the dairy smallholders in Zambia. It can inform individual stakeholders to make better informed investment decisions.

Claire van der Kleij Agri-Hub coordinato Agri-Pro-Focus
Brian Kapotwe, Leader dairy group Agri-Pro-Focus

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Summary

A field survey and focussed group discussions have been carried in Zambia among 66 small scale dairy farmers and their cooperatives to collect data on factors affecting the profitability of dairy farming in Zambia. The dairy farmers were situated in the four provinces of Zambia along the line of rail (Southern, Lusaka, Central and Copperbelt). The findings show that the small holder dairy chain is profitable and can further contribute to economic growth and employment in Zambia. There is considerable scope to increase this contribution. Most farmers currrently produce less than 10 l of milk per day. Production levels are still low in general and drop another 30% in the dry season. No effective ways of conserving high quality feed for the dry season are practiced, 70 % of farmers do not have pasture to harvest feed for the dry season. Few young people are attracted to the sector, it is thought that increasing profitability will make dairy production more attractive to the youth. Labour costs are a substantial part of production costs. Efficiency of labour is therefore important. Ease of access to water is relevant, as besides saving labour this would also increase production levels. Small scale dairy farmers should develop ways and means to increase productivity. Better availability of inputs would certainly help, as well as improvement in the delivery of milk, currently hampered by large distances from farms to milk collection centres and very limited cooling capacity. More collaboration with processors is also suggested as a way of increasing the total value of the dairy chain and agree on fair and equitable distribution of revenues within the value chain. Some specific suggestions for what could strengthen an enabling environment are also derived from the study: Discourage export of maize bran, encourage local breeding stocks and work on better diets for the dairy cows, especially during the dry season. Training of farmers to practice pasture production is one way to improve profitability of the small scale dairy milk production. Extension offices, dairy institutions together with the Dairy Association of Zambia can go into the field or visit famers on their farms or at their cooperatives to enlighten them on the benefits of pasture growing. The farmers can be trained on how and what type of pastures to grow for their dairy animals e.g. Napier grass and on what size of land to grow the pasture as well as the management practices to be carried out. These institutions should as well explain in detail to the farmer on how to harvest and conserve the pasture for the dry period or dry season when food for the animals is minimal. By doing so, the farmers will have costs on concentrates reduced, due to the availability of pasture in the dry period. By growing the correct required pasture, animals will be provided with adequate nutrition levels to continue producing high quality milk even in the dry period at higher volumes than what is currently being produced. With reduced dependence on concentrates in the dry period as well as presence of high quality pasture, as well as increased volume of milk produced, farm incomes will rise. Pasture management requires labour, which can be in short supply. In such a case, dairy farmers could organize themselves at cooperative level to have some mechanization to reduce labour requirements. More local breeding of high grade dairy animals by commercial farmers and/or more local entrepreneurs or cooperatives offering A.I. services would also be beneficial for small scale farmers and reduce dependency on costly imports.

At the end of 2013 the government of Zambia has lifted the export ban on maize bran and now allows maize farmers and millers to export their maize bran to the neighbouring countries. However demand for maize bran is constantly on the rise and this had led to increase in price for maize bran. The small scale farmer therefore tends to incur high costs on feeding his or her dairy animals. Dairy Association of Zambia should discuss and agree with the government to reduce drastically the amount of maize bran being exported to other countries. The government should calculate the benefits of using maize bran for the local dairy industry as compared to export earnings and subsequently stop commercial farmers from exporting maize bran and instead encourage the local use of maize bran in the dairy sector.

Currently Zambia dairy milk market has two major processors. This has led to local monopolies and therefore tends to affect pricing of raw milk. The processors being small in number are able to dictate what price they will purchase the raw milk from the farmer. Therefore, dairy association of Zambia, Zambia national farmers union and the government (ministry of agriculture and livestock) should seize the opportunity to encourage competition between processing firms. DAZ should encourage cooperatives to engage into vertical integration where they are able to carry out processing activities of raw milk, such as Choma and Mpima dairy cooperatives. This will help the farmer sell his milk at a relatively better price than currently thereby increasing profitability of the small scale dairy farmer. If there are good business plans for the cooperatives the economic empowerment could fund dairy cooperatives to help them acquire the equipment to enable them start adding value to the milk. Formal registration of women should be encouraged by DAZ. The dairy value chain should encourage more women in the chain. Quality of milk and rearing young calves will improve with more women in the sector. More transparency in the chain between cooperatives and processors could be encouraged as the mutual benefits of increasing quantity and quality of milk produced is recognized and an equitable distribution of these benefits within the chain can be achieved. Initiatives of DAZ to boost the total value of the chain must be based on transparency in the chain, allowing all players in the chain to benefit from this boost, including farmers, cooperatives, processors and service providers. This would create more employment and take farmers out of poverty.

1 Introduction

1.1 Global dairy outlook

The dairy sector has come to be recognised as an important industry, especially in relation to rural and peri-urban development. Dairy products provide high-quality protein and micronutrients generally lacking in cereal-based diets but which are especially important for children and child-bearing women. It has also been said that the dairy industry has the potential to create as many as 200 jobs for every 1 million litres of milk produced and distributed annually (Mumba & Pandey, 2012)[1].

At its core, the dairy industry's perpetual drive to optimize production has led to a willingness to adopt new technologies that enable more to be done with less. Farmers are producing more milk per cow and dairy processors are increasing output and reducing operating costs. Due to a focus on efficiency, the dairy industry has shown steady growth the past five years despite an economy that has slowly recovered from a hard-hit decline. During this period the global compound annual growth rate (CAGR) is 4.1% according to Global Industry Analysts.

Global sales of dairy products are forecast to pass the reach $500 billion per annum soon. . India, US and China have in that order the world largest production. Parmalat, a major processor in Zambia is since 2011 part of Lactalis, the number 3 dairy processor in the world. Two countries with a large dairy cooperative are Netherlands and New Zealand. These cooperatives are also among the top 5 dairy processors in this World.

Underlying reasons for the increasing global demand for dairy products and rising exports are:

- Population growth
- Popularity of dairy products
- Westernization of diets (to include more dairy)
- Broader array and appeal of dairy products

1.2 An Overview of the Dairy Sector in Africa

Substantial growth potential exists in Sub-Saharan Africa for expanding the dairy industry by bringing the traditional cattle sector into the formal dairy system. In a country like Uganda, the dairy sector contributes around 40-50 percent of the livestock Gross Domestic Product (GDP) and 17-19 percent of the overall agricultural GDP (DDA, 2002). Dairy is an important livelihood option,

[1] Omore et al, 2004 says that for every 100 litres per day of milk collected, processed and marketed, up to four jobs are created both on and off the farm site

especially for rural and peri-urban citizens, and can develop into a dynamic sector of the economy (Staal *et al*, 2008).

In the case of Kenya, 55 percent of the milk produced enters the market, although around 75 percent of this is sold through informal channels (FAO, 2011). Milk-based enterprises are attractive in Kenya, supporting more than 1.8 million smallholder households engaged in dairy production.

1.2.2 Zambia's Dairy Sector

Currently, over 80 percent of all raw milk (253 million litres per annum) produced in Zambia comes from the traditional sector. In monetary terms, milk from the traditional sector is worth over US$80 million per annum. The bulk of this milk (over 90 percent), however, does not reach the formal market. As of 2008, only 84,000 tonnes of processed dairy products in Zambia came out of the local dairy sector, compared to Zimbabwe's 389,000 tonnes; South Africa's 3.2 million tonnes; and Kenya's 4 million tonnes. Zambia therefore imports significant quantities of milk powder that is processed to cover the deficits of pasteurised milk, estimated at 6 million USD/a (Valeta, 2004).

Productivity within the Zambian traditional dairy sector is currently at 2 litres per cow per day. Emergent farmers who also keep cross breeds produce between 12 and 15 litres, while commercial producers are at between 17 and 24 litres.

Average milk production per cow in selected countries:

Country	Average production in liter per cow
Botswana	9.6
Kenya	15.1
South Africa	15.1
Zambia	8.2
Zimbabwe	8.6

As can be seen from the table above the overall average of 8.2 litres is lower than Zimbabwe, Botswana, Kenya and South Africa's. Naturally, low productivity has implications on pricing. Literature shows that Zambian pricing for raw milk per litre (about $0.60) is relatively high that of Kenya ($0.30). South Africa is at $0.40 per litre. The price of milk in Zambia is influenced by a number of factors, notably low production volumes to serve the urban demand. Zambia is blessed with a relatively good transport system along the line of rail, where most of the dairy production

and consumption in concentrated. Import of fresh milk is expensive and processors therefore prefer local sourcing. A similar pattern emerges even for pricing of processed milk (ACF, 2012; FAOSTATS, 2009; World Bank, 2011).

Transformation of the traditional dairy sector (through improved breeds, better animal management and increased herds) seems to present greater scope for expansion (when compared to the commercial sector) so as to meet the growing demand for milk, while at the same time also improving rural livelihoods. With more than 20 million hectares of grazing land, Zambia has the capacity (even with current animal management practices) to raise its cattle population from the current 3 million herds to over 7 million. Kenya has 13.5 million animals on almost the same grazing land size as Zambia, while Zimbabwe has 5.4 million herds of cattle on 12.1 million hectares of grazing land.

Zambia's annual per capita milk consumption stands between16.5 to 19.4 litres, compared to the 200 litres recommended by the World Health Organisation (WHO) and the Food and Agriculture Organisation (FAO). In a recent study for East Africa it can be seen that although there are variations in local situations, generally speaking the dairy sector is more developed in Kenya than in some other countries (Makoni *et al.,* 2014).

Although smallholder milk producers have increasingly organized themselves around dairy cooperatives that manage milk collection centres (MCCs), most have restricted themselves to the bulking, chilling and marketing of raw milk. Very few offer additional services to farmers such as veterinary services, dairy equipment services, artificial insemination (AI), animal feed, training, microfinance, and such other services that are often essential to enhancing productivity and, subsequently, to the growth of the sector.

A recent consultative process within the Zambian dairy sector identified the following key issues:

i. Limited profitability in the sector for businesses/cooperatives, believed to be largely linked to issues of productivity and capacity to negotiate pricing;

ii. Limited production volumes which affects opportunities linked to scale; and

iii. The need for increased investment into collection and processing facilities to stimulate production and profitability.

Valeta (2004) argues that the current value chain relationship leans heavily in favour of milk processors. While the producer price may not typically go beyond US$0.60 per litre, the processor is able to sell posturized milk for more than US$1.60, giving them much bigger gross margins than the farmer.

Mumba & Pandey (2012) point out that Zambia's adoption rate of good animal husbandry practices (under 35 percent) is still low. This they attribute to the poor provision of extension services as well as expensive or unavailable veterinary drugs and vaccines. The country's socialist history has also left many farmers still believing that these products and services should be provided free of

charge by Government. Another barrier is the widely-held misconception that commercial milk production can only be undertaken with exotic animal breeds. Yet, a substantial overall amount of milk that is of even better quality (because of higher fat content) can be obtained from local breeds than from foreign breeds. A combination of factors mentioned above have resulted into continued low productivity and poor market linkages.

Advances in technology now make it possible to use the "Village Milk System" promoted by the FAO. This is a safe low-cost, small scale milk pasteurisation mechanism that can be used by rural milk producer groups. However, limited access to electricity, as well as poor state of roads have major effects on the rate of establishment of MCCs in many rural parts of the country that have high traditional cattle populations.

Not surprisingly, most MCCs that seem to be performing relatively better than others are found along the main national transport network and especially around urban centres where basic infrastructure is available. However, the increasing density of dairy units around the urban areas may create new challenges, such as the risk of the spread of disease between herds. Zambia has seen recent cases of e.g. Food and Mouth disease, Liver fluke, CBPP and Tick-borne diseases. This is especially challenging due to the inability of Government Veterinary and Health Departments to provide guidelines and enforce regulations.

At a regional level, the operationalisation of the Common Market for Eastern and Southern Africa (COMESA) has opened Zambia to the threat of competition from the more efficient and productive Kenyan and South African dairy farmers. Unless productivity issues are addressed, the Zambian producers will in the long run inevitably succumb to such competition.

Prior studies of the Zambia dairy sector have highlighted the following as being key to moving past the current state of affairs:

- Enhance commercial livestock breeding capacity;
- Better animal healthcare mechanisms;
- Improved feeding through appropriate supplementation;
- Greater access to, and use of, A.I. to improve smallholder cattle breeds; and
- Higher levels of entrepreneurship and commercial orientation amongst smallholder dairy farmers.

Various other studies from across Africa indicate that the majority of smallholder dairy farmers depend on a cooperative or self-help groups to bulk and market their milk. In several instances, these marketing channels tend to operate more from a social perspective and with very little commercial orientation. However in Zambia with its low dairy density and high transportation costs, bulking of milk is an important means to reduce the transportation costs from smallholder to processor. In some rural societies is more for status and subsistence purposes.

The institutional arrangements within the cooperatives also appear to affect various aspects pertaining to governance, management and operations. Most governance and management systems are weak and often lack strategic focus, and are susceptible to mission drift and even to incidences of resource mismanagement and fraud. Most members have little or no access to entrepreneurship and business support services. The lack of such skills has in the past affected the ability of smallholder farmers to develop clear enterprise development pathways and to forge viable business relationships with other value chain players. In some cases, previous negative experiences have left many smallholder farmers with low confidence in market systems.

Milk production generally rises during the wet season, and then falls drastically in the dry seasons when animal food supply reduces because most farmers struggle to procure feed. This supply variation has knock-on effects on households both as milk producers and as consumers. Productivity also continues to be affected by limited and unreliable extension services and poor animal breeds. With such scenarios, milk production tends to contribute little to reducing household vulnerability. It does however appear that, with targeted interventions aimed at improving animal husbandry practices and market access amongst emergent farmers, the sector has the potential to reduce the raw milk supply deficit in the country and also significantly increase household income for the farmers. This report provides some specific pointers to assist with the design and implementation of interventions for the Zambian context.

1.3 Viability and profitability of small holder dairy farming

At the moment little data exists on complete enterprise viability analysis of small holder dairy farming in the country. With the ever changing landscape of dairy farming it is important to clearly establish factors affecting profitability of small holder dairy farming taking into account the various regional variations, culture, types of animal breeds kept, attitude, infrastructure and farmer's commercial orientation. Zambia has been benefitting from good maize harvests and therefore an abundancy of maize bran. Since Zambia now allows export of maize bran, the price dumping of maize bran on the local market has gone in 2014 and prices for dairy feed are higher than recently.

As the general industry in the country moves towards commercialisation, small holder dairy farmers need to be clear on key issues in relation to the viability of dairy farming such as;

- The minimum level of investment needed to venture in dairy farming
- The minimum number of dairy animals/ productivity rate per animal in order to break even
- The social and economic considerations affecting the effectiveness of the chain
- The business and entrepreneurial skills needed to successfully in dairy farming

2 Methodology

2.1 Objectives of the Study

2.1.1 Aim

This study aims at assessing the relative profitability of smallholder dairy farming and determining the socio-economic factors affecting it. The purpose is to identify what the highest cost centres are for dairy stakeholders and provide recommendations on how to lower the costs, improve price setting to achieve increased economies of scale for a business.

2.1.2 The objectives are

1. To analyse the small holder dairy value chain in Zambia
2. To assess viability/profitability of small holder farming taking into account the following;
    a. The cluster/regional variations in relative profitability.
    b. The social economic factors
3. To provide recommendations on how to improve dairy farming.

2.1.3 Scope of Analysis

In order to ensure that a complete analysis of the factors around profitability are analysed, the study looked the following aspects of the dairy enterprise.

- Production processes,
- The costs involved,
- Gross margins,
- Transportation,
- The minimum production levels needed to reach viable dairy production in Zambia,

In establishing the relative profitability of small holder dairy farming in Zambia, the study aimed to establish the following;

- The cluster/ regional variations in relative profitability for small holder dairy farming
- Some social and economic factors that affect profitability
- Profitability at primarily the first stages of the value chain, namely (Production)

Based on a detailed context analysis further data has been collected on;

- Type of animal breeds kept by small holder farmers and their related gross margins
- Types of business services available to farmers and level of accessibility
- Comparative analysis of production potential versus actual production
- Comparative analysis of production and productivity for selected animal breeds
- Comparative analysis of average production costs per region

Most people use gross margin analysis to calculate profits of dairy at an individual farm level due to the fact that it is the simplest and most practical method of assessing enterprise profitability and it is widely used in farm management economics. However in complete enterprise costing (PBA and CBA) the fixed costs are also allocated, unlike for gross margin analysis where only the outputs and variable costs are allocated to individual enterprises. A database has been build that also holds data for fixed costs. Required data have been collected or if no (accurate) numbers are available data have been entered as estimates.

Through this study, the research has properly effectively analysed profitability in the following ways;

1. Analysis of costs and gross margins required to make profit through the formal dairy market for individual farmers, cooperative (or milk collection centre) and processors.
2. Formulation of recommendations for improvements to dairy stakeholders including government.

2.2 Research Design

A cross-sectional survey design employing qualitative and quantitative data collection techniques was used. The study sites included 7 districts from 4 provinces; namely Central Province (Kabwe and Chibombo districts), Southern Province (Mazabuka, Namwala, Monze, and Choma districts), Copperbelt Province (Luanshya district), and Lusaka Province (Chilanga and Lusaka districts).

2.2.1 Study Sample and Sampling Technique

The study had a target selection of 12 dairy cooperatives (6 in Southern 2 in Lusaka, 2 in Central and 2 in Copperbelt Provinces) and individual farmers that were member of these cooperatives. The study was done together with the Dairy Association of Zambia. The study was conducted in two teams. One team collected data around Lusaka and North of Lusaka and the second team collected data in Southern province.

Multi-stage sampling which included both purposive and random sampling was employed in this study. Patton (1990) claims that: "The logic and power of purposive sampling lies in selecting information-rich cases for an in-depth study. Information-rich cases are those from which one can learn a great deal about issues of central importance to the research. In this study, information rich cases were those farmers regularly delivering milk to milk collection centers (MCCs).

2.2.2 Data Collection Instruments

The study used triangulation in data collection through the use of **interviews** and **reviewing of documents**. Silverman (2000) points out that triangulation in data collection involves the use of two or more methods and can help to explain the richness and complexity of data. This avoids a situation where research results are generated exclusively on one method (Patton, 1990; Freebody, 2003). The assumption is that some of the methods have weaknesses and exclusive reliance on one could bias or even distort the researcher's work.

The collection of data was by the following methods which included

- ✓ Questionnaire: which had semi structured questions.

- ✓ Focused group discussion: The five members of the executive of twelve cooperatives were interviewed.
- ✓ Individual interviews: Retailers and processors were also interviewed.

In total over 100 farmers have been interviewed in Southern Province. Analysis of the data was done with the SPSS version 21. For the analysis 6 farmers per cooperative were randomly taken for analyses from cooperatives in Southern Province, from the other cooperatives 5 farmers per cooperative have been included in the data analyses, making a data set of 66 farms.

2.2.3 Area Covered

The areas and the cooperatives covered in the study are as follows:

- ✓ Southern Province, (Cooperative covered Niko, Namwala central, Magoye, Monze dairy, Silwili and Choma dairy).
- ✓ Copper belt, (Fisenge and Mpatamatu).
- ✓ Central, (Chibombo and Mpima).
- ✓ Lusaka, (Mapepe and Palabana)

3 Results

3.1 Analysis of small holder dairy value chain

In the analysis of the value chain for viability / profitability the following were taken into consideration;

1. The environment in which the chain was operating,
2. The activeness of the stakeholders in the chain ,
3. The extent to which the farmers and cooperatives were involved,
4. The value share, and the challenges in the chain.

3.1.1 The small holder value chain

The small holder dairy value chain, excluding the informal sector, is represented below in figure 1, where information flows are indicated the flows will go in both directions;

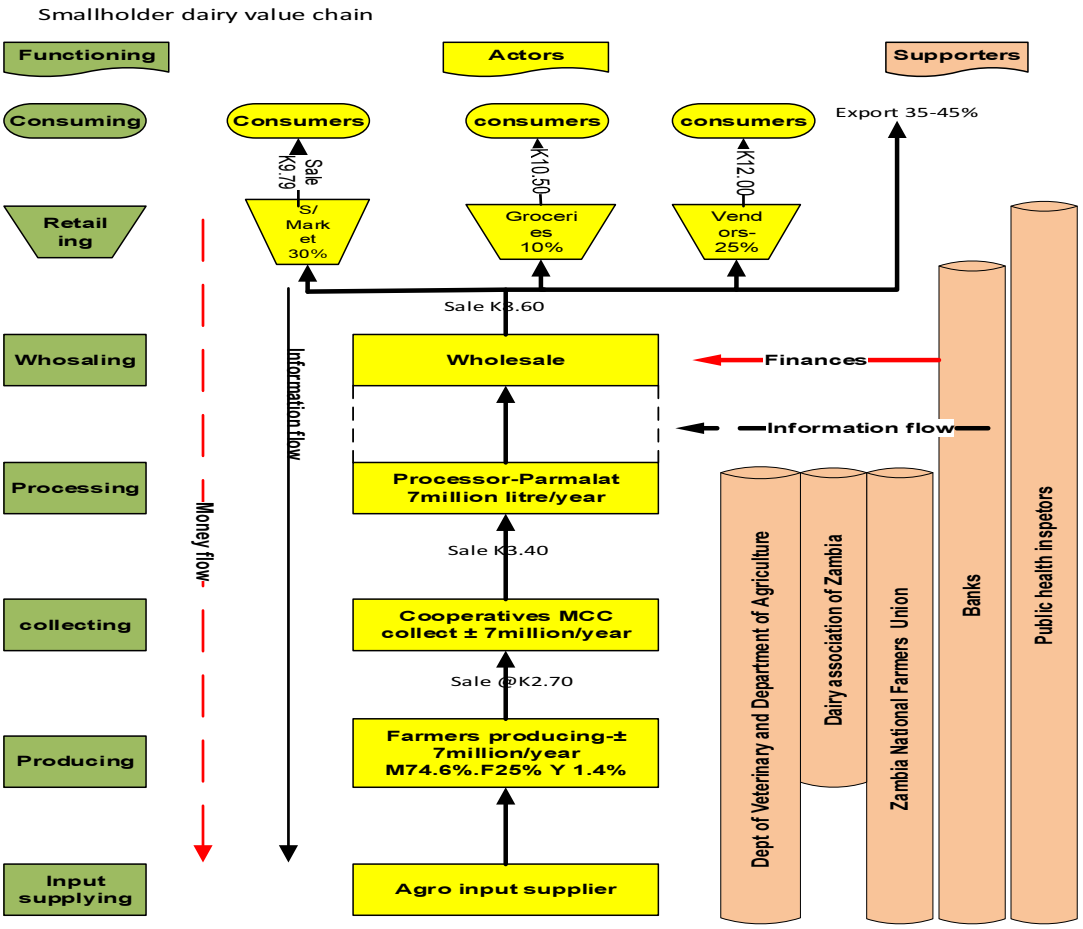


Figure 1. Dairy Value Chain in Zambia

3.1.2 Illustrations of the environment in which the chain is operating

The government has supported the dairy chain as it could be seen that most of the milk collection centres (MCC) were constructed with support from government or NGO's (approximately 80% of MCC's in survey) and later handed over to cooperatives. In addition government had put up a number of Artificial insemination facilities in some milk collection centres, however we did not find them functional in e.g. Chibombo and Mapepe.

For good dairy production the availability of good livestock feed is essential. However on-farm production of livestock feed as well as availability on the market are both low. Maize bran has been promoted as a livestock need, but currently its export is promoted, meaning less availability for the dairy sector. Also the infrastructure for milk storage and transport with lack of cooling capacity is a bottleneck in increasing the impact of the dairy sector on the economy, more rural electrification or on-farm energy production would ease this issue. Smallholders using communal land (53% of farmers in survey) and wishing to produce silage or other forms of livestock feed would benefit from a more secure land tenure situation. A good finalized dairy development strategy would also provide a stable policy environment that makes it easier for individuals to invest in the dairy sector and get access to credit. Presently the Country is finalizing its livestock development policy while establishing the dairy Industry Development Board following the enactment of the Dairy Industry Development Act of 2010 on 16 th April 2010. Zambia would be in a position to have higher export earnings from the dairy sector when the volumes of local production would grow substantially.

3.1.3 Stakeholders and their Functions in the Chain

a) Actors

The following actors where identified in the chain and there functions;

1. Agro input supplier: The agro input suppliers in the chain where the ones providing the inputs such drugs, chemicals, dairy equipment and other necessary requirements for the farmers. Quite a number of agro input suppliers are active in the major agricultural production areas in Zambia. More suppliers importing high quality pre-mixes would have a positive impact on the quality of livestock feed on the market.
2. Farmers: small holder dairy farmers were very active in the chain as they were the ones involved producing milk which they sold to their cooperatives. They kept the chain running as they were the producers of the raw material (Milk).
3. Processors: The chain had two major processors, Parmalat and Zam-milk. These processor were responsible to adding value to the milk collected from the cooperative. The processors also provided the incomes to the farmers in their monthly payments as they were buying milk from the farmers.
4. Retailer. The retailers included the following, Supermarkets, Groceries and vendors who were responsible in selling the milk and dairy products to the consumers.

b) Supporters

The supporters in the chain and their functions were as follows;

1. Banks; Zambia national Commercial Bank, ZANACO is one of the banks which is providing loans in form of Heifers. The bank is very active but the interest rates are very high. This is deterring most of the farmers to get the loans as they have no security. The condition of giving farmers who have at least one or more cows before is also preventing the new entrants without animals from accessing the loans. No evidence was found that farmers within cooperatives would borrow each other money as a means to widen availability of funds for investments and reduce interest rates.
2. Extension Services; The veterinary and agricultural extension are involved in the provision of veterinary services to the farmers. But from the focused group discussion it was found out that there was inadequate veterinary staff on the ground. Due to this farmers faced a challenge of high disease incidences. The officers were trained in animal health management and had little know how specifically in dairy management. This also led to farmers having inadequate knowledge in dairy management as the veterinary and agricultural extension officers were biased to their field. Cooperatives could also actively organize sharing best practices between members to increase skills of members.
3. Dairy Association of Zambia; The Dairy Association of Zambia (DAZ) was very active in the chain supporting farmers and processors. DAZ was linking farmers to input suppliers, capacity building of the farmers in dairy management and helping in importing the breeding stock for the farmers.
4. Zambia National farmers' union; The union acts as an interface between farmers and government in lobbying for the improvement of policies that could favour the dairy farmers and working hand in hand with DAZ to find ways of improving the conditions of the farmer. Some suggestions are given under the recommendations in this report.
5. Public Health Inspectors; The Public health inspectors were responsible for the monitoring of the hygienic standards in the chain and ensuring that the premises are kept to standard. More transparent pricing for milk grades and cooperatives informing members on the importance of hygienic standards would also help in increasing hygiene.

3.1.4 Extent to which farmers and cooperatives are involved in the chain

Of course farmers and cooperatives are part of the chain. However their influence is limited, even though they provide 70% of fresh milk from smallholders. An example to this effect was on the price determination of milk, that is basically dictated by the processors. The possibilities for farmers to translate high input costs in better prices are very limited. To be efficient in production is about the only for many farmers to make sure they generate a positive income. The price was determined by the processor and this price was passed on to the farmers. The processor had control over the chain including the cooperative. DAZ could only lobby to adjust for a better price.

If the processor was not willing to adjust, the price remained the same. The processors provide an incentive for milk quality as the price level between the 3 different grade of milk quality (based on cell count) is 20 ngwee per grade. This helps in stimulating quality of milk and therefore the possibility for the processor to add more value to the milk by producing higher value products. This study is based on data collected from members of cooperatives. Some smallholder dairy producers are not members of cooperatives, but 70% of the marketed milk from smallholders is produced by members of cooperatives. It can be assumed that these farmers have even less influence in the dairy sector. It can be expected that the influence of smallholders will be fairly limited until they organize the processing and marketing of dairy themselves through their cooperatives.

Challenges in the chain:

a) Governance , Information flow and Transparency in the chain

DAZ was currently actively disseminating information in the chain and actively linking cooperatives to input suppliers. Good transparancy in the chain is important to maximize total value of the chain and get an equitable distribution of the benefits. The processors are also members of DAZ but do not provide information on processing costs of milk. The processors are not perceived as transparent in their dealings to the cooperatives or farmers.

b) **Few competing processors**

Currently the power dynamics and control of the chain is all in the hands of the processor as he determines the key factors of the chain like prices. The processor only consults the shareholders in determining the price and not farmers. There is need to involve the farmers' association DAZ in determining the price and the two should come up with a model on how prices should be determined in future. The chain was facing a challenge of having limited processors as the sector was relatively small. Some farmers asked said that some of the current processors were showing some monopolistic tendencies in certain areas. The data gathered from focussed group discussions with cooperative executives indicated that new processors who came into the chain had problems such as;

No capacity to collect all the milk produced by farmers at milk collection centres and payments by the new processors were erratic.

The best way to increase competition between processors is to increase the total value of the dairy chain. In this way it is possible to raise profits for processors, while at the same time increase the profits for the farmers. To achieve this it is necessary to increase quantity of milk (lower transportation costs, higher volumes) as well as quality of the milk (enabling production of high value products like cheese). Then it is attractive for processors, and attractive for new processors to entere the market. Alternative scenarios for cooperatives include start processing and marketing themselves. This will not be easy because it requires investments, good management and the risks increase. Of course this would need careful business planning where a transition phase with part of

the milk sold to processors and part of the milk processed by the cooperative (based on own marketing possibilities) is likely. Cooperatives could build capital for such investments by withholding a certain fraction of the milk price. This would mean sacrificing some short term income for the members in exchange for long term profitability, and it may be difficult to reach consensus between members as their short-term needs might be high. On the other hand there are plenty examples around the world whereby small scale dairy farmers escaped the poverty trap by taking this route, e.g. in the Netherlands one dairy cooperative is now among the top five dairy processors in the world, bringing strong revenues to its members.

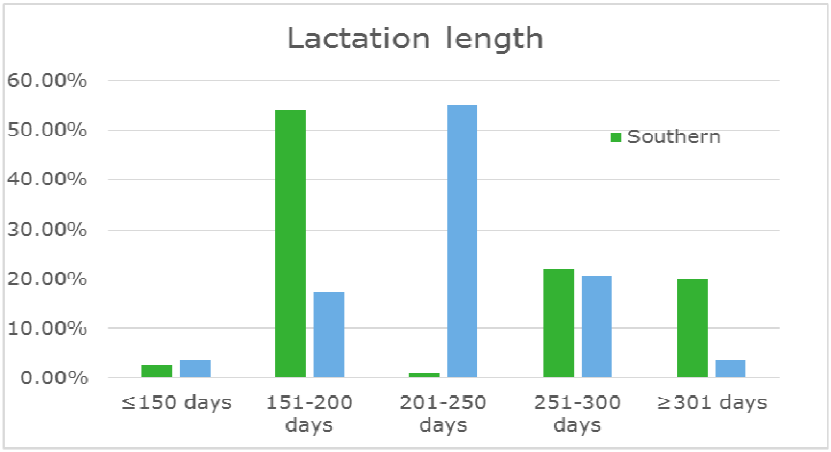
3.2 Viability of small holder dairy farming

Factors affecting Profitability

a) **Lactation Length**

The lactation length had a serious effect on the profitability of the chain. When the lactation length is short then the farmers will lose some profits from lack of production of milk.

In southern region i.e. Southern Province only 22% of the dairy cows had a lactation length of between 251 and 300 days, while 21% in the Copperbelt, Central and Lusaka had same range of lactation length of between 251 and 300 days. According to Adams *et al* (2009) under feeding of cows especially in terms of energy or an imbalanced ration was a major cause of short lactation length and excessive drops in milk generally accompanying this. This short lactation length was a result of poor nutrition as most farmers in the chain depended on use of high quantities concentrates and maize stover as major source of feeds. Figure 2 shows how varying the lactation length are. The lactation length had severe effects on the profitability of the dairy industry. The farmers with short lactation length were losing money as the animal dried up quickly. In some cases animals where drying up within 150days.



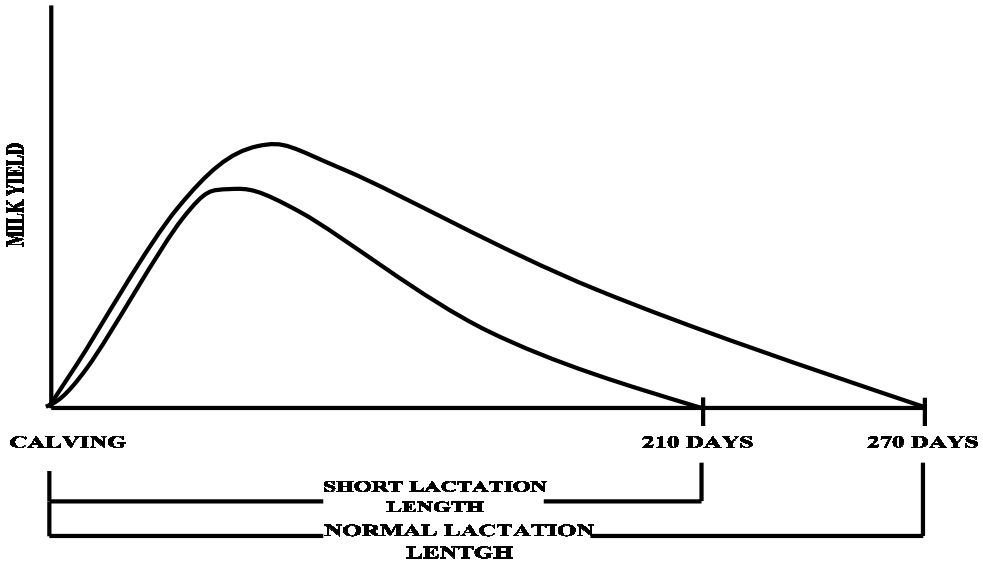


Figure 2. Distribution of lactation length in survey.

b) **Milk yield**

The milk yields are given in table 1. While the milk yields did not show a difference between the various provinces and cooperatives in the rain season, there was a marked difference among provinces and cooperatives in milk yield in the dry season. In drier areas the milk yields in the dry season are lower.

Rain Season

The analysis of the result showed that milk yield was as given in table 1 where the yields are split over the two distinct seasons of Zambia, the rain season and the dry season, with a distinct differences in grass availability, resulting in lower milk yields in the dry season

Table 1. Distribution of average milk yield in survey

NUMBER OF FARMERS	LITRES/DAY	PERCENTAGE
32	≤ 10	48.5%
16	11 -15	24.2%
13	16 -20	19.7%
5	≥ 21	7.6%

Dry Season

NUMBER OF FARMERS	LITRES/DAY	PERCENTAGE
37	≤ 7	56.1%
16	8 – 11	24.2%
4	12 – 14	6.1%
9	≥ 15	13.6%

c) **Number of milking animals**

The average herd size for the whole covered area was as given in table 2:

Table 2. Average herd size of farmers in survey.

NUMBER OF MILKING ANIMALS	PERCENTAGE OF FARMERS
3 – 5	53%
6 – 9	30.3%
10 – 13	9.1%
14 – 17	4.5%
>18	3%

Most of the farmers 53% had 3-5 milking animals. With the current economic situation and the inflation farmers should be encouraged to have at least 10 or more milking animals to realise a better profit and be able to expand. Having 3-5 anaimals will support the family but will not enable the farmer to purchase the replacement stock which are expensive.

d) **Maize bran**

The export of maize bran by government had severe impact on the dairy industry as the remaining maize bran was inadequate and becomes expensive because of high demand. This resulted in pushing up the production costs of milk. According to Kasalo (2013) he urged government to restrict the exports of maize bran to cushion the negative impact on the countries production of dairy products. He further said that reducing export of maize bran would also cushion the price of the commodity. The increase in the price of maize bran due to shortage has resulted in a higher cost of dairy products. And according to ZNFU (2013) they state that there was uncontrolled and unprecedented export of maize bran / molasses which had a negative bearing on domestic livestock. Consequently in the last year the local price of bran increased to high levels.

This was evident from the cost of production calculated from the two regions. The cost of production was quite high, as in southern province the production of a litre of milk was at K1.85 except for Niko and Namwala central who their production cost was around K1.30. This was because they were not using any concentrates and were keeping local breeds. For the Northern region which include Lusaka, Central and Copper belt the cost of production was also high and was around K2.28 per litre.

e) **Animal Feeding (Pasture and Concentrates)**

Pasture and Concentrate usage; The use of crop residues, mostly maize stover, was highly pronounced in the small holder dairy value chain, This caused a big difference in production costs between the rain season and dry season: Animals producing 8 litres in the rainy season could drop to 5.5 litre in the dry season representing a drop of 31 % . The drop was also attributed to lack of quality feeds during this period.

According to Mohd *et.al.* (2013) dairy animals, because of their high requirement for a higher plane of nutrition, need more of nutritious forage and will almost always require feed supplementation. In view of this, high quality grasses and legumes are required for the productivity of the animals. The findings in the survey showed that most of the small holder dairy farmers where using maize stover whose nutritive value was very low and no supplementation of any nature, but there was high use of concentrates not supported with nutritive grasses.

The analysis on the data collected on pasture growing shows that 46 farmer's equivalent to 70% where not growing pastures and 20 farmers equivalent 30 % where growing or buying pastures in the chain. Tables 3 to 8 give some details.

For those growing pastures the land size used was as given in table 3:

Table 3. Land size used by farmers in survey.

NUMBER OF FARMERS	SIZE OF LAND	PERCENTAGE
15	≥ 1Ha	23 %
3	2Ha	5 %
2	≤ 4Ha	3 %
46	Not Growing	70 %

Table 3 shows that 23 % were growing ≥ 1Ha, 5 % were growing 2 Ha of pasture and 3% were growing ≤ 4Ha. The major part of the farmers interviewed 70 % were not growing pastures, but depended on crop residues and grazing animals on natural veldts or standing hay which was of poor quality.

Table 4. Pasture yields of farmers in survey.
Pasture yield

NUMBER OF FARMERS	YIELD	PERCENTAGE
15	≥ 2 tonnes	23 %
4	2.1 – 4 tonnes	6 %
1	4.1 – 5 tonnes	2 %
46	0	70 %

Table 5. Types of pasture grown by farmers in survey

NUMBER OF FARMERS	TYPE	PERCENTAGE
3	Hay	5 %
11	Silage	17 %
2	Hay& silage	3 %
4	Other (such as: cow candy)	6 %
46	Not growing	70 %

Table 6. Costs of seeds for farmers in survey.

NUMBER OF FARMERS	COST OF SEED(ZMW)	PERCENTAGE
13	≤ 1000	20 %
1	1001 – 2000	1 %
1	2001 – 3001	1 %
51	NOT SPENDING	77 %

Table 7. Costs of fertilizer for farmers in survey

NUMBER OF FARMERS	COST OF FERTILIZER (ZMW)	PERCENTAGE
2	≤ 200	3 %
3	201 – 400	5 %
5	401 – 600	7 %
56	NOT SPENDNG	85 %

Table 8. Cash expenditures on weeding by farmers in survey.

NUMBER OF FARMERS	COST OF WEEDING (ZMW)	PERCENTAGE
6	≤ 150	9 %
1	151 - 200	1 %
3	≥ 201	4 %
56	NOT SPENDING	85 %

Use of concentrates

Several rough indicators, , i.e. a study from GART and information from DAZ, assume that approximately 1 kg of concentrates is sufficient for cow grazing in the dry season to produce 2 litres of milk. This means that a cow who produce 10 Litres of milk per day, should then have access to 5 kg of concentrates.

The findings on the small holder farm level shows that the 79% of the farmers use concentrates. Because the members of the cooperatives from Namwala Centre and Niko (both traditional beef animals) do not use any concentrate to feed the cow, we can say that out of the 10 other cooperatives 96 % of the farmers use concentrates. 53% of the farmers purchases their concentrates from agro-dealers and 26 % of the farmers use home-made concentrates. If in terms of nutrient recycling more manure would be used to increase productivity of grass, this would also

have a positive impact on milk yields and less concentrates would be needed. However in Zambia manure is not much used by small-scale farmers to fertilize their pastures.
The analysis on the usage of concentrates gave results as given in tables 9 and 10. There was no signicifant difference in costs of concentrates per province.

Table 9. Concentrates used by farmers in survey.

NUMBER OF FARMERS	TYPE OF CONCENTRATE	PERCENTAGE
17	Homemade	26 %
35	Buying from Agro Dealers	53 %
14	Not Using	21 %

Table 10. Cash expenditures for purchase of concentrates by farmers in survey.

NUMBER OF FARMERS	COST (ZMW)	PERCENTAGE
34	≤ 5000	51 %
1	5001 – 10000	1 %
31	NOT PURCHASING	47 %

f) **Labour and Payments**

The minimum wage in Zambia is 700 ZMW per month (source: wageindicator.org/Zambia).

The use of hired labour and family labour upon analysis of the data gave us table 11 and 12. There was no difference in the use of family labour across provinces and cooperatives.

Table 11. Type of labour used by farmers in survey.

NUMBER OF FARMERS	TYPE OF LABOUR	PERCENTAGE
49	Family	74 %
13	Hired	20 %
4	Both	6 %

Table 12. Salaries paid by farmers in survey.

NUMBER OF FARMERS	AMOUNT (ZMW)	PERCENTAGE
33	≤ 500	50 %
4	501 – 600	6 %
29	USING FAMILY LABOUR	44 %

From the analysis we can say that there are no farmers who meet the minimum wage for their workers. This means that the farmers employ their workers in an informal way. We can conclude that the price of labour is higher in Copperbelt and Central province compared with the price in Southern province. Because of the high costs farmers have resorted to use of family labour.

g) **Breeding/AI**

AI is important in improving the productivity of the local dairy animals. In the study it was found out that in southern province only 22% were using AI and Northern region of the study only 35.1%were using AI. According to Madalane *et.al.* (1990) economic gains which can be accrued from the choice of the breeding strategy and continuous F_1 heifer replacement program may have a sound economic basis particularly for low management farms and crossbreeding is the best alternative for such animals. No data on animal weight have been recorded in this study. The visual impression is that the domestic breeds are low in weight, and with good calf/heifer rearing these weights and the production capacity of animals can be increased.

h) **Gender in the chain**

Sustainability of the chain can only be guaranteed when there is equity of participation. Rubin and Manfre (2011) state that when women participate fully in agricultural value chain the qualtiy of products is improved. They further stated that women contribute time, energy, creativity and knowledge to production, processing and marketing. These inherent characteristics are not common in men. In the survey it was found that the participation of women was only 25% as opposed to men who were at 73 % and the youth were at 1.4%.This is a serious scenario which need urgent attention in the dairy value chain. For continuity and ensuring that the smallholder dairy chain continues to flourish more women and the youth is needed.
The data collected from the focused group discussion showed the membership as in table 13:

Table 13. Membership distribution of cooperatives.

Membership in the Cooperatives			
	Membership		
Dairy cooperative Name	Female	Male	Youth
Fisenge	109	2	9
Mpatamatu	10	20	8
Chibombo	12	14	
Mpima	66	134	
Palabana	26	71	10
Mapepe	23	34	
Magoye	100	600	
Monze	67	233	
Siwili	14	128	
Choma	30	50	
Niko	5	75	
Namwala central	22	66	
Total	484	1427	27
Total in percentages	25%	73.6%	1.4%
Total amount of members	1938		

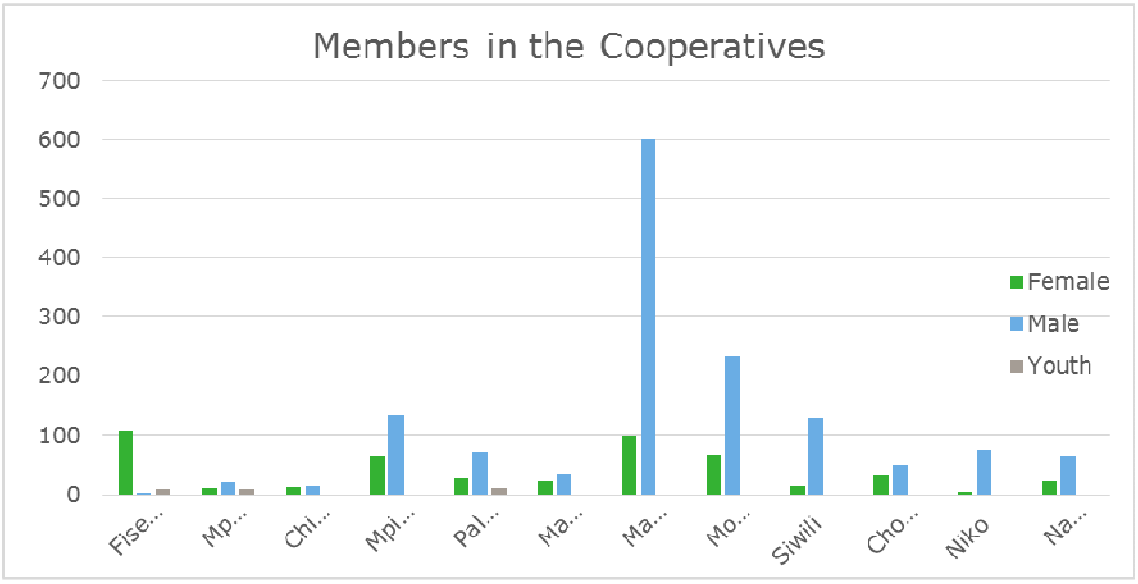


Figure 3. Membership distribution of cooperatives in survey.

The result shows that the chain had more men i.e. 74 %, women 25% and youth 1%.

i) **Land tenure**

The results showed that farmers who had land on title and those who had traditional land where as in table 14:

Table 14. Land tenure position of farmers in survey.

NUMBER OF FARMERS	AMOUNT PAID	PERCENTAGE OF FARMERS
28	≥ ZMW1000	42 %
1	ZMW 1100 – 1500	1 %
37	TRADITIONAL LAND	57 %

From the analysis of the results it indicated that 53% of the dairy farmers where using traditional land which restricted their freedom of practising the needed activities like growing pasture needed for the animals. In traditional land there no freedom to have control over your land as neighbours can easily encroach on your land. Farmers are always living with uncertainties as headmen can decide to do anything with the land. Farmers are not free.

This therefore calls for farmers to start having title deeds on their land where they can have freedom to practice what they have been taught without interference from the neighbours

j) **Water sources**

From the focused group discussions with cooperative member in Magoye, Niko and Namwala central the farmers complained about the distance to the source of water for the animals. Animals

had to walk about on average 5km per day to have accessto the source of water. This calls for DAZ and government to help in sinking the boreholes for farmers to access clean water for the animals in the nearby places as it contributed to farmers having less milk due to animals wasting their energy in walking long distances to the river to get water and back.

k**) Distance to Milk collection centre**

In nearly all the focused group discussions the issue of distance to the milk collection centre came up. Farmers were asking for ways in which milk quality can be maintained at farm level. The request was for DAZ and Government (MAL) to source the solar coolers which farmers can buy. This will enable them cool the milk at farm level before they deliver it to the milk collection centre. The major complaint was that most of the milk dropped in grade due to high microbe multiplication and this came as a result of distance to the MCC. The processors measure the grade and a premium is paid for milk of better grade. Farmer on average are living 6 km from the milk collection centres and due to high temperature milk goes bad before it reaches the collection centres.

3.3 VALUE SHARE IN THE CHAIN

Information on value share in the chain is important for all stakeholders to know. In this research processors could not release some information. Data in that part of the chain is therefore limited. According to the Agricultural Consultative forum (2012), for a MCC to make a profit they need increase the levels of production in their localities. Lack of data has made it difficult for the Ministry of Agriculture and Livestock to plan and implement policies based on verified facts and figures. However we have derived the information as in table 15:

Table 15. Value share in the chain

FORMULAE USED:

1. Gross Income = revenue – variable costs
2. Added Value = price received by actor – price paid by actor
3. Value Share = added value x 100/ final revenue
4. Gross Margin = gross income x 100/ final revenue

SELLING PRICES OF MILK:

1.	Super markets	K9.79 per liter
2.	Grocery Stores	K10.50 per liter
3.	Vendors	K12.00 per liter
4.	Farmer to cooperative	K2.70 per liter
5.	Cooperative to Parmalat	K3.40 per liter
6.	Parmalat to retailers	K8.60 per liter

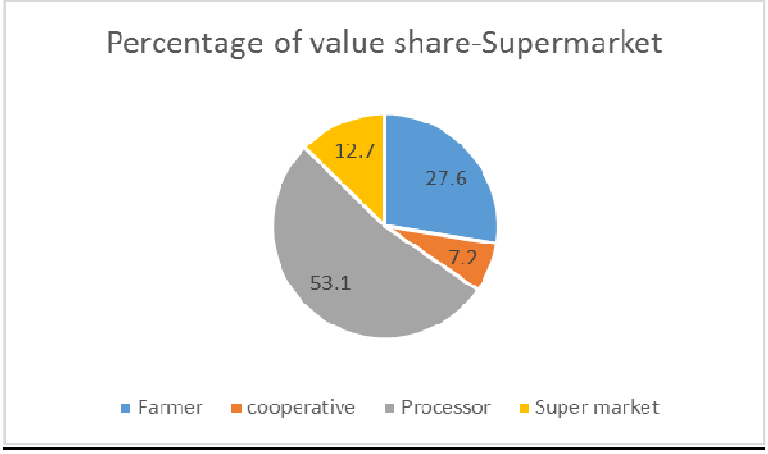
VARIABLE COST PERCENTAGES:

1.	Farmers	67% of revenue generated
2.	Cooperatives	9% of revenue generated
3.	Processor	40% of revenue generated (Assumption)
4.	Supermarket	10% of revenue generated (Assumption)

5. Vendors 10% of revenue generated
6. Groceries 7% of revenue generated

VALUE SHARE TABLE, see annex 2 for the calculations:

CHAIN ACTOR	VARIABLE COSTS	REVENUE	GROSS INCOME	ADDED VALUE	VALUE SHARE	GROSS MARGIN
Farmers	K1.80	K2.70	K0.90	K2.70	28 %	33 %
Cooperatives	K2.94	K3.40	K0.46	K0.70	7 %	14 %
Processor	K4.76	K8.60	K3.84	K5.20	53 %	45 %
Supermarkets	K9.46	K9.79	K0.33	K1.19	13 %	3 %



3.3.1 MEASURES OF PROFITABILITY

The profitability level in the chain was measured using the gross margin and the break-even point. The determinants in the calculation were based on milk yield in the rain season, dry season and the variable costs. The variable costs included concentrates, labour, transport, drugs and breeding costs (AI or Bull Hire). The processors in Zambia do not adjust their price for milk between seasons to reflect the difference in scarcity of milk. This could be introduced by them as a mechanism to enhance milk production in the dry season and thereby get a more even supply of milk throughout the year.

Central Province, Lusaka Province and Copperbelt Province

1. Wet Season

Facts from data collected
Farmers are milking 5 animals on average
Lactation period is 7 months
Animals give 13 litres per animal per day
Selling price of milk to cooperative is K2.70
Farmers sell 1 bull calf @ K1000.00

Gross Income:

5 Animals x 13 litres x 210 days x K2.70	K36855.00
1 Bull calf @ K1000.00	K1000.00
Total	K37855.00

Variable Costs:

Concentrates 0.5kg/l x 5 animals x 210 days x 13l x K2	K13650.00
2 Labour x K500 x 12 months	K12000.00
Transport K140 x 7 months	K980.00
Drugs K140 x 12 months	K1680.00
Bull hire K25 x 5 animals	K125.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K28555.00

Gross Profit K9300.00

Cost of producing a litre of milk = K28555/ (5 x 13 x 210) = K2.10

Cost of production in % = 75 %
Gross profit in % = 25 %

2. Dry Season

Facts from data collected
Farmers are milking 5 animals on average
Lactation period is 7 months
Animals give 9.5 litres per animal per day
Selling price of milk to cooperative is K2.70
Farmers sell 1 bull calf @ K1000.00

Gross Income:

5 Animals x 9.5 litres x 210 days x K2.70	K26932.50
1 Bull calf @ K1000.00	K1000.00
Total	K27932.50

Variable Costs:

Concentrates 0.5kg/l x 5 animals x 210 days x 9.5l x K2	K9975.00
2 Labour x K500 x 12 months	K12000.00
Transport K140 x 7 months	K980.00
Drugs K140 x 12 months	K1680.00
Bull hire K25 x 5 animals	K125.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K24880.00

Gross Profit K3052.50

Cost of producing a litre of milk = K24880/ (5 x 9.5 x 210) = K2.50

Cost of production in % = 89 %
Gross profit in % = 11 %

Break-Even Point

Formula: $fixed\ costs \div (price\ per\ unit - variable\ cost\ per\ unit)$

Fixed Costs Assumptions

Building @ K10 000 and 25 years life span (depreciation)	K400
Maintenance of building @ 10% of cost	K1000
Machinery (chuff cutter) @ K2000 and 10 years life span	K200
Maintenance of chuff cutter @ 10% of cost	K200
Animal investment @ 16% interest (7 x 12000 x 16%)	K13 440

	K15 240

Breakeven point = K 15,240 / (K 2.70 – K 2.28)= 36,300 litres

CENTRAL PROVINCE (ZAM MILK) with a different milk pricing

1. Wet Season

Facts from data collected
Farmers are milking 5 animals on average
Lactation period is 7 months
Animals give 13 litres per animal per day
Selling price of milk to cooperative is K2.50
Farmers sell 1 bull calf @ K1000.00

Gross Income:	
5 Animals x 13 litres x 210 days x K2.50	K34125.00
1 Bull calf @ K1000.00	K1000.00
Total	K35125
Variable Costs:	
Concentrates 0.5kg/l x 5 animals x 210 days x 13l x K2	K13650.00
2 Labour x K500 x 12 months	K12000.00
Transport K140 x 7 months	K980.00
Drugs K140 x 12 months	K1680.00
Bull hire K25 x 5 animals	K125.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K28555.00
Gross Profit	K6570.00

Cost of producing a litre of milk = K28555/ (5 x 13 x 210) = K2.10

Cost of production in % = 81 %
Gross profit in % = 19 %

2. Dry Season

Facts from data collected
Farmers are milking 5 animals on average
Lactation period is 7 months
Animals give 9.5 litres per animal per day
Selling price of milk to cooperative is K2.50
Farmers sell 1 bull calf @ K1000.00

Gross Income:	
5 Animals x 9.5 litres x 210 days x K2.50	K24937.50
1 Bull calf @ K1000.00	K1000.00
Total	K25937.50
Variable Costs:	
Concentrates 0.5kg/l x 5 animals x 210 days x 9.5l x K2	K9975.00
2 Labour x K500 x 12 months	K12000.00
Transport K140 x 7 months	K980.00
Drugs K140 x 12 months	K1680.00
Bull hire K25 x 5 animals	K125.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K24880
Gross Profit	K1057.50

Cost of producing a litre of milk = K24880/ (5 x 9.5 x 210) = K2.50

Cost of production in % = 96 %
Gross profit in % = 4%

SOUTHERN PROVINCE:

1. Wet Season

Facts from data collected
Farmers are milking 7 animals on average
Lactation period is 7 months
Animals give 8 Litres per animal per day on average
Average Selling price of milk to cooperative is K2.70
The farmers sell 1 bull calf @ K1500.00 Average price

Gross Income:	
7 Animals x 8 litres x 210 days x K2.70	K31 752.00
1 Bull calf sale @ K1500.00	K1500.00
Total	K33 252.00

Variable costs:	
2 Labour x K300 x 12 months	K7200.00
Transport K140 x 7months x 1	K980.00
Drugs K140 x 12 months	K1680.00
Concentrates 0.5kg/l x 8l x 7 lactating animals x 210 days x K2	K11760.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K21740.00

Gross profit	K11512.00

Cost of producing a litre of milk = 21740/ (7 x 8 x 210) = K1.85
Cost of production in % = production cost / price received x 100%
Gross profit in % = (price received – production cost) / price received x 100%

Cost of production % = 69 %
Gross profit in % = 31 %

2. Dry Season

Facts from data collected
Farmers are milking 7 animals on average
Lactation period is 7 months
Animals give 5.5 Litres per animal per day on average
Selling price of milk to cooperative is K2.70
The farmers sell 1 bull calf @ K1500.00

Gross Income:	
7 Animals x 5.5 litres x 210 days x K2.70	K21 829.50
1 Bull calf sale @ K1500.00	K1500.00
Total	K23 329.50

Variable costs:	
2 Labour x K300 x 12 months	K7200.00
Transport K140 x 7months x 1	K980.00
Drugs K140 x 12 months	K1680.00
Concentrates 0.5kg/l x 5.5l x 7 lactating animals x 210 days x K2	K8085.00
Concentrates (dry period) 60 days x 1kg x K2	K120.00
Total	K18 065.00

Gross profit	K5 264.00

Cost of producing a litre of milk = 18 065/ (7 x 5.5 x 210) = K2.20

Cost of production % = 77 %

Gross profit in % = 23 %

Break-Even Point
Breakeven point = K 15,240 / (K 2.70 – K 2.02) = 22,400 litres

NIKO AND NAMWALA CENTRAL (Using traditional beef animals)

1. Wet Season

Facts from data collected
Farmers a milking 7 animals on average
Lactation period is 7 months
Animals give 3.5 litres of milk per animal per day on average
Selling price of milk to cooperative is K2.80
Farmers sell 1 bull calf @ K 1600.00

Gross Income:	
7 Animals x 3.5 litres x 210 days x K2.80	K14406.00
1 Bull calf @ K1600.00	K1600.00
Total	K16006.00
Variable Costs:	
1 Labour x K300 x 12 months	K3600.00
Transport K70 x 7 months	K490.00
Drugs K140 x 12 months	K1680.00
Total	K5770.00
Gross profit	K10236.00

Cost of producing a litre of milk = K5770/ (7 x 3.5 x 210) = K1.10

Cost of production % = 36%
Gross profit in % = 64%

2. Dry Season

Facts from data collected
Farmers a milking 7 animals on average
Lactation period is 7 months
Animals give 2.5 litres of milk per animal per day on average
Selling price of milk to cooperative is K2.80
Farmers sell 1 bull calf @ K 1600.00

Gross Income:	
7 Animals x 2.5 litres x 210 days x K2.80	K10290.00
1 Bull calf @ K1600.00	K1600.00
Total	K11890.00
Variable Costs:	
1 Labour x K300 x 12 months	K3600.00
Transport K70 x 7 months	K490.00
Drugs K140 x 12 months	K1680.00
Total	K5770.00
Gross profit	K6120.00

Cost of producing a litre of milk = K5770/ (7 x 2.5 x 210) = K1.60

Cost of production % = 47%
Gross profit in % = 53%

3.4 SOCIAL ECONOMIC FACTORS AFFECTING PROFITABILITY IN THE CHAIN

1. Artificial Insemination: people being suspicious that AI brings animals of GMO nature.
2. The chain has more men than women; 73.6% men, 25% women and 1.4% youth.
3. Land used in most of small holder dairy is under tradition.
4. Women are capable but they are suppressed mostly by men in the chain.
5. The distance to the milk collection centre is affecting quality thus resulting in affecting profit margins.

4 Conclusions and recommendations

CONCLUSIONS

Small holder dairy chain is profitable but the export of maize bran, the costs of veterinary drugs , short lactation length, farmers non growing pastures, importation of breeding stock at high cost(loans with high interest rates) are threatening the viability and profitability of the chain.

RECOMMENDATIONS

1. **Train farmers in pasture production and conservation for use in dry season as opposed to use only maize stover.**

With our rule of thumb that 1 kg of concentrates at K2/kg, production will increase 2 l at K2.80/l, it is obviously better to feed animals well. Over the years extension offices have trained the small scale farmer to feed animals on maize stover in the dry season. The stover has low protein content which does not meet the required protein and energy levels the dairy animals need. This has led to reduced milk quality as well as reduced milk yield obtained in the dry season. Milk quality is affected negatively due to low or poor protein supplementation in the dry period as a result of feeding the dairy animals only with maize stover or poorly harvested pasture. This ultimately has been followed by a reduction in returns to the farmer thereby affecting the profitability negatively. Therefore, the training of farmers to practice pasture production is one way to improve profitability of the small scale dairy milk production. Extension offices, dairy institutions together with the Dairy Association of Zambia can go into the field or visit famers on their farms or at their cooperatives to enlighten them on the benefits of pasture growing. The farmers can be trained on how and what type of pastures to grow for their dairy animals e.g. Napier grass and on what size of land to grow the pasture as well as the management practices to be carried out. These institutions should as well explain in detail to the farmer on how to harvest and conserve the pasture for the dry period or dry season when food for the animals is minimal. By doing so, the farmers will have costs on concentrates reduced, due to the availability of pasture in the dry period. By growing the correct required pasture, he animals will be provided with adequate nutrition levels to continue producing high quality milk even in the dry period at higher volumes than what is currently being produced. With reduced dependence on concentrates in the dry period as well as presence of high quality pasture, as well as increased volume of milk produced, the farmer will be able to earn more income than currently. Pasture management requires labour, which can be in short supply. In such a case, dairy farmers could organize themselves at cooperative level to have some mechanization to reduce labour requirements.

2. **Encourage local commercial farmers to start breeding high grade dairy animals for sale to small scale farmers.**

Import of exotic breeds of dairy animals from South Africa is there, but at a high cost, even the new loan scheme from ZANACO and DAZ The interest rate on these loans is 16%. This rate is however still high for a small scale dairy farmer. Local commercial farmers could engage more in local breeding of high grade dairy animals for sale. This would allow small scale farmers to

purchase high grade breeds locally at a price lower than that of the imported animals from South Africa. This will reduce the capital investment for the small scale farmer as well as reduce the costs on replacement heifers. This will allow the small scale farmer to have a larger Gross profit from his or her dairy enterprise thereby profitability would have been increased.

3. **Dairy association of Zambia to lobby government to stop exportation of maize bran – DAZ to help some private partners to start producing maize bran for farmers locally.**

Over the recent years Zambia has recorded a bumper harvest in maize production. At the end of 2013 the government of Zambia has lifted the export ban on maize bran and now allows maize farmers and millers to export their maize bran to the neighbouring countries. However demand for maize bran is constantly on the rise and this had led to increase in price for maize bran. The small scale farmer therefore tends to incur high costs on feeding his or her dairy animals. Dairy Association of Zambia should discuss and agree with the government to reduce drastically the amount of maize bran being exported to other countries. The government should calculate the benefits of using maize bran for the local dairy industry as compared to expert earnings and subsequently stop commercial farmers from exporting maize bran and instead encourage the farmers and millers to engage into maize bran processing. This will result in a high availability of maize bran on the local market for the small scale farmer to purchase at a lower price. The farmer will therefore face lower costs on production (feeding) which will directly increase the profit the farmer will obtain.

4. **Minimize costs to dairy farmers of inputs like drugs, acaricides, pasture seeds, fertilizers, AI and dairy equipment.**

Zambia currently does not practice the manufacture of dairy equipment such as cooling tanks, chillers, tractors as well as extracting semen from bulls for AI. The country however does practice the production of seed for pasture, production of vaccines and other chemicals used for dairy activities. The importation of equipment results in high costs on the equipment which are faced by the dairy farmer as well as the cooperative. Therefore the Dairy Association of Zambia should come in and lobby with government together with the Zambia National Farmers Union to remove any tariffs on inputs to the dairy sector. Tariffs on fertilizer inputs such as phosphate rock, tariffs on equipment such as cooling tanks, chaff cutters, imported semen should all be lobbied for removal. This will reduce the cost of purchase and cost of use of these inputs thereby reducing the cost on production that the farmer will face. The result will be an increase in profits obtained by the farmer. It would also be good if many private sector companies compete for prices and quality of services to the dairy chain.

5. **Encourage a variety of processing channels.**

Currently Zambia dairy milk market has two major processors in Zam milk and Parmalat. This has led to local monopolies and therefore tends to affect pricing of raw milk. The processors being small in number are able to dictate what price they will purchase the raw milk from the farmer. Therefore, dairy association of Zambia, Zambia national farmers union and the government

(ministry of agriculture and livestock) should seize the opportunity to encourage competition between processing firms. DAZ should encourage cooperatives to engage into vertical integration where they are able to carry out processing activities of raw milk, such as Choma and Mpima dairy cooperatives. This will help the farmer sell his or her milk at a relatively better price than currently thereby increasing profitability of the small scale dairy farmer.

In addition the government should extend the economic empowerment fund to dairy cooperatives so that they can acquire the equipment to enable them start adding value to the milk they produce like Mpima and Choma dairy cooperatives.

6. Gender

Encourage all stakeholders to embrace the gender equity. Formal registration of women should be encourages by DAZ. The dairy sector should also become more attractive to youth for the sake of continuity in case of their parents getting very old and unable to perform certain functions in the dairy. Increasing profitability will certainly help in attracting youth, but campaigns may also be good to bring young people with fresh ideas into the dairy sector.

The dairy value chain should encourage more women in the chain as most of the women are widowed and have a responsibility of taking care of their families i.e. feeding them and paying of school fees. So dairy farming can be a good source of the income and the needed proteins for the family. Quality of milk and rearing young calves will improve with more women in the sector.

7. Transparency in the chain

From the focused group discussions we had with the processors it was discovered that the processors were holding on to certain information and could not release it. The information on the cost of production was not released and farmer did not know how the price for milk were determined. DAZ also was given some information but not on the cost of production. More transparency in the chain between cooperatives and processors could be encouraged as the mutual benefits of increasing quantity and quality of milk produced is recognized and an equitable distribution of these benefits within the chain can be achieved. Initiatives of DAZ to boost the total value of the chain must be based on transparancy in the chain, allowing all players in the chain to benefit from this boost, including farmers, cooperatives, processors and service providers. This would create more employment and take farmers out of poverty.

References

- Adams, R.S, L.J. Hutchinson and V.A. Ishler. 2009. Evolution of Milk Production In the Notrth Eastern Region of Romania, Agro-life scientific Journal –volume 2 , Issue 1 , 2013 (ISSN 2285-5718), University of Agronomic Science and Veterinary Medicine Of Bucharest, Romania.
- The Agricultural Consultative forum. 2012. Policy Brief. Vol 1 issue 2, July 2012. Performance and Competiveness of the Dairy value chain in Zambia.
- Freebody, P.R. 2003. Qualitative Research in Education. 248 pp. SAGE Publishers. Newbury Park, CA, USA.
- Kasalo, J. 2013. DAZ. Times of Zambia, 29 July 2013.
- Madalene F.E, R.L. Teodero, A.M. Lemos, J.B.N. Montiro and R.T. Barbosa. 1990. Journal of Dairy Science volume 73, Issue 7 pages 1887-1901
- Makoni, N.; Mwai, R.; Redda, T.; Zijpp, A.J. van der; Lee, J. van de. 2014. White Gold : Opportunities for Dairy Sector Development Collaboration in East Africa. Report 14-006. Wageningen UR
- Mariuki, H.G, Dairy Development in Kenya, FAO 2011 .
- Mohd M.A, M. Najib M and P.K. Eng. 2013. Pasture and fodder establishment and management for smallholder dairy Production.
- Mumba, C., K.L. Samui, G.S. Pandey, B.M. Hang'ombe, M. Simuunza, G. Tembo and S.W. Muliokela. 2011. Economic analysis of the viability of smallholder dairy farming in Zambia. Livestock Research for Rural Development 23 (06).
- Mumba, C. K.L. Samui, G.S. Pandey and G. Tembo. 2012. Econometric analysis of the socio-economic factors affecting the profitability of smallholder dairy farming in Zambia. Livestock Research for Rural Development 24 (04).
- Mumba, C., G.S. Pandey and C. van der Jagt. 2013. Milk production potential, marketing and income oppportunities in key traditional cattle keeping areas of Zambia. Livestock Research for Rural Development 25 (04).
- Pandey G.S, Voskuil G.C.J. 2011. Manual on improved feeding of Dairy cattle by smallholder farmers, Golden Valley Agricultural Research Trust, May 2011.
- Pandey, G.S., B.M. Hang'ombe, F. Mushabati and A. Kataba. 2013. Prevalence of tuberculosis among southern Zambian cattle and isolation of Mycobacterium bovis in raw milk obtained from tuberculin positive cows. Veterinary World, EISSN: 2231-0916.
- Patton, M.Q. 1990. Qualitative evaluation and research methods (2nd ed.). 532 pp. Sage Publications. Newbury Park, CA.
- Silverman, D. 2000. Doing qualitative research: a practical handbook. 316 pp. SAGE publishers, Newbury Park, CA.Staal, S.J., Pratt, A.N and M. Jabbar. 2008. 'A Comparison of Dairy Policies and Development in South Asia and East Africa', PPLPI Working Paper No. 44-1 Pro-Poor Livestock Policy Initiative, International Livestock Research Institute. Addis Ababa.
- Rubin, D. and C. Manfre. 2011. Promoting Gender equitable in Agriculture value chain; Issues, Opportunities and Next step.
- Valeta, A.M. 2004. Zambia Dairy Policy Study. RATES Centre, Nairobi
- World Bank, 2011. Report No. 62377-ZM. "Zambia: What Would it Take for Zambia's Beef and Dairy Industries to achieve their Potential? Finance & Private Sector Development Unit Africa Region
- ZNFU 2013. National Budget submission.

Annex 1: Questionnaire for Farmers.

Section A: Background Information

Name of Farmer……Name cooperative……
Province.....
District.....Area.....Phone number.....

1. What is your gender?

☐ Female ☐ Male

Section B: Milk production and Marketing

2. How many animals do you milk per day (last year Sept 2013 - August 2014)?
☐ 3-5 ☐ 6-9 ☐ 10-13 ☐ 14-17 ☐ ≥18

3. What is the lactation length of your milking cows?
☐ ≤150days ☐ 151-200days ☐ 201-250days ☐ 251-300days ☐ ≥301days

4. How many litres do your animals give per day per animal in rainy season?
☐ 6-10L ☐ 11-15L ☐ 16L-20L ☐ ≥21L

5. How many litres do your animals give per day per animal in dry season?
☐ 4-7L ☐ 8-11L ☐ 11-14L ☐ ≥15L

6. How many litres do you sell per year?
☐ ≤15000L ☐ 15001-30000L ☐ 30001-45000L ☐ ≥ 45001L

7. What is the selling price per litre?
☐ 1.50-2.00ZMW ☐ 2.01-2.50ZMW ☐ 2.51-3.00ZMW ☐ ≥3.01ZMW

8. Where do you sell your milk?
☐ Parmalat ☐ Varun ☐ Dairy Kings ☐ Zam-milk ☐ Cooperatives

9. How is the demand for milk?
☐ Very good ☐ good ☐ bad ☐ very bad

10. How long does it take to be paid?
☐ ≤One week ☐ 2weeks ☐ 3weeks ☐ ≥ 4weeks

11. Does your cooperative get involved in the determination of the milk price?
☐ Yes ☐ No ☐ I do not know

12. If the answer is no who determines the price? (Skip if the answer is yes)
☐ Government ☐ Processors ☐ Farmers

13. Does your cooperative have a contract with the milk buyer?
☐ Yes ☐ No ☐ I do not know the contract.

14. How many litres do you take for home consumption per day?
☐ ≤ 2l ☐ 3-5l ☐ 6-8l ☐ 10L

Section C: Costs of Animal Concentrates, forage production and Animal Feeding

15. What is the source of your concentrates?
☐ Homemade ☐ Buy from agro dealers ☐ do not use concentrates

16. What is the cost of making the concentrates (Homemade) per month?
☐ ≤ 2000ZMW ☐ 2001-4000ZMW ☐ 4001-6000ZMW ☐ 6001-8000ZMW
☐ ≥8001ZMW

17. What is the cost of purchasing concentrate per month (already made from agro dealers) ?
☐ ≤ 5000ZMW ☐ 5001-1000ZMW ☐ 10001-15000ZMW ☐ ≥15000ZMW

18. How much of the concentrate do you give a lactating cow per day?
☐ ≤2kg ☐ 3-4kg ☐ 5-6kg ☐ ≥7 kg

19. How much concentrates do you give per cow per day during the dry period?
☐ 1-2kg ☐ 3-4kg ☐ ≥5 kg

20. What is the amount of concentrates you give per calf per day?
☐ ≤1kg ☐ 1.5kg ☐ 2kg ☐ ≥2.5kg ☐ I do not give concentrates to calves

21. Do you grow any pastures for dairy animals? (if the answer is no skip to next section)
☐ Yes ☐ No

22. What type of pastures do you grow?
☐ Hay ☐ Silage ☐ Hay + Silage ☐ Others

23. What are the cost of seeds used in pasture production?
☐ ≤1000ZMW ☐ 1001-2000 ZMW ☐ 2001-3000ZMW ☐ ≥3001ZMW

24. What are the cost of fertilizers used in pastures production?
☐ 200ZMW ☐ 201-400ZMW ☐ 400-600ZMW ☐ ≥800ZMW

25. What is the cost of weeding the pastures?
☐ ≤150ZMW ☐ 151-200ZMW ☐ ≥201ZMW

26. When do you harvest your pasture (forage)?
☐ March-April ☐ April-May ☐ May –July

27. How much pasture do you harvest from the area cultivated?
☐ ≤2 tone ☐ 2.1-4 tonnes ☐ 4.1-6 tonnes ☐ ≥6.1tonnes

28. When do you use your pastures harvested to feed the animals?
☐ April- July ☐ August- Sept ☐ October – Mid November ☐ May-November

29. What is the size of the land grown for pastures?
☐ 1ha ☐ 2ha ☐ 3ha ☐ ≥4 ha

30. How much hay do you give to a milk producing animal /day?

☐ ≤ 5kg ☐ 6-10kg ☐ 11-15kg ☐ ≥16

31. How much silage do you give to a milk producing animal /day?
☐ ≤ 5kg ☐ 6-10kg ☐ 11-15kg ☐ ≥16

Section D:Breeding, Replacement stock and cull

32. How much do you buy a replacement cow?
☐ ≤5000ZMW ☐ 6000-8000ZMW ☐ 9000-11000ZMW ☐ ≥12000ZMW ☐ Did not buy

33. How much do you sell a culled cow?
☐ ≤1000ZMW ☐ 1001-2000ZMW ☐ 2001-3000ZMW ☐ ≥3001ZMW

34. How many replacement heifers did you buy during the year?
☐ 0 heifers ☐ 1heifer ☐ 2heifers ☐ 3heifers ☐ 4 heifers

35. How many replacement bulls did you buy in the year?
☐ 0 bulls ☐ 1 bull ☐ 2 bulls ☐ 3 bulls

36. What is the average age at first calving for your cows?
☐ 2years ☐ 2.5years ☐ 3years ☐ ≥3.5 years

37. What is the life span of your producing cow in the herd?
☐ ≤3 years ☐ 4-5 years ☐ 6-8 year ☐ 9-10year ☐ ≥11years

38. What is the calving interval of your cows on the farm?
☐ Zero per year ☐ one in a year ☐ one in two years ☐ one in three years

39. How many bull calves did you sale during the year? (skip 40 if answer is 0)
☐ 0 calves ☐ 1calf ☐ 2 calves ☐ 3calves ☐ 4calves

40. What is the selling price of the bull calves?
☐ ≤1000ZMW ☐ 1100-1500ZMW ☐ 1600-2000ZMW ☐ ≥2100ZMW

41. Do you use a bull for breeding (skip 42 if answer is no)?
☐ Yes ☐ No

42. How much does it costs to buy a bull?
☐ ≤5000ZMW ☐ 5100-8000ZMW ☐ 8100-11000ZMW ☐ ≥11100ZMW

43. Do you use artificial insemination (if answer is no skip to next section)?
☐ Yes ☐ No

44. What is the total cost of insemination?
☐ ≤50ZMW ☐ 51-100ZMW ☐ 101-150ZMW ☐ ≥151 ZMW

45. How many insemination do you do before the cow conceives?
☐ One ☐ two ☐ three ☐ four

Section E: Transport of Milk

46. What type of transport do you use to deliver the milk to Milk collection centre?

☐ Walk ☐ Bicycle ☐ Vehicle ☐ Scotch cart ☐ Public transport

47. What is the cost of transport per month?
☐ 20-50ZMW ☐ 51-100ZMW ☐ 101-150ZMW ☐ ≥151ZMW

Section F: Animal health

48. What type of disease prevention do you give to the animals?
☐ Vaccinations, Deworming &Dipping ☐ Dipping only ☐ Dipping and Deworming

49. How much do you spend per animal for disease control per month?
☐ ≤100ZMW ☐ 101-150ZMW ☐ 151-200ZMW ☐ ≥201ZMW

Section G: Building, Equipment and Maintenance costs

50. How much did it cost to build your dairy building? …... /25 years (to determine depreciation)
What is the cost of depreciation of the dairy building?
☐ ≤ 10000ZMW ☐ 10001-15000ZMW ☐ 15001-20000ZMW
☐ ≥ 20001ZMW

51. What are the costs of the maintenance (ZMW) for all dairy building per year?
☐ ≤1000 ☐ 1001-1500 ☐ 1501-2000 ☐ ≥2001 ☐ no maintainance

52. What equipment have you got for dairy? (Skip question if no machinery)
☐ Milking machine ☐ Tractor+ equipment ☐ Milking machine + Tractor +equipment ☐ Cooling tank + Milking machine + Tractor+ equipment ☐ Nothing

53. How much did it cost to buy your dairy machinery? ……/10 years (to determine depreciation)
What is cost of depreciation of your machines?
Tractor+ equipment…… Milking machine……cooling tanks……

54. What is the cost of maintenance of the machines?
☐ Tractor+ equipment……. ☐ Cooling tanks..... ☐ Milk machine.....

Section H: Water

55. Where do you get your water for irrigation of pastures?
☐ Borehole ☐ River ☐ Well ☐ Do not irrigate ☐ Water Company

56. Where do you get the cow drinking water?

☐ Borehole ☐ River ☐ Well ☐ Water Company

57. What is the costs of water bill per month used in dairy?
☐ ≤100 ZMW ☐ 101-150 ZMW ☐ 151-200 ZMW ☐ ≥201 ZMW

58. What is cost of water used in pasture irrigation per month? (skip if pasture is not grown)
☐ ≤150ZMW ☐ 151-200ZMW ☐ 201-250ZMW ☐ 251-300ZMW
☐ ≥301ZMW

59. How many times do you give the animals water?

☐ One time /day ☐ two times /day ☐ three times/day ☐ water is always available

Section I: Labour

60. Do you use your family labour in the farm?
☐ Yes ☐ No

61. How many hours do you spend working on dairy each day?
☐ 2 hrs. ☐ 4 hrs. ☐ 6 hrs. ☐ 8 hrs. ☐ 10hrs

62. What family members are involved in your dairy enterprise?

Male	Number	Female	Number
☐ 18-25	.....		.....
☐ 26-35	.....		.....
☐ 36-46	.....		.....
☐ 47-55	.....		.....
☐ ≥ 56	.....		.....

63. What are the ages of the workers employed at your dairy farm?

Male	Number	Female	Number
☐ ≤15	.....		.....
☐ 16-25	.....		.....
☐ 26-35	.....		.....
☐ ≥36	.....		.....

64. How much do you pay your male workers per month?
☐ ≤500 ZMW ☐ 501-600 ZMW ☐ 601-800 ZMW ☐ ≥801 ZMW

65. How much do you pay your female workers?
☐ ≤500 ZMW ☐ 501-600 ZMW ☐ 601-800 ZMW ☐ ≥801 ZMW

Section J: Miscellaneous costs

66. What is the total cost for the bill of electricity per month?
☐ ≤200 ZMW ☐ 201-250 ZMW ☐ 251-300 ZMW ☐ ≥301 ZMW

67. What is the cost of fuel used on dairy activities?
☐ ≤250 ZMW ☐ 251-300 ZMW ☐ 301-350 ZMW ☐ ≥351 ZMW

68. What are the cost paid for Land Ownership per year?
☐ ≤1000ZMW ☐ 1001-1500ZMW ☐ 1501-2000ZMW ☐ ≥2001ZMW

Checklist for Processors

Name of officer ……Position…….

Name of company.....

1) What volumes of milk do you collect from the cooperative per month?
2) How much do you pay for a litre of milk?
3) Who are other processors collecting milk from the same point?
4) Do you differ in purchasing prices?
5) What is the cost of transporting raw milk per month?
6) What is the cost of labour per month?

7) What is the cost of packaging?
8) What are the other variable costs in processing milk?
9) How much milk is wasted from collection to final processing?
10) What is the cost of electricity per month?
11) How much is the selling price of processed litre of milk.
12) Where do you sell your milk and other dairy products (customers)?
13) How is the demand for milk?
14) Do you export some milk to neighbouring countries?
15) How much milk do you export?
16) How much do you sell per litre of the export milk and other products?
17) What are the fixed costs related to milk processing.
18) What are some of the market challenges you face?
19) What is the cost of maintenance of the equipment?
20) Does milk quality affect pricing?
21) Who determines the milk price?

Checklist for Dairy Association of Zambia

Name…….. Title…….

1 What is the nature of your membership?
2 What activities do you undertake as association to improve the enabling environment in the dairy sector?
3 What challenges do you face as you support the activities of small holder dairy farmers?
4 Give us your view of the market power dynamics between small holder cooperatives and processors.
5 How milk prices are usually set and agreed?

Checklist for Cooperatives

Name…….. Title……
Membership Male…… Female……..

1. What is the role of cooperative in determining the price?
2. What are the sources of income for the cooperative?
3. Do you own or rent the buildings?
4. What assets do you own (chilling tanks, processing equipment, transport etc?)
5. How much do you spend on bills for electricity and water per month?
6. How much is the total maintenance costs for your equipment?
7. What is the depreciation cost for the building?
8. Do you buy milk from Members and sell to Processor?
9. Do you have contracts with the buyers of the milk?
10. What are your markets for milk?
11. What market information do you get for the members?
12. What are your market channels for milk?
13. What are the market challenges you are facing?
14. How many people do you employ?
15. How much do you pay for labour per month?
16. How much do you sell the milk per litre to the processor?
17. How much do you pay the milk per litre to the farmers?
18. Is there any competitor in purchasing of milk?

Check list for Supermarket/Groceries/Vendors

1. What is your selling price of milk per litre?
2. What is your purchasing price per litre of milk?
3. What are the variable cost involved in the purchasing and selling of milk?
4. What are the fixed cost related to selling of milk?

Annex 2. Calculations Value Share

CALCULATIONS:

Farmers

Variable Costs = 67/100 x K2.70
= K1.80

Gross Income = K2.70 – K1.80
= K0.90

Added Value = K2.70 – K0
= K2.70

Value Share = K2.70 x 100/ K9.79
= 27.6%

Gross Margin = K0.90 x 100/ K2.70
= 33 %

Processor

Variable Costs = (40/ 100 x K3.40) + K3.40
= K4.76

Gross Income = K8.60 – K4.76
= K3.84

Added Value = K8.60 – K3.40
= K5.20

Cooperatives:

Variable Costs = (9/ 100 x K2.70) + K2.70
= K2.94

Gross Income = K3.40 – K2.94
= K0.46

Added Value = K3.40 – K2.70
= K0.70

Value Share = K0.70 x 100/ K9.79
= 7.2%

Gross Margin = K0.46 x 100/ K3.40
= 14%

Value Share = K5.20 x 100/ K9.79
= 53.1%

Gross Margin = K3.84 x 100/ K8.60
= 44.7%

Supermarket

Variable Costs = (10/ 100 x K8.60) + K8.60
= K9.76

Gross Income = K9.76 – K9.46
= K0.33

Added Value = K9.79 – K8.60
= K1.19

Value Share = K1.19 x 100/ K9.79
= 12.2%

Gross Margin = K0.33 x 100/ K9.79
=3.4%

Vendors:

Variable Costs = (10/ 100 x K8.60) + K8.60
= K9.46

Gross Income = K12.00 – K9.46
= K2.54

Added Value = K12.00 – K8.60
= K3.40

Value Share = K3.40 x 100/ K12.00
= 28.3%

Gross Margin = K2.54 x 100/ K12.00
= 21.2%

Groceries:

Variable Costs = (7/ 100 x K8.60) + K8.60
= K9.20

Gross Income = K10.50 – K9.20
= K1.30

Added Value = K10.50 – K8.60
= K1.90

Value Share = K1.9 x 100/ K10.50
= 18%

Gross Margin = K1.3 x 100/ K10.50
= 12.4%

Alterra Wageningen UR
P.O. Box 47
6700 AA Wageningen
The Netherlands
T +31 (0)317 48 07 00
www.wageningenUR.nl/en/alterra

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