EFFECTS OF FLUCTUATIONS IN PRICES FOR RAW MILK ON PROFITABILITY OF CATTLE PRODUCTION ENTERPRISE IN BURUNGA SUB-COUNTY, KIRUHURA DISTRICT-UGANDA

BY

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DECLARATION

I Moses Mwesigwa declare, that this dissertation has not been submitted to any academic institution for an award.

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DEDICATION

With deepest love and affection this dissertation is dedicated to the cream in my coffee cup Mrs. Sarah Nassozi, Mwesigwa.

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ABBREVIATIONS

ADAP	Ankore dairy products
AFC	Age of first calving
AIDS	Acquired Immune deficiency syndrome
CI	Calving Interval
DDA	Dairy Development Authority
ERP	Economic Recovery Program
FAO	Food and Agriculture Organisation
GM	Gross Margin
H/C	Heads of Cattle
HIV	Human Immune Virus
LL	Lactation Length
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernization of Agriculture
MAAIF	Ministry of Agriculture Animal Industry &Fisheries
MFEPD	Ministry of finance Economic planning & Development
SCC	Somatic Cell Count
SUMPCA	South Western Uganda milk producers coop. Association
TCO	Technical centre for Operations
UBOS	Uganda Bureau Of Statistics
UPPAP	Uganda Poverty participatory Assessment Project

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May God bless youl.

ABSTRACT

The study was done in Burunga Sub-county to establish impact of fluctuations in raw milk prices and to identify constraints to marketing of raw milk. Seventy seven farmers were sampled from stratified farms according to herd size. The small herds had 1-50 heads of cattle, the medium herds had 50-100 heads of cattle, and the large herds had over 100 heads of cattle.

The majority of cattle owners (47.4%) (n=77) were illiterate, while only 5.3% had studied above ordinary level. The land acreage per unit head of cattle was 1.6, 2.7 and 6.5 acres for the small, medium and large herd size strata respectively. The majority of farmers from the large herd stratum took dairy farming as a way of life; whereas the majority in the medium herd size herd stratum said it was profitable. There was overwhelming gender imbalance in livestock ownership. Ninety point seven percent (n=77) were males as compared to 11.3% . The majority of farmers in the large herd stratum (68.4%), kept local long-horned Ankole cattle, whereas the majority of farmers in the small and medium herd strata (62.5% and 90.5%) kept crosses respectively. All farmers raised their herds on natural pastures, none of the farmers gave supplements to their calves, used manure nor borrowed a bank loan. The mean AFC, CI and LL were 27.9, 16.7 and 10.7 respectively. Farmers were using local, cross bred or exotic bulls for breeding. No farmer used AI. Farmers in the small and medium herd size strata used cross breeds as sires mainly; whereas those with large herds used local Ankole bulls as sires. Eighty eight percent (n=68) were watering their cattle from dams and 12% from river Katonga. Water scarcity during drought and high costs of bush clearing were the major constraint to their

cattle enterprise. Only 32.5% of the overall farmers were members of dairy cooperative; majority of whom were from the small size stratum. None of the farmers added preservatives to raw milk to extend its shelf life. Milk vendor especially pick-up milk traders attributed the payment of low price for raw milk to long distance, seasonal roads and poor quality of milk. For 50.2% of the respondents, the income from raw milk sales could not sustain farm activities; whereas 27.6% had to sell live cattle to manage farm expenditures. Eighty eight percent (n=66) made ghee when there was no buyer for milk, whereas 11.6% retained it for home consumption. Dairy plant managers set lower and upper price limits when prices fell and rose respectively. Disease control costs were in form of tick control using acaricides, antibiotics, anti trypanocides and dewormers.

There was marked rise of prices of milk during dry season averaging Ug. Shs. 340±16.2; and lowest during rainy season averaging Ug. Shs. 150 ±12.2. The average price for raw milk was Ug. Shs. 266±12 for the whole year sales.

The gross margin (GM)/acre for the small, medium and large herd size strata were found to be Ug.Shs. 50,000 Ug.Shs. 93,000 and Ug.Shs. 26,000 respectively

CHAPTER ONE

INTRODUCTION

1.1. Background of study

The livestock sub sector of Uganda contributes 17 % to 19 % of the Agricultural Gross Domestic Product (AGDP) and 7-9 percent of the National GDP (DDA, 2002). Dairying is an integral part of the agricultural system of most parts of Uganda. It is estimated that small holder farmers engaged in mixed farming and pastoralists together own 90 percent of the national cattle herd. (DDA, 2002). A substantial amount of milk consumed in urban centres and towns comes from the rural cattle corridor areas of greater Mbarara district.

Dairy farmers form the majority of 80% of the population whose livelihood depends on farming(DDA, 2002). The benefits of livestock farming are milk, meat, draught power, organic fertilisers, income, savings, and dowry. In addition, hides and skins are the only marketable livestock products that fetch foreign exchange. Milk sales provide the main regular income from livestock. Therefore, if the grassroots livestock farmers are not given maximum support in the marketing of raw milk, the consequences will be detrimental to the development of the livestock industry and the national economy (DDA, 2002).

According to the Dairy Development Authority, the total national milk production in 2006 was about 1.4 billion litres. The western region produced 36%, central 34%, the mid-western 15%, northern 8% and eastern 7 % (Kinani, 2007). In the southern and

western regions, excess milk is poured while there is shortage in other parts of the country. The wastage is due to the inability to establish an efficient system of marketing raw milk. (Kinani, 2007).

Therefore, Burunga Sub County, which lies in the rural cattle corridor, gives a good study area for seasonal effects on prices for raw milk and livestock production.

This study was done to demonstrate how seasonal effects on prices for raw milk affect profitability of the cattle enterprise; and to quantify the losses. The seasonal effects on prices for raw milk tended to differ with season. During the rainy season, when there is a lot of milk on farms, many roads are impassable. Pickup trucks do not go deep in the villages to buy milk. This leaves a kind of monopoly for a few buyers who brave the poor roads to decide the price to offer to dairy farmers per litre of milk. In most cases they offer very low prices that the income from milk sales cripples the purchasing power of the farmers for routine inputs like acaricides, dewormers and veterinary services. The revenue from raw milk sales at such times is too little to be re-invested in livestock production. In the dry season when the prices for raw milk is fairly high, many dairy farmers use the additional revenue from milk sales to pay the debts and outstanding bills incurred in the rainy season while trying to acquire routine inputs and other farm costs.

1.2. Study area description

Burunga sub-county is found in the south western Uganda, Kiruhura district. It borders with Ssembabule and Kyenjojo Districts, with river Katonga making the northern borderline. In the east it borders with Kinoni sub-county, in the south it borders with Rwemikoma sub-county and in the west it borders with Buremba sub-county.

According to the Uganda population and Housing Census (2002), Burunga sub-county had a total population of 9,407, of which 5,321 were males and 4,586 were females. Livestock population by species was 45,000 cattle, 3,000 sheep, 15, 000 goats, 30 pigs and 600 local chickens.

Burunga sub-county experiences two rainy seasons in March to May and September to November. The dry spell is very severe and pronounced especially in June, where many farmers migrate to look for water and pastures. The vegetation is mainly *Acacia species* with thickets. Farmers keep mixed breeds of cattle, sheep and goats. The majority of the cattle are local long-horned Ankole cattle. Milk and ghee are the main products from the cows.

There are seven milk collecting centres in the entire sub-county namely Kiguma, Kibani, Kiringa, Magondo, Nyakariro, Buhembe and Burunga.

1.3. Statement of the study problem

Livestock farming is increasingly becoming difficult due to the seasonal changes in prices for raw milk that are experienced in the dry and wet seasons. However, no study has been undertaken in this area to quantify the magnitude of the problem.

The revenue from raw milk sales is low and often inconsistent that farmers cannot predict the viability for investing in livestock farming.

1.4. Justification of study

The Plan for Modernization of Agriculture (PMA), Poverty Eradication Action Plan (PEAP), are aimed at improving household income. Thus the effects due to seasonal pattern and how they cause fluctuations in raw milk prices, on the predominantly pastoralist community, needs to be studied critically to help the stakeholders come out of poverty. The findings will be used by livestock policy makers and planners for deciding best measures in livestock development due to fluctuations in prices of raw milk. Farmers should in the long run benefit if livestock planners in the dairy sector address the identified pertinent issues.

1.5. Objectives of the study

i) Identify constraints to marketing of raw milk.

ii) Establish fluctuation patterns of raw milk prices.

iii) Determine effect of fluctuations of milk prices **on household income (????)** and profitability of cattle milk production enterprises.

1.6. Hypothesis

i) There are constraints that affect marketing of raw milk.

ii) There is a pattern in fluctuation of milk prices

iii) Fluctuations of milk prices affects household income profitability of milk cattle production enterprises

CHAPTER TWO

LITERATURE REVIEW

2.1. Milk production Systems

Under the production of marketable milk, the key elements in raw milk production are: the animal, the farmer, the land and technology (Jorgen *et al.*, 1994). Availability of good quality dairy animals, properly trained farmers, access to adequate land and technology resources are vital in enabling farmers to produce milk in excess of their subsistence needs (*Ngigwana,1990*). This is true with any milk production systems (. *Mbogoh et al, 1990, Kurwijila,1990*). Dairy farmers' organizations are important in linking producers to milk markets (Ref, India, Kenya etc). The efficiency of these dairy producer organizations is affected by the nature of management, government interference or wrong policies (Jorgen *et al.*, 1994). Milk in the tropics is produced by a cross-section of farmers. Few are specialized dairy farmers. In many areas, specialized dairy farming is not profitable. Dairy industries vary greatly in tropical countries. Milk producers can be divided into two broad categories; namely the traditional subsistence producers and commercial milk producers (Chamberlain, 1989). The majority of milk is produced by millions of small-holders and semi-nomadic livestock owners (Ref ....). So it is important to include them in development plans for increasing milk production. Women have traditionally been the dairy keepers in many nations (Ref...) but their roles in dairy production have frequently been ignored.

2.1.1. Traditional milk production systems

The two major forms of subsistence milk production systems (small cropping farms that keep livestock for work and milk), and pastoralists who graze cattle, sheep and goats for family milk and meat supplies (Rothenberg, 1976; Wilson and Clarke, 1976 and Nell, 1990). Pastoralists, herding cattle, sheep and goats, still occupy many of the drier areas of East Africa. Very few of these pastoralists now lead a true nomadic lifestyle. Most are classified as trans-humance, seasonally moving stock to take advantage of feed and water in different locations (Chamberlain, 1989). The pastoralists survive in areas where no other form of production is possible by taking advantage of short periods of good water and grazing. They make use of areas with 300 mm or less rainfall, often irregular and unreliable. The pastoral livelihood strategy is through production of milk (Jahnke 1982,). According to Pratt and Gwynne (1977), Cossins (1983) and Dyson-Hudson (1982) this strategy of production and consumption of milk has enabled the pastoral rangelands to have a high human support capacity per unit area of land than if they were to adopt beef production systems.

2.1.2. Commercial milk production systems

Most of the small holders, crop farmers and pastoralists are moving into commercial milk production as a source of regular income. Many small holders selling milk regularly only own one-to-four cows. Some sell their milk directly to customers in their village or

nearby cities. They can also; others sell directly to sell to milk cooling plants or through a cooperative marketing scheme. Collecting and bulking these small amounts of milk produced by millions of individual small holders can channel large quantities to urban consumers. According to Jorgen *et al.*, (1994), Dairy Cooperatives have to operate as business enterprises rather than as social or political entities. Enabling policy and legal framework are essential for their effectiveness. The involvement of key players such as women has been shown to be central to success of operating Dairy Cooperative ventures. Although milk collection and cooling is still the most effective way of delivering milk from rural based producers to urban markets, options suitable for small scale processing operations offer better economic returns and marketing efficiency in particular circumstances (Jorgen *et al.*, 1994).

Efficiency in milk marketing and processing need not be very sophisticated as long as it enables milk to reach the consumer in an acceptable form and at an affordable price. Marketing of raw milk through private milk vendors has been successful but measures against adulteration should always be considered (DDA, 2002).

Peasant producers can only supply little milk for the expanding city markets. It has been observed that tropical farmers concentrating on dairying as a commercial business are producing more milk. Due to ever increasing demand, large specialized dairy farms are becoming more important source of milk in many tropical countries. However, many very small farmers are also trying to produce milk regularly for sale.

2.1.3. Effects of seasonal pattern on milk production and marketing

New forage growth at the start of the wet season rapidly increase milk yield; and may even occur as late as six months after calving. For tropical farms with seasonal rainfall, calving time has a major effect on collection of milk production. Many milkers show that where the seasonal nature of feeding cannot be altered, it is best to have cows calve at least one month after the start of the wet season. Cows will calve in better condition, calf weight is improved and the cow will have a good chance of conceiving again (Chamberlain, 1989; Smith, 1985).

Lack of all-weather roads hinders community development. A poor road network not only means that poor farmers cannot reach health care facilities, school, and markets, but that services such as security bodies and suppliers, cannot reach the community. Of equal importance, lack of transport isolates communities and also contributes to poverty. Roads and transport still make collection and distribution difficult. Access to scattered and distant small farms is often no more than a rough milking track. Transport methods range from head load to bicycles and, motor vehicles (DDA, 2002).

Milk is generally not cooled on farms in developing regions. Milk producers and users have adopted in many ways to lack of cooling. Much dairy development has taken place close to cities where milk can be sold direct from the cow into the consumer's containers. Milk from farms within a one-hour radius of the city may be collected twice per day by private vendors and transported by bike or cans to customers. Preservatives (like

peroxides tablets) are some times added to milk immediately after milking to help maintain its quality. (Chamberlain, 1989).

2.2. Factors affecting milk production

Projects to improve milk production in tropical countries are high on the priority list of international and bilateral aid agencies. Yet to a greater extent than in any other area of agricultural development, the failure rate has been discouragingly high (Preston, 1989). Most errors can be traced to the transfer of the "wrong" technology; thorough a failure to understand the different roles of milk production in developing countries. The specialized dairying model of advanced countries has been shown to be inappropriate; building on, and improving existing systems is proving to be a more cost- effective approach, and much more likely to succeed technically as well as economically (Preston, 1989). The range of farmers producing milk in the tropics is very varied, with the majority of milk coming from mixed, small family farms with multi-purpose livestock. Such variety makes it dangerous to generalize about the best course for improvement. However, it is important to differentiate between large specialized dairy farms and small traditional livestock owners to satisfy increasing demands.

Intensive dairying can only be successful where there is an organized stable market, a large amount of capital, a high standard of management skills and advice, productive livestock and regular supply of good quality fodder. When any of these factors is lacking, intensive dairying should not be contemplated (Chamberlain, 1989). At the other end of

the scale, are the traditional subsistence milk producers, whose stock produce and breed at very low levels surviving on otherwise wasted vegetation and poor quality crop residues, with a minimum of a management and health care. Although livestock productivity is low in those traditional systems of management, the cost of producing milk from them is also low; so they can provide a cheap source of milk for the cities. Individually, traditional farmers can only increase their production at a limited rate; but millions of farmers, each slowly increasing his production, can contribute a great deal.

Lack of education amongst small farmers in developing countries has made progress difficult in improving market for milk and dairy products. Also small subsistence farmers' production is the low leaving little surplus milk to market. Where both literacy and income are low, it is very difficult for farmers to change from their traditional ways of marketing. However, the income earned by small scale farmers from surplus milk has encouraged them to increase production in many tropical countries without affecting their cropping and beef output (Chamberlain, 1989). The most important limit to increased production from subsistence small scale farms has been availability of land. This is further complicated by the low milk productivity of cattle kept. The productivity of indigenous tropical livestock which is adopted to tropical conditions is low with wide inter-calving intervals. The exotic suitable dairy stock cannot tolerate local climate, diseases and parasites; and convert local feedstuffs into livestock products, hence not suirable for the poor rural subsistence farmers. It is therefore desirable to select best milkers among the indigenous cattle. This would involve use of proven good local bulls with history of siring good milk output offspings. The identification of such bulls will

involve progeny testing which has often proved difficult with tropical rural subsistence herds. If progeny testing is impractical, the best cows should be identified by their own performance and used to produce bulls.

These bulls should be used over herds for only a short period and replaced and hopefully better bulls become available. The weakest link in most dual and multi-purpose large ruminant production systems is the rearing of the calf. Under pastoral conditions, with wet and dry seasons, young stock post-weaning are subjected almost invariably to a deficiency of protein relative to energy in the absorbed nutrients from the digestive tract. This results in reduced feed intake and consequently energy deficiency. In societies that depend on milk as a dietary staple food, the young calf and people compete for the available milk supply. This is indicated by the purchase of maize grain by Kenyan pastoralists during periods of low rainfall (and therefore at a time when pastures are deficient in protein and fermentable Nitrogen). The maize purchases by the family were inversely related with milk off-take. The reduced amount of milk available for the calves can be highly detrimental, particularly when the herd is grazing on dry pastures or crop residues. The cows will yield less at this time, due to the imbalanced feed available. Thus the calf suffers both counts: an imbalanced basal diet together with a reduction in the supply of by-pass nutrients from milk (Fatullah and Preston, 1985).

2.2.1. Demand for milk

The per capita consumption of has increased over the last five years from a low of

30 litres per year to a level of 40 litres as of 2001(DDA, 2002). However, this is still below the World Health Organisation recommended level of 200 litres/person/year. In urban areas, the per capita consumption is higher and estimated at 48 litres/year while in rural areas it is estimated at 22 litres/year (DDA, 2002).

Milk supply in most tropical countries falls short of demand; so much of the milk sold in urban areas is manufactured wholly or partly from imported ingredients, which are expensive unless supported by foreign aid. These imported ingredients have been helpful but have also created some problems. Local preferences, for sweetened, rejected milk in particular, have developed, reducing interest in locally produced fresh milk. Care must be taken in the future that overseas aid does not jeopardize the development of local dairy industries. There are many reasons for suggesting that the most economic way of meeting the increasing demand for milk in developing countries is through improving the existing livestock production systems based on the multi purposes animal, rather than by developing specialized milk and meat production.

High levels of milk production (e.g. from specialized dairy breeds) are impossible in the humid tropics because the cows have problems in disposing of the heat produced by the digestion and metabolism of the large amounts of feed required for high production. (Preston, 1989). The demand for fresh milk and dairy products varies from country to country. Some areas have traditionally used milk and dairy products, while for others it's an addition to the traditional diet. Fresh milk consumption is often limited to the richer classes and expatriates in the cities. Where there is good price for milk the small holders will tend to use less of their dairy produce at home and sell more to increase their incomes (Land O'Lakes, 2001).

. People in developing centuries are slow to abandon traditional products, they have taste preferences for certain products and prefer milk from one species of animal more tan that from others.

Recording the milk production of individual cows in an integral point of dairy cattle improvement and is an internal part of dairy cattle improvement and is the basis of pregnancy testing. In many tropical countries there is no organized milk recording service, proportion of cows. Milk recording in most countries has five main objectives: to help farmers to maintain an efficient herd and to provide data for pregnancy testing and government planning. If farmers feel that official interests are the main reason for milk recording then they are unlikely to participate (Chamberlain, 1989).

There must be obvious incentives for the farmer because it does mean extra work for him. Farmers could possibly be paid for records kept and be given free advice, free inseminations, perhaps even free recording until the benefits of recording are apparent.

2.2.2 Constraints to increased productivity of the livestock enterprise

Consultations revealed that the objective of most poor farmers is to move out of poverty by improving and sustaining their productivity. To do this, households that are engaging in agriculture and fishing must overcome the constraints that affect their productivity that are at household level, and they maximize the utilization of the assets, resources and opportunities that are available to them. However, poor farmers are often frustrated in

their efforts due to failure to access simple and basic requirements (MAAIF, 2000). The constraints are: - effects of land tenure and policy, effects of HIV infection and AIDS, effects of land tenure and policy to milk production, marketing infrastructure constraints, poor roads and transport networks, poor storage and processing of raw milk, policy and supervision of dairy development.

2.2.3 Land tenure and policy

Although fairly comprehensive Land Act was enacted by Parliament in 1998, it still remains to be implemented to bring about the desired changes in land tenure systems, land policy and land registration as well as land administration improvements. Thus, the constraints of the land tenure system that are not conducive to the emergence of land markets persist. Also the issue of land ownership and inheritance by women who are key stakeholders in agricultural production has not yet been resolved. In addition, the lack of a centralized land registry results in difficulties in getting land title deeds in rural areas. (MAAIF, 2000). Production is constrained by shortages of land, for example in the south west, due to fragmentation, small holdings, population pressure and forced sale of land to meet necessities. Other constraints include declining soil fertility, overuse of small plots, poor methods, and erosion and drought conditions. Local people recommend sensitization on proper land management techniques, and demarcation of plots with title deeds to avoid disputes (MAAIF, 2000)

2.2.4 HIV/ AIDS infection

The HIV/AIDS epidemic continues to impact negatively on agricultural production. It has the impact of loss of skilled and unskilled labour that would otherwise be engaged in livestock production, research, and extension services and in policy formulation and implementation. It has a direct impact on loss of assets and use savings for medical care and funeral expenses. HIV/AIDS mitigation measures therefore, will have a positive impact on agricultural production, household incomes and people's welfare. Malaria, which is also endemic in most parts of the country also contributes to, loss of skilled and unskilled labor, decreased productivity and capacity to generate incomes that could be invested in livestock production.

2.2.5 Policy and supervision of dairy development

Most countries have government departments responsible for dairy development. The effectiveness of these government organizations varies but is usually invited by lack of trained act ministrations, researches, extension workers and teaches who can help to build up local dairy industry under difficult conditions. Most countries are making an effort to train people in one sections of milk composition but progress can only be show especially if there is in tradition of milking and milk handling (Chamberlain, 1989).

The Government instituted the policy of developing farming activities through organised farmers' groups and cooperatives. This policy was to be executed by the National Agricultural Advisory Services (NAADS).

Donors and non-governmental organisations have also partnered with the Government to implement the policy. For a new policy is to succeed, especially in the livestock sector, which is largely a peasants' occupation, it must be backed by strong and effective education and training of farmers, and advisory and extension services.

Most of the developed countries from which we copy the methods of marketing raw milk and milk processing market their raw milk through cooperatives. A well-organised dairy cooperative union runs on the following principles: a board with term limits, a management team comprising highly-qualified personnel, the ability to recruit members, observance financial controls and procedures, hiring competent auditors, milk quality testing at all levels, training members constantly to achieve quality milk, paying members promptly for their milk and creating saving schemes(Chamberlain, 1989).

Other principles are investing profits, drawing strategic development plans and holding annual general meetings. A cooperative is a business as well as a democracy. It is member-owned, member-controlled and benefits its members (Kinani, 2007).

Milk production in Israel is carried out under the quota system regarding payments to producers; the payment system refers to milk produced within the limits of quota; while production above quota will be paid according to the marginal market prices actually received for that milk-mainly exports. (Dairy Survey report, 1999).

Producer prices include the following elements;

1. A basic price (target price)
2. Payments according to fat and protein content
3. Payments according to Bacteriological quality and somatic cell count (SCC)

The general agreement by milk producers in Israel and the Israel Government is that the price should reflect the average cost of production plus an agreed return for the farmers' labor, and capital invested in the process of milk production (Dairy Survey Report, 1999). The average cost of production is established by conducting a countrywide survey of costs once every two years. This survey includes a very detailed cost analysis for a random

Government has liberalized the dairy sub sector and the monopoly of sub sector activities by the Dairy Corporation has been removed. As a consequence, a number of private sector milk processing activities have started operating in several areas. A dairy development authority has been established and government will continue to support the sub-sector by providing supportive policies, regulation and improving infrastructures (MAAIF, 2000).

2.3. Marketing channels of milk

Before Uganda's dairy sector was liberalised in 1992, the state-run Dairy Corporation Limited held the monopoly for collection and sale of milk in the country (Mutima, 2004). The post-liberalization era saw the entry of many small-scale milk market agents. Because official legislation did not recognize this 'informal' milk market, the sector's operations were largely unregulated with little or no quality controls. Thus, in a bid to remedy this situation the government enacted the revised Dairy Industry Act in 1998 leading to the Dairy Development Authority (DDA) being established as the national regulatory body. The Uganda National Dairy Traders Association (UNDATA) came into

being a year later as the umbrella association of Uganda's small-scale milk traders, cooling plant operators, transporters and processors. Through its chairman, UN-DATA is represented on the DDA board, enabling the voice of the small milk trader to be heard at the national level. UN DATA's overall mission is to promote the marketing of high quality milk and dairy products within Uganda through efficient operation and management of dairy trade. Yet despite these achievements, the group still faces some challenges. Long distances traveled on poor roads cause transporters to incur heavy losses as raw milk goes sour before it reaches the cooling plants. Many farms are difficult to access due to poorly developed rural road net-works; this increases transport costs and often causes farmers to lose market opportunities for their milk. The lack of electricity supply in many parts of rural Uganda hinders the setting up of cooling facilities at milk collection centres. Yet another constraint is inadequate funding to implement formal training courses and purchase better milk handling equipment. Even with these hurdles, UN-DATA is optimistic that with the assistance of the government and development partners, these problems can be overcome and significant improvements in the traditional milk market achieved. UNDATA intends to continue training its members on hygienic milk handling thus acting as a potential avenue for implementing a regional training and certification scheme for small-scale milk traders (Mutima, 2004).

One of the first priorities in developing a dairy industry is to have a stable, organized market that gives adequate returns to the farmers. The factors most likely to increase milk production steadily are a good selling price relative to production costs. Price setting is a major difficulty for governments planning dairy developments, where the overall aim is

to extend milk supplies to the maximum number of people. It's difficult for the industry to satisfy both the welfare aims and the need to be profitable. The most widely acclaimed are milk cooperatives, especially where dairying is based on small-scale farming. Although collecting milk from thousands of small farms seems un orthodox way to run a dairy industry, it can provide a large volume of milk.

Authorities some times assume that milk distribution and sale will take care of itself. Establishing a healthy dairy industry any where in the world depends on a suitable market for milk and milk products and facilities and trained people to collect, process and distribute them (Chamberlain, 1989). The system also provides valuable, regular milk marketing to otherwise very poor village people (Jackson, 1981). There are now many organized milk markets in the tropics but milk is still sold by traditional methods direct from the animal or through a raw milk vendor. These methods lend them selves to milk adulteration (direction with mater or and contamination, although they can be safe and legal if road supervised. Economists in developed countries have tried for years to establish a fair pricing method for milk, usually based on volume, competition and bacterial quality. The only way of healthy dairy industry can be established any where in the world is for producers to have a price incentive and for consumer to be able to afford the product. If milk is good at a price that neglects the true cost of producing, processing and distributing it, consumption is limited to the higher income groups.

The wealthier sector is also likely to buy luxury products like fresh cream, butter and Ice cream. So some portion of the market can be aimed at them for maximum profits.

However, milk pricing must not neglect part of its purpose, in extending milk supplies to the lower income groups ways must be found for simple, low cost packaging and distribution (Chamberlain, 1989). The easiest way to increase milk yield is to offer a favorable price to farmers. Price stability holds the producers confidence, encouraging them to supply the market regularly. Where milk supply is seasonal, processors can keep their prices stable by making storable products.

2.4. Factors affecting pricing of milk

At present there are no effective grassroots/villages-based, commercially oriented institutions capable of mobilizing the production capacity of small producers for the production of income-generating commodities. The co-operative movement and other farmer's organization are yet to be empowered, moved away from political hegemony, donor dependency and be allowed to operate independently and on a commercial basis.

The founders of cooperatives often turn out to be autocratic, hard to remove from elective offices and usually attempt to use their positions on the governing board to draw unfavorably large allowances to the detriment of the cooperatives they helped form.

Therefore, members of dairy cooperatives need to be educated on the principles of cooperatives and good governance so that their members can understand issues relating to controls and member economic participation (UNDFA, 2007).

The main constraints facing milk cooperatives include adulteration of milk using water, milk getting spoilt as a result of additives meant to preserve it and the high cost of chilling equipment such as coolers and deep freezers.

The high electricity tariffs, bad leaders, negative attitudes towards cooperatives resulting from their mismanagement in the past, disorganised division of labour, poor pyramidal control of activities, and poor human relations are also hindering progress.

Other constraints are poor communication between the executive committees and the grassroots dairy farmers, greed, embezzlement, lack of conflict management skill, inadequate funding, inadequate education and training and lack of advisory and extension services for the dairy farmers regarding the formation and operation of dairy cooperatives (UNDFA, 2007).

2.4.1. Milk marketing infrastructure constraints

Inadequacy of physical infrastructure such as feeder roads, communication facilities, power supply, education and health facilities, water supply and market infrastructure continue to constrain marketing of agricultural produce and investments in rural areas and are responsible for the high market transaction costs (MAAIF, 2000). The availability of statistics regarding food crops and export crops is unsatisfactory. Many agencies are involved in the collection and dissemination of agricultural data and they are not well co-ordinated. Organizational and financial as well as managerial deficiencies are acute in most of these institutions. Also the potential users do not know the work of the various agencies. There is therefore, an urgent need for the establishment of information services that is acceptable to producers and market operators (MAAIF, 2000). Market problems:

Serious constraints exist to successful marketing, realization of profits and thereby affordability of basic livelihood assets. Low and fluctuating prices resulting from seasonal fluctuations in the supply and demand for agricultural produce coupled by force sale due to demand for cash to meet basic needs (health, education and food) do not allow farmers to strategically sale produces when prices are high. In many districts, ready markets are not available for sale of produce and purchase of inputs. Long distances to produce markets, impassable and lack of affordable transport, especially in the rainy season, further hamper market access. High market dues for produce sales in general, licenses for fisher-folk and traders, and livestock slaughter fees, relative to low incomes are said to eat into market profits (UNDFA, 2007). The market tendering system was seen by poor farmers as corrupt and exploitative. Although both men and women are involved in marketing, women may have limited access to the profit. Further, women appear to be most affected by inadequate market facilities, such as sanitation or shelter. Therefore, poor farmers recommend construction of communal collection facilities; organization of farmers groups to bulk market produce; creation of a conducive environment for local trade; improvement of marketing networks; development of strategies to eliminate exploitation by middlemen; access to marketing information; and a review of the current local market management, dues collection and tendering.

2.4.2. Economics of improving milk quality

Milk is most easily contaminated and perishable agricultural product, as it is an ideal medium for bacterial growth. Milk quality starts to decline immediately after milking due to bacteria and other contaminants entering milk. The speed at which quality declines depends on the hygiene of the milker, milking equipment and storage vessels as well as

the temperature and length of time that milk is stored before sale to the consumer or treatment at a factory. Tropical conditions are ideal for quick milk deterioration (Bachmann, 1985).

The milk standards act must relate to local conditions if milk is boiled before use and consumed within hours of production, then high quality standards are not so abundant. As the time between production and consumption increase, then standards of milk quality on the farm must also increase. If the cost of improving quality exceeds the benefit to farmers in terms of increased income, it will not work. Farmers must see a suitable incentive to improve through pricing and improved markets. From past experience, the best way to improve milk quality is by paying premiums for good hygiene and composition (Korhonen, 1980).

By working together with the government and stakeholder NGOs, UNDATA seeks to enhance solidarity among Uganda's small-scale milk traders and promote safe and efficient production, handling, distribution and marketing of milk. This unified stance has fostered efforts to improve milk quality particularly in the informal sector where raw milk sales dominate. By educating its members on milk quality and safe milk handling, the association has influenced many transporters to switch to carrying milk in hygienic metal cans instead of using cheaper non-food grade plastic jerry cans. Some small-scale processors have also sought to add value to liquid milk by adopting appropriate technologies such as batch pasteurization, fermentation and cooling, which also enhance milk safety (DDA, 2002).

2.4.3. Marketing costs

At present both investment finance and working capital are the main bottlenecks for smallholder agricultural production. Yet creation and sustenance of a dynamic and productive modern agricultural sector would require a continuous basis of the uptake of new, more productive and high-yielding technology by farmers. Thus creation of viable and sustainable rural financial systems is one of the key elements to agricultural development because most of the productive and high-yielding technologies have to be made available to farmers only as purchased off-farm inputs (MAAIF, 2000)

Lack of capital and access to credit: lack of capital financial, management skills, and failure to access credit facilities in urban centers; unfavorable borrowing terms particularly short and ill-timed repayment schedules. They stated that they need funds to tide them over during times of seasonal hardship, to purchase new inputs, and to start new income generation ventures. Further, public credit delivery, such as "Entandikwa," was seen to have failed during implementation. Women report that small-scale informal credit for household items and service delivery fees is available to them through revolving savings groups in some communities. Poor farmers recommend credit in kind, as well as cash; user-friendly terms to suit their mode of livelihood; youth schemes; channels of distribution outside of Government.

2.4.3. Storage and processing of raw milk

Chilling centres have been established in many areas where farmers can bring their milk for cooling before it's transported to the city (SUMPCA, 2003).

Milk is bought fresh and it is traditionally boiled before use. Lack of storage and processing: Lack of storage limits the marketability of perishable goods, such as

vegetables, fish and dairy products. Further, mention was made of the lack of grinding mills and fish processing facilities (drying, smoking, salting) close to communities.

In addition to appraisal work, the Technical Center for Operation (TCO) has also been committed in giving support to existing farmer's organizations. For example SUMPCA (South Western Uganda Milk Producers Cooperative Association) was created in 2001 following the involvement of south- western dairy farmers in research activities, in partnership with the French research institute CIRAD and the French Embassy. The association benefited in late 2002, before the launching of the project, a support from the French Embassy aimed at facilitating the attainment of milk cooler (6 months renting), cans and other small equipment. At the end of the 6 months renting period, the association eventually bought the cooler on a rent and purchase basis (SUMPCA, 2003).

. This milk collecting centre, which is probably the only real cooperative milk collecting centre in the District (both owned and managed by the association), encountered small difficulties at the beginning (problem of payment by the processors and insufficient market, but now performs very well. Its average marketed volume is around 2000 litres a day and the good (and unexpected) economic results allow SUMPCA to accelerate the reimbursement program, and also to invest in new collective assets (milk cans, improvement of the premises and so on. (SUMPCA, 2003).

CHAPTER THREE

MATERIALS AND METHODS

3.1. This was a cross-sectional survey in Burunga sub-county which is found in the south western Uganda, Kiruhura district. It borders with Ssembabule and Kyenjojo Districts, with river Katonga making the northern borderline. In the east it borders with Kinoni sub-county, in the south it borders with Rwemikoma sub-county and in the west it borders with Buremba sub-county.

The study was done in four parishes namely: Magondo, Kiguma, Burunga and Rwiigi. Magondo represented the mixed crop and cattle production system, Kiguma represented the pastoral production system, Burunga represented areas with small herds and crop production system and Rwiigi was mainly crop dominant area.

3.2. Sample size estimation

The data from milk collecting points and dairy plant managers indicated that at least ninety (90) farmers from the above four sub counties consistently delivered milk for sale at the various collecting centres in the sub county. This necessitated stratifying farmers into three herd size categories of small, medium and large, each comprising at least thirty farmers for random sampling sampling.

The sample size was determined using Krejcie and Morgan, (1970) format (appendix i); in which seventy seven farmers in total out of the three herd categories were sampled from stratified farms according to herd size. The small herds (n=24) had 1-50 heads of

cattle, the medium herds (n=26) had 50-100 heads of cattle and the large herds (n=21) had 0ver 100 heads of cattle. Ninety five farmers were selling milk in the entire sub-county. Twelve of the respondents were female and 65 were men. There were ninety five farmers who sold milk in the entire sub county.

3.3 Data collection, quality assurance and analysis

A questionnaire was designed (appendix ii), which was predominantly quantitative, historical and descriptive survey. The sampling was done at dairy plants and milk collecting centres, dairy farmers, and mixed farmers and beef farmers in Burunga sub-county. Prominent Dairy farmers, Milk processors, managers of Milk collecting centres were interviewed.

Questionnaires and in-depth face–to-face interviews and examination of farm records were used to gather the information. Participatory rapid appraisal methods were used to collect qualitative data on bush clearing, drinking water for cattle, out-standing constraints on the farm, why they chose dairy farming; how the fluctuations have affected the farm, form of raising replacement stock.

In addition, a questionnaire was used to collect quantitative data on income from raw milk, inputs and out puts from the milk production enterprise.

Quality assurance was done by asking similar questions in a different way, and by going back to the field to cross check or clarify the findings.

Data was entered in EXCEL (5.0) and the following analyses were made:

i-Descriptive Statistics

ii-Statistical Analyses- chi-square test and students t-test

iii-Economic Analysis

3.4 Economic analysis

Economic analysis was done to determine the gross margin (GM) - which is calculated as Gross output less variable costs. This can be represented by the equation as:-

GM=Gross output-Variable costs

Sensitivity analysis when prices are stablised during wet season, if prices stabilized, got by multiplying annual sales with average unit price of cattle and litre of milk

CHAPTER FOUR

RESULTS

4.1. Characterisation of milk production system

Seventy seven farmers were sampled from stratified farms according to herd size. The small herds had 1-50 heads of cattle, the medium herds had 50-100 heads of cattle and the large herds had over 100 heads of cattle. Twelve of the respondents were female and 65 were men .The level of education of owners of the farms is shown in Table 1.

Table 1. Percentage distribution of respondents based on level of education

Level of education	Small	Medium	Large
Illiterate	20.8	11.5	47.3
Primary	33.3	50	31.6
Ordinary level	37.5	30.8	15.8
Above ordinary level	4.4	7.7	5.3

Farmers in the large herd strata category were most illiterate than farmers in the medium herds(X^2=5.9, $p<0.05$) and small herds (X^2=4, $p<0.05$).

4.2. Land and herd size of cattle keeping households

The average land size and mean herd size per household class herd holding structure were as shown in Table 2. Thirty three point eight percent (n=24) of the farmers were with small herds, where as 36.6% (n=26) had medium sized herds and 29.6 %(n=21) had large herds.

Table 2. The average land size and mean herd size per household class herd holding structure.

Herd size category	Mean land acreage	Mean cattle herd size	Acreage per unit head of cattle
Small	58.6±4.4	37	1.6
Medium	99.2±5.5	62	2.7
Large	239.5±29.7	129	6.5
Overall average	132.4	76	3.6

4.3. Engagement in dairy farming enterprise

The reasons given by farmers as to why they engage in dairy farming enterprise were given as shown in Table 3.

Table 3. The reasons for engaging in dairy farming enterprises given as percentage.

Reason	Herd size category		
	Small	Medium)	Large
Its good	16.7	32.6	28.6
Its profitable	24.1	65.5	37.6
Its a way of life	13.2	17.8	40.1
Its the activity I can manage	0.6	0	1
Its what I grew seeing	9.6	17.8	22

4.4. Cattle ownership

Ownership cattle herds by gender were as shown in Table 4.

Table 4: Percentage ownership of cattle herds as by gender

Herd category	Men	Women
Small	83.3	16.7
Medium	87.2	12.8
Large	94.7	5.3
Overall average	88.4	11.6

4.5. Breeds of cattle reared

The breeds of cattle kept were local long horned Ankole Sanga cattle and Ankole-Friesian crosses. .Some of the farmers keep local Ankole breed or Ankole-Friesian crosses alone, others kept both the local and Ankole-Friesian crosses. Details are shown in Table 5.

Table 5. Percentage of farmers according to different herd strata and the breed of cattle.

Herd category	Breed of cattle kept		
	Local Ankole	Crosses	Both local Ankole and crosses
Small	20.8	62.5	16.7
Medium	9.5	90.5	0
Large	68.4	31.6	0

The medium herd sized farmers kept significantly more improved dairy crosses than small herd sized farmers (X^2=6.46, $p<0.05$) and large herd sized farmers (X^2 =18, $p<0.001$). Small farmers also kept more improved dairy breeds than the large herds (X^2 =7.15, $P<0.01$)

All farmers raised their herds on natural pasture. None of the farmers supplemented their cattle, used manure, used draft power nor borrowed a bank loan.

The cattle on farms of the different herd size strata were of different age groups. Percentage herd age specific composition was as shown in Table 6

Table 6. Herd age specific composition on small, medium and large herds

Herd size category	Lactating cows	Dry cows	Heifers	Female calves	Male calves	Steers	Bulls
Small	25.5	15.1	29.2	24.3	1	4	0.9
Medium	24.3	13.4	22.8	23	4.2	11	1.3
Large	23.9	12.8	30.2	26.7	2	3	1.4
Overall Mean	24.6	13.8	27.4	24.7	2.4	6	1.2

The averages age at first calving (AFC), calving interval (CI) and lactation length (LL) at different herd size strata were as shown in Table 7.

Table 7. The mean age at first calving, calving interval and lactation length at different cattle herd size strata

Production parameter	Small	Medium	Large	Overall
Mean AFC (months)	27.6± 2.3	26.8 ± 2.4	29.3 ±1.6	27.9
Mean calving interval (months)	16.7 ± 0.7	16.1 ± 0.4	17.3 ±1.7	16.7
Lactation length (months)	10.8 ±0.4	10.2 ±0.7	11.2±0.7	10.7

Farmers are using local, cross bred or exotic bulls for breeding. No farmer used Artificial Insemination (AI). The percentage using sires of a particular type were as shown in Table 8. Majority of the farmers in the large herd strata were using local Ankole bulls as sires.

Table 8. Percentage of farmers in different herd size strata using a particular sire type.

Herd category	Sire breeds type (%)		
	Local Ankole	Ankole-Friesian crosses	Fresian exotics
Small	16.7	41.7	31.6
Medium,	31.6	68.4	0
Large	63.2	26.3	10.5

4.6. Constraints to dairy cattle keeping enterprises

The overall cattle farmers' perception as constraint to cattle keeping enterprises were as shown in Fig. 1. Meanwhile farmers perception based on herd size category were as shown in Table 9. Scarcity of water and drought were the major constraints affecting 80% of the farmers. Drugs and treatment was the least constraint was t he least constraint. Farmers perception was that water scarsity, drought and high cost of bush clearing were major constraints to cattle keeping, but not income.

Table 9. Percentage of farmers who cited a certain constraints to their cattle keeping enterprises

Constraint	Herd size strata		
	Small	Medium	Large
High cost of bush clearing	45.8	53.8	14
Drugs for treatment	24	31	5
Water scarcity & drought	41.7	42.3	62
Low Income from milk	12.5	3.8	19

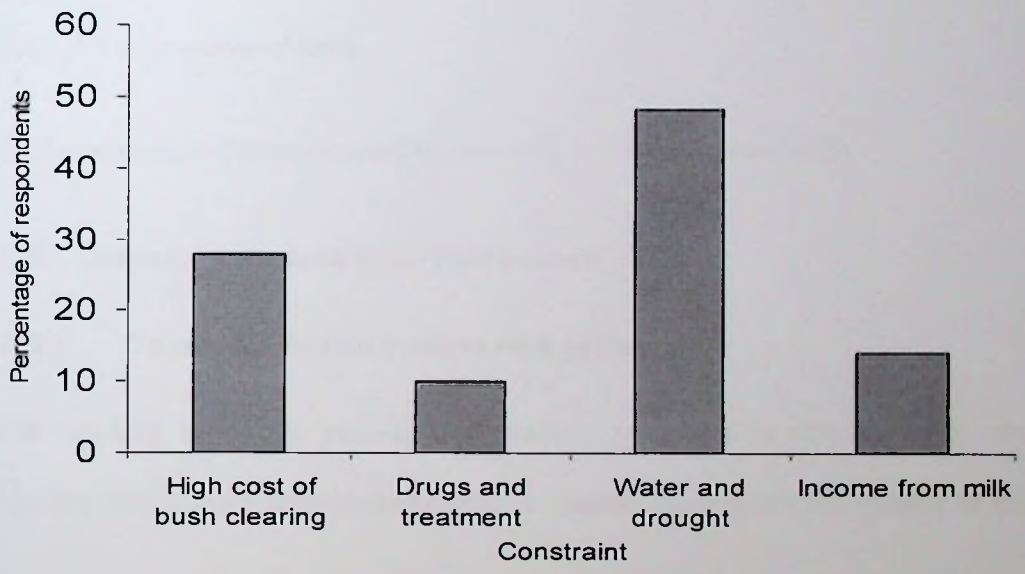


Fig. 1: Percentage of farmers who cited a certain problem being a major constraint in their cattle keeping enterprise

4.7. Constraints to marketing of raw milk

4.7.1. Membership to dairy cooperative societies

Thirty two point five percent (n=25) were members of dairy cooperative society. Fifty four point two percent of farmers in small strata herd size, 30.8% in medium size and 19% in large herd size belonged to dairy cooperative societies. The small herd sized farmers had significant participation in co-operatives than the large herd sized farmers (X^2=5.9; $p<0.05$). The participation of small and medium gherd sized farmers in co-operatives were not significantly different (X^2=2.8, $p>0.05$).

4.7.2. Preservation of milk

No Farmers added preservatives to raw milk to extend its shelf life.

4.7.3. Seasonal raw milk price fluctuations

4.7.3.1. Cuases for fluctuations on milk prices

Milk vendors, especially pick-up milk traders' responses to why they buy raw milk at such low prices were attributed to: distance, season, poor roads and quality of milk.

Dairy – plant managers and pick-up milk traders were asked whether they give incentives, for example better prices to farmers with high quality milk. No incentives were given to farmers with high quality milk.

4.7.3.2. Farmer response to fluctuations of milk prices

The dairy enterprises were affected by seasonal fluctuations in prices of raw milk. The farmers' response on how fluctuations in prices for raw milk affect their farms were as shown in Table 10.

For most farmers, sales from milk were not enough to meet their operational costs. Not a significant portion of them was selling their cows to meet farm operational cost.

Table 10: The percentage farmers' from different strata response about how fluctuations in prices for raw milk affect their farms.

How fluctuations of milk prices affect farm activities	Small	Medium	Large
The income from raw milk sales cannot sustain farm activities	54.2	65.4	52.3
Have to sell live cattle to manage farm expenditures	25	23.1	33.3
Cannot develop the farm with income from raw milk sales	20.8	11.5	14.3

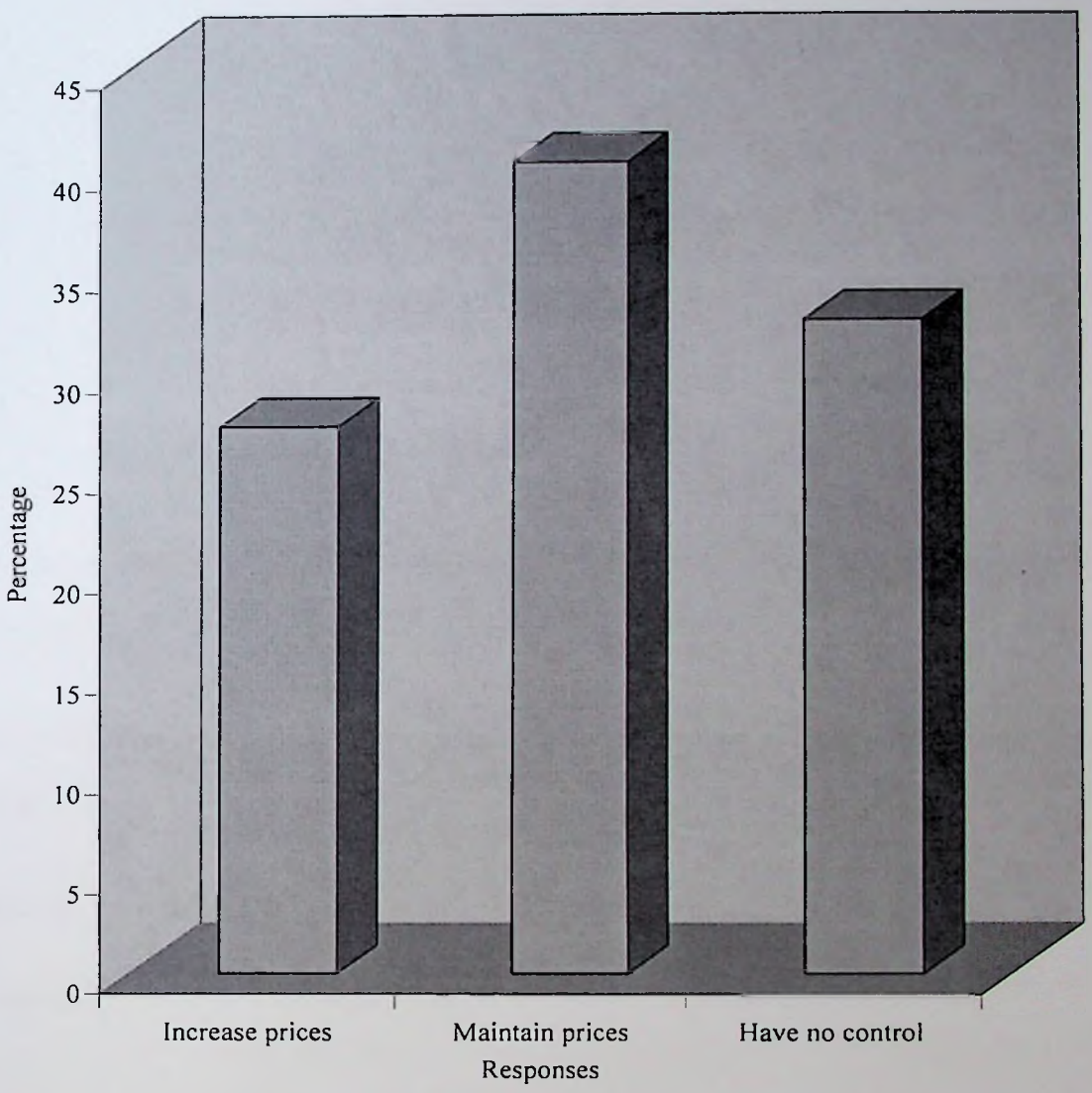
When there was no buyer for raw milk 88 %(n=66) make ghee and 11% drink the milk. The responses responses according to herd size strata when there are no milk buyers were as shown in Table 11. No significant numbers of farmers were pouring milk when it was in excess. Majority used it for making ghee. A kilogram of ghee was sold at Ug. Shs. 6,000. Forty litres of raw milk from Ankole cattle was required to make 1 Kg of ghee, whereas 80 litres of raw milk from Friesian cattle was required to make 1 Kg of ghee.

Table.11. Percentage responses of farmers when there are no buyers

Responses	Small	Medium	Large
Making ghee	65.2	69.2	80.9
Family use	37.5	15.4	9.5
Nothing done (pouring)	0	15.4	4.7

Farmers in the different herd size strata had different coping mechanisms when there are many buyers. The majority maintained prices even when there were many buyers. Their response was as shown in Fig. 2.

Fig 2. Percentage responses of the farmers to many buyers of milk



4.7.3.2. Milk buyers responses to milk price fluctuations

Dairy plant managers set lower price limits when prices fall and set upper limit when price rise. This only happens for farmers who belong to Ankole Dairy Products (ADAP) Cooperative society. *What do milk vendors do?.*

4. 8. Economics of cattle milk production enterprises

The major inputs in cattle production enterprises were labour, buildings for calves and disease control.

4.8.1. Disease control costs

Disease control costs included tick control using acaricides and treatment. The treatment was done using antibiotics, dewormers and trypanocides.

The acaricides used in tick control were: Milbtraz®, Renegade® and Decatix® as shown in Table 12.

Table 12. Percentage use of acaricides in tick control

Herd category	Type of acaricide		
	Milbitraz®	Renegade®	Decatix ®
Small	58.3	8.3	29.2
Medium	30.4	21.7	47.8
Large	52.6	10.5	36.8

Milbtraz® and decatix were commonly used. Decatix® commonly used by medium herd owners, whereas Milbtraz® mainly used by large and small herd owners. The mean

volume of acaricide spray used per adult cattle was 1.6 litres and 0.7 litres for calves. Average costs per lire of acaricides were Ug. Shs. 25,000, Ug. Shs. 40,000 and Ug. Shs. 90,000 for Milbtraz®, Renegade® and Decatix® respectively.

The annual total disease control costs were as shown in Table 13.

Table 13. Annual disease control costs (Ug.Shs.'000) and percentange contribution of each disease control strategy to total disease costs

Input	Herd size categories		
	Small	Medium	Large
Acaricide costs	105.2±42.3 (24%)	211.4±24.3 (24.3%)	272.4±22.8 (21.3%)
Antibiotics costs	165.3±29.7 (37.7%)	275.7±28.6 (31.8%)	405.1±26.9 (31.8%)
Dewormers	99.1±8.6 (22.6%)	267.5±9.6 (31.5%)	405.1±26.9 (31.5%)
Trypanocides	68.5±4.6 (15.6%)	117.1±4.0 (15.3%)	195.6±5.1 (15.3%)
Total costs	438.4	871.8	1,275.7

4.9.2. Labour

The labour was in form of milking, herding, spraying and bush clearing. Family was supplementing paid labour especially in watering, herding and spraying. Details on labour costs per household in different herd category were as shown in Table 14..

The major labour costs in small and medium herd sized farms were incurred in bush clearing, while for large sized farms it was in herding.

Table 14 . Total labour costs (Ug.Shs'000) and percentage contribution of each labour activity to total labour costs

Input	Herd size categories		
	Small	Medium	Large
Herding	368 (33.1%)	558 (30.1%)	754 (53.9%)
Milk delivery	260 (23.4%)	422 (21.6%)	212 (15.1%)
Bush clearing	484 (43.5%)	944 (48.3%)	432 (30.9%)
Total	1,112	1,954.0	1,398.0

4.9.3. Building costs

There were costs incurred in building roofed calf pens and unroofed open boma in the various herd strata. The details were as shown in Table 15.

Table 15. Average costs (Ug.Shs) for building calf pens and open boma and percentage contribution of each building activity to total building costs

Input	Herd size categories		
	Small	Medium	Large
Roofed calf pens	31,250 (60.7%)	32,240 (59.1%)	34,215 (58.4%)
Open bomas	20,263 (39.3%)	22,265 (40.8%)	24,325 (41.5%)
Total	51,513	54,505	58,540

4.9.4. Feeding

Cattle were raised on local pasture, but only supplemented with mineral salt licks. Annual costs incurred in purchase of mineral licks were as shown in Table 16.

Table 16: Annual costs(Ug. Shs) incurred in purchase of mineral licks

Input	Herd size categories		
	Small	Medium	Large
Mineral salt licks	46,333	96,450	154,255

4.9.5. Total input costs of cattle dairy enterprises

The total input costs were as shown it Table 17 .

Table 17. Total input costs (Ug.Shs.'000) for dairy cattle enterprises and percentage contribution of each input to total input costs

Input	Herd size categories		
	Small	Medium	Large
Disease control costs	438 (27,4%)	871 (30.3%)	1,275 (46.8%)
Labour	1,112 (69.5%)	1,954 (67.9%)	1,389 (51%)
Building costs	51 (3.2%)	54 (1.9%)	58 (2.1%)
Feeding	46 (2.9%)	96 (3.3%)	154 (5.7%)
Total costs	1,209	2,104	1,610
Cost per head of cattle	37.8	33.9	12.5

4.9. Outputs of cattle milk production enterprises

The major outputs from milk cattle enterprises were milk and live cattle sales.

4. 9.1. Milk output

4.9.1.1. Fluctuations of milk prices

The average price for milk was found to be Ug. Shs 266±12, 263 ±9, and 176±10.4 for the small, medium and large herd size strata respectively. The mean prices for the dry season were 322±8, 320±9 and 200 for the small, medium and large herd size strata respectively. Whereas in the wet season the mean prices were 267±15, 267±11 and 155±19 for the small, medium and large herd size strata respectively. Monthly variation of milk prices were as shown in Fig. 3. There was a geographical difference in prices offered to farmers. Farmers in the large herd size stratum sold milk at prices lower than their counter parts in the small and medium herd size strata.

4.9.1.2. Seasonal variation of daily milk yield, number of lactating cows and daily milk sales

The mean seasonal daily milk yield, daily milk sales, milk prices, number. of lactating cows, daily herd milk yield (litres/day at any given time in the wet and dry season for each herd size stratum were as shown in Table 18.

4.9.1.3. Seasonal variation of daily income from sale of milk

Daily milk per capita home milk consumption was 0.7 litres and average household size was 13 people. Average daily income due to milk sales during dry season were as shown

in Table 19. Meanwhile for wet season, the average daily incomes due to milk sales were as shown in Table 20.

During wet season, if prices were stabilized, the daily income from milk sales were expected to rise by 20.9% for small herd categories, 19.8% fro medium herd size households and 29% for lsrge herd size households. The variations of daily income with price stabilization to dry season price were as shown in Figure 3. For large herd size households, if pricing of milk is made to be Ug.Shs 320, the daily income from milk sales is expected to rise by 111.3%. The non-saleable milk during wet season was estimated to be 16% for small herds, 13% for medium and 29% for the large herd sized households. The farmers in the large herd stratum will get more money if the prices were stabilised.

Table 18: Average milk yield, price and number of lactating animals per herd size stratum in the wet and dry season.

Herd size category	Mean seasonal daily herd milk yield (litres)		Overall daily milk sales (litres/day)	Overall milk price (Ug.Shs)	Mean number. of lactating cows	Mean milk yield (litres/day)	
	Wet	Dry				Wet	Dry
Small	49.2±16.2	31.7±12.2	32.2±8.8	266±12	10.3±0.6	3.8±0.6	2.4±0.4
Medium	125.2±14.9	75.7±10.7	100.4±13.2	263±9	23±1	5.6±0.7	3.4±0.5
Large	103.2±2.2	68.4±13.4	64.2±14	176±10.4	39.3±2.9	2.6±0.5	1.8±0.5

Table 19: Average and ranges of daily milk sale income (Ug. Shs) per household during dry season

Household herd strata	Daily income ranges		Average daily income
	Lower	Upper	
Small	3,392	11,273	7,332
Medium	17,920	24,768	21,344
Large	9,200	14,560	11,880

Table 20: Average and ranges of daily milk sale income (Ug. Shs) per household during wet season

Household herd strata	Daily income ranges		Average daily income
	Lower	Upper	
Small	6,408	15,059	10,733
Medium	27,047	35,004	31,025
Large	14,260	14,942	14,601

Fig. 3. Monthly fluctuations of milk prices among different herd size strata groupings

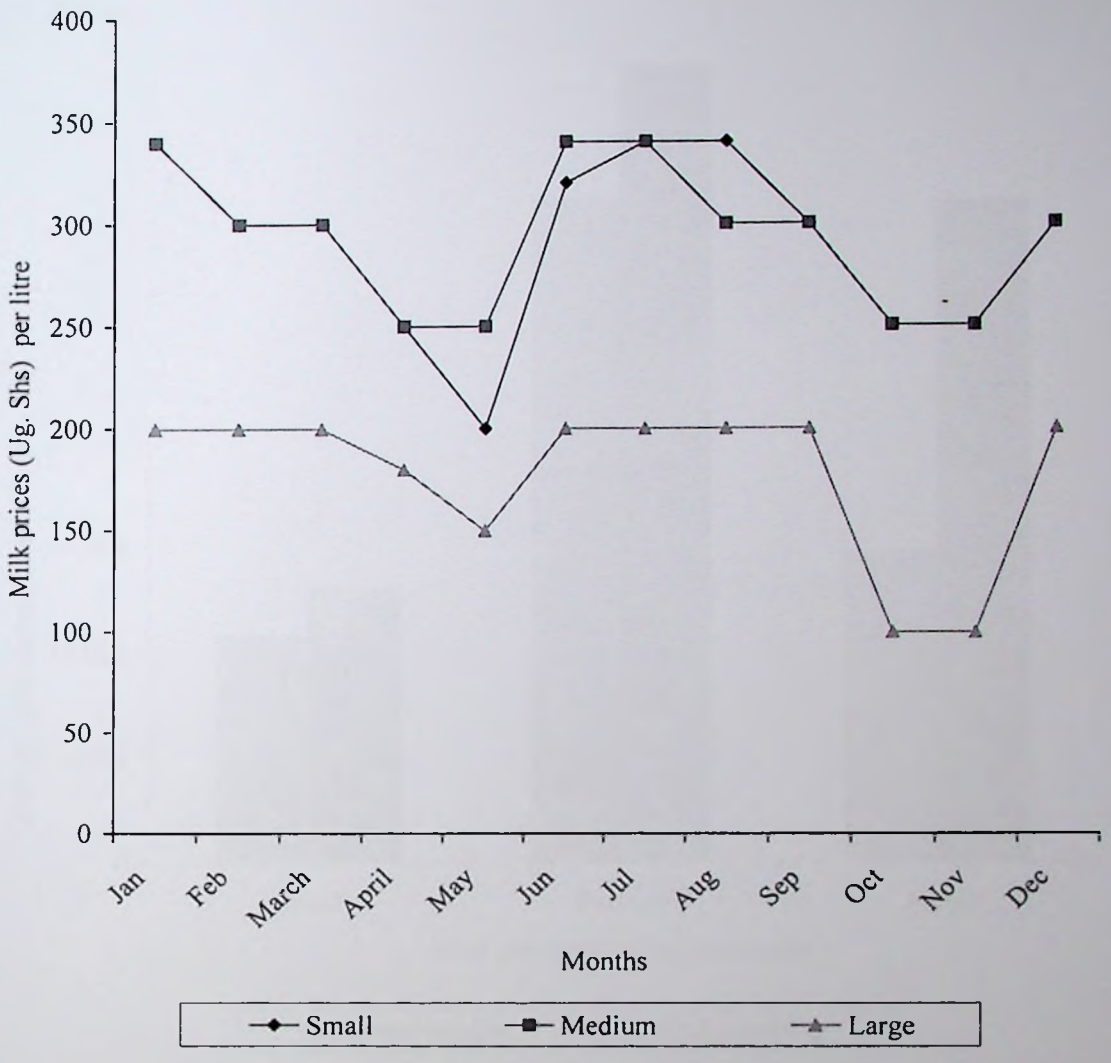
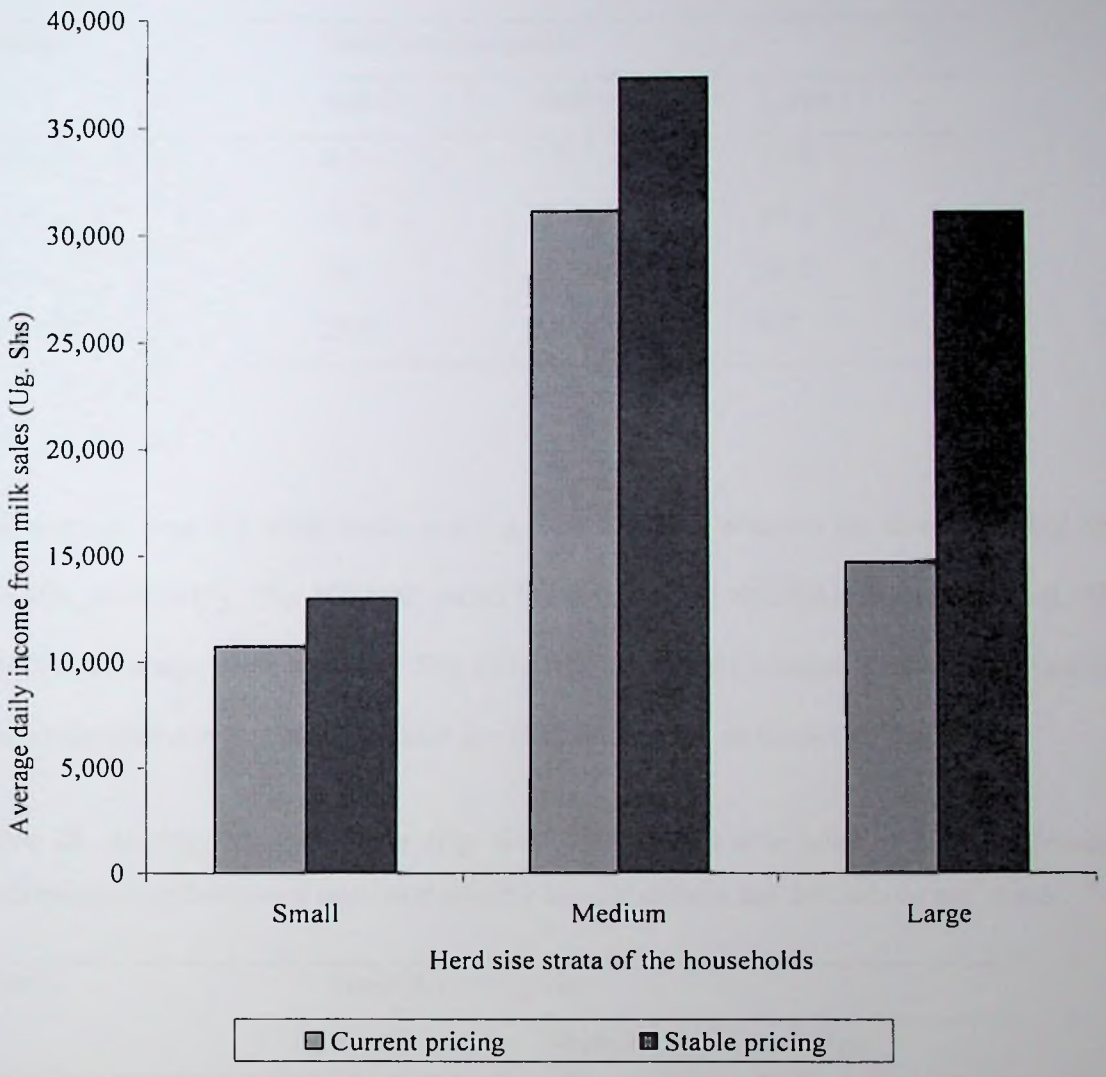


Fig. 4. Variation of daily income during rainy season with stabilisation of pricing.



4.9.2. Output from live cattle sales

The criteria used by farmers for selecting animals for sale were as shown in Table 21 . Selection of cattle for sale for both small and medium herd strata was based on unwanted bulls (50%); whereas in large herds it was culling due to old age (38.1%).

Table 21. The percentage of farmers who using a particular criteria for selecting cattle for sale.

Criteria	Herd size categories		
	Small	Medium	Large
Bad temperament	8.3	7.7	14.3
Culling due to old age	20.8	38.5	38.1
Unwanted bulls	50	50	30.1
No particular criteria	20.8	3.8	4.7

The average cost for adult cattle was Ug. Shs 322,300, whereas for steers was Ug Shs 115,400; heifers Ug. Shs 300,000; Incalf heifer cross Ug Shs500,000 and bulls Ug. Shs 450,000. Average price was Ug. Shs 337, 500. Details of income derived from annual live cattle sales and annual milk sales per herd strata were as shown in Table 22.

Table 22. Average annual output (Ug. Shs '000) from cattle sales and milk sales and percentage contribution of each sale activity to total output per household per strata

Criteria	Herd size categories		
	Small	Medium	Large
Annual Live cattle sales output (Ug.Shs.)	1,012.6 (24.5%)	1,687.7 (14.9%)	3,712.9 (47.4%)
Annual milk sales (Ug.Shs.)	3,126.3 (75.5%)	9,637.9 (85.1%)	4,124.2 (52.6%)
Total	4,138..9	11,325.6	7,837.1

4.9.3. Gross margin analysis milk cattle production enterperises

The details of gross margin analysis were as shown in Table 23.

Table 23. Average Gross margin (Ug. Shs) of dairy enterprises per household per herd size strata.

Item	Herd size categories		
	Small	Medium	Large
Total outputs	4,138,913	11,325,588	7,837,126
Total variable costs	1,209,000	2,104,000	1,610,000
Gross margin	2,929,913	9,221,588	6,227,126
Gross. margin/acre	49,998.5	92,959.6	26,000.5

4.1. Characterisation of milk production system

Seventy seven farmers were sampled from stratified farms according to herd size. The small herds had 1-50 heads of cattle, the medium herds had 50-100 heads of cattle and the large herds had over 100 heads of cattle. Twelve of the respondents were female and 65 were men .The level of education of owners of the farms is shown in Table 1.

Table 1. Percentage distribution of respondents based on level of education

Level of education	Small	Medium	Large
Illiterate	20.8	11.5	47.3
Primary	33.3	50	31.6
Ordinary level	37.5	30.8	15.8
Above ordinary level	4.4	7.7	5.3

Farmers in the large herd strata category were most illiterate than farmers in the medium herds(X^2=5.9, $p<0.05$) and small herds (X^2=4, $p<0.05$).

4.2. Land and herd size of cattle keeping households

The average land size and mean herd size per household class herd holding structure were as shown in Table 2. Thirty three point eight percent (n=24) of the farmers were with small herds, where as 36.6% (n=26) had medium sized herds and 29.6 %(n=21) had large herds.

Table 2. The average land size and mean herd size per household class herd holding structure.

Herd size category	Mean land acreage	Mean cattle herd size	Acreage per unit head of cattle
Small	58.6±4.4	37	1.6
Medium	99.2±5.5	62	2.7
Large	239.5±29.7	129	6.5
Overall average	132.4	76	3.6

4.3. Engagement in dairy farming enterprise

The reasons given by farmers as to why they engage in dairy farming enterprise were given as shown in Table 3.

Table 3. The reasons for engaging in dairy farming enterprises given as percentage.

Reason	Herd size category		
	Small(n=24)	Medium (n=26)	Large (n=21)
Its good	16.7	32.6	28.6
Its profitable	24.1	65.5	37.6
Its a way of life	13.2	17.8	40.1
Its the activity I can manage	0.6	0	1
Its what I grew seeing	9.6	17.8	22

4.4. Cattle ownership

Ownership cattle herds by gender were as shown in Table 4.

Table 4: Percentage ownership of cattle herds as by gender

Herd category	Men	Women
Small	83.3	16.7
Medium	87.2	12.8
Large	94.7	5.3
Overall average	88.4	11.6

4.5. Breeds of cattle reared

The breeds of cattle kept were local long horned Ankole Sanga cattle and Ankole-Friesian crosses. .Some of the farmers keep local Ankole breed or Ankole-Friesian crosses alone, others kept both the local and Ankole-Friesian crosses. Details are shown in Table 5.

Table 5. Percentage of farmers according to different herd strata and the breed of cattle.

Herd category	Breed of cattle kept		
	Local Ankole	Crosses	Both local Ankole and crosses
Small	20.8	62.5	16.7
Medium	9.5	90.5	0
Large	68.4	31.6	0

All farmers raised their herds on natural pasture. None of the farmers supplemented their cattle, used manure, used draft power nor borrowed a bank loan.

The cattle on farms of the different herd size strata were of different age groups. Percentage herd age specific composition was as shown in Table 6

Table 6. Herd age specific composition on small, medium and large herds

Herd size category	Lactating cows	Dry cows	Heifers	Female calves	Male calves	Steers	Bulls
Small	25.5	15.1	29.2	24.3	1	4	0.9
Medium	24.3	13.4	22.8	23	4.2	11	1.3
Large	23.9	12.8	30.2	26.7	2	3	1.4
Overall Mean	24.6	13.8	27.4	24.7	2.4	6	1.2

The averages age at first calving (AFC), calving interval (CI) and lactation length (LL) at different herd size strata were as shown in Table 7.

Table 7. The mean age at first calving, calving interval and lactation length at different cattle herd size strata

Production parameter	Small	Medium	Large	Overall
Mean AFC (months)	27.6± 2.3	26.8 ± 2.4	29.3 ±1.6	27.9
Mean calving interval (months)	16.7 ± 0.7	16.1 ± 0.4	17.3 ±1.7	16.7
Lactation length (months)	10.8 ±0.4	10.2 ±0.7	11.2±0.7	10.7

Farmers are using local, cross bred or exotic bulls for breeding. No farmer used Artificial Insemination (AI). The percentage using sires of a particular type were as shown in Table 8. Majority of the farmers in the large herd strata were using local Ankole bulls as sires.

Table 8. Percentage of farmers in different herd size strata using a particular sire type.

Herd category	Sire breeds type (%)		
	Local Ankole	Ankole-Friesian crosses	Fresian exotics
Small	16.7	41.7	31.6
Medium,	31.6	68.4	0
Large	63.2	26.3	10.5

4.6. Constraints to dairy cattle keeping enterprises

The overall cattle farmers' perception as constraint to cattle keeping enterprises were as shown in Fig. 1. Meanwhile farmers perception based on herd size category were as shown in Table 9. Scarcity of water and drought were the major constraints affecting 80% of the farmers. Drugs and treatment was the least constraint was the least constraint. Farmers perception was that water scarcity, drought and high cost of bush clearing were major constraints to cattle keeping, but not income.

Table 9. Percentage of farmers who cited a certain constraints to their cattle keeping enterprises

Constraint	Herd size strata		
	Small	Medium	Large
High cost of bush clearing	45.8	53.8	14
Drugs for treatment	24	31	5
Water scarcity & drought	41.7	42.3	62
Low Income from milk	12.5	3.8	19

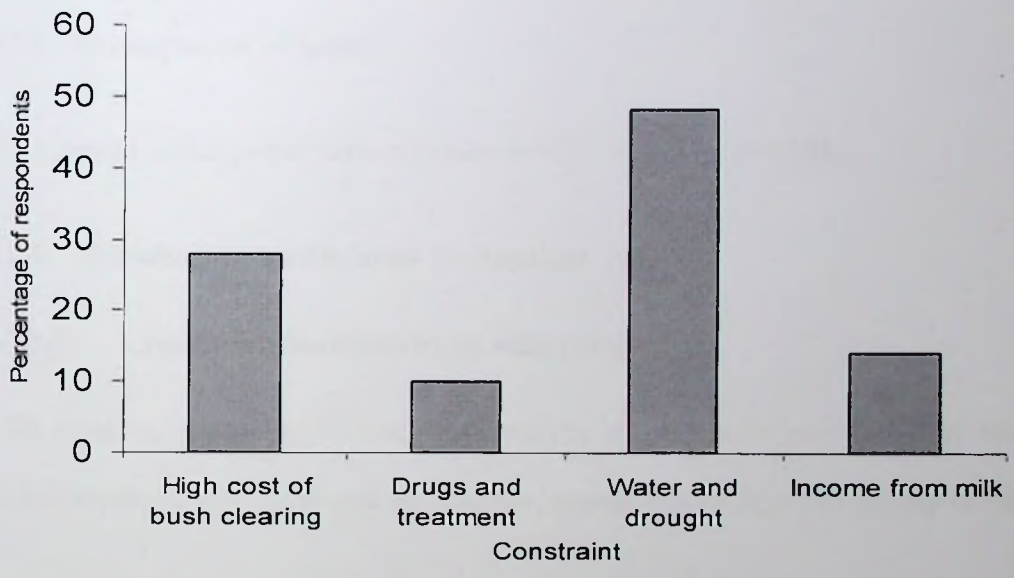


Fig. 1: Percentage of farmers who cited a certain problem being a major constraint in their cattle keeping enterprise

4.7. Constraints to marketing of raw milk

4.7.1. Membership to dairy cooperative societies

Thirty two point five percent (n=25) were members of dairy cooperative society. Fifty four point two percent of farmers in small strata herd size, 30.8% in medium size and 19% in large herd size belonged to dairy cooperative societies. The small herd sized farmers had significant participation in co-operatives than the large herd sized farmers (X^2=5.9; $p<0.05$). The participation of small and medium gherd sized farmers in co-operatives were not significantly different (X^2=2.8, $p>0.05$).

4.7.2. Preservation of milk

No Farmers added preservatives to raw milk to extend its shelf life.

4.7.3. Seasonal raw milk price fluctuations

4.7.3.1. Cuases for fluctuations on milk prices

Milk vendors, especially pick-up milk traders' responses to why they buy raw milk at such low prices were attributed to: distance, season, poor roads and quality of milk.

Dairy – plant managers and pick-up milk traders were asked whether they give incentives, for example better prices to farmers with high quality milk. No incentives were given to farmers with high quality milk.

4.7.3.2. Responses to fluctuations of milk prices

4.7.3.2. Farmer response to fluctuations of milk prices

The dairy enterprises were affected by seasonal fluctuations in prices of raw milk. The farmers' response on how fluctuations in prices for raw milk affect their farms were as shown in Table 10.

For most farmers, sales from milk were not enough to meet their operational costs. Not a significant portion of them was selling their cows to meet farm operational cost.

Table 10: The percentage farmers' from different strata response about how fluctuations in prices for raw milk affect their farms.

How fluctuations of milk prices affect farm activities	Small	Medium	Large
The income from raw milk sales cannot sustain farm activities	54.2	65.4	52.3
Have to sell live cattle to manage farm expenditures	25	23.1	33.3
Cannot develop the farm with income from raw milk sales	20.8	11.5	14.3

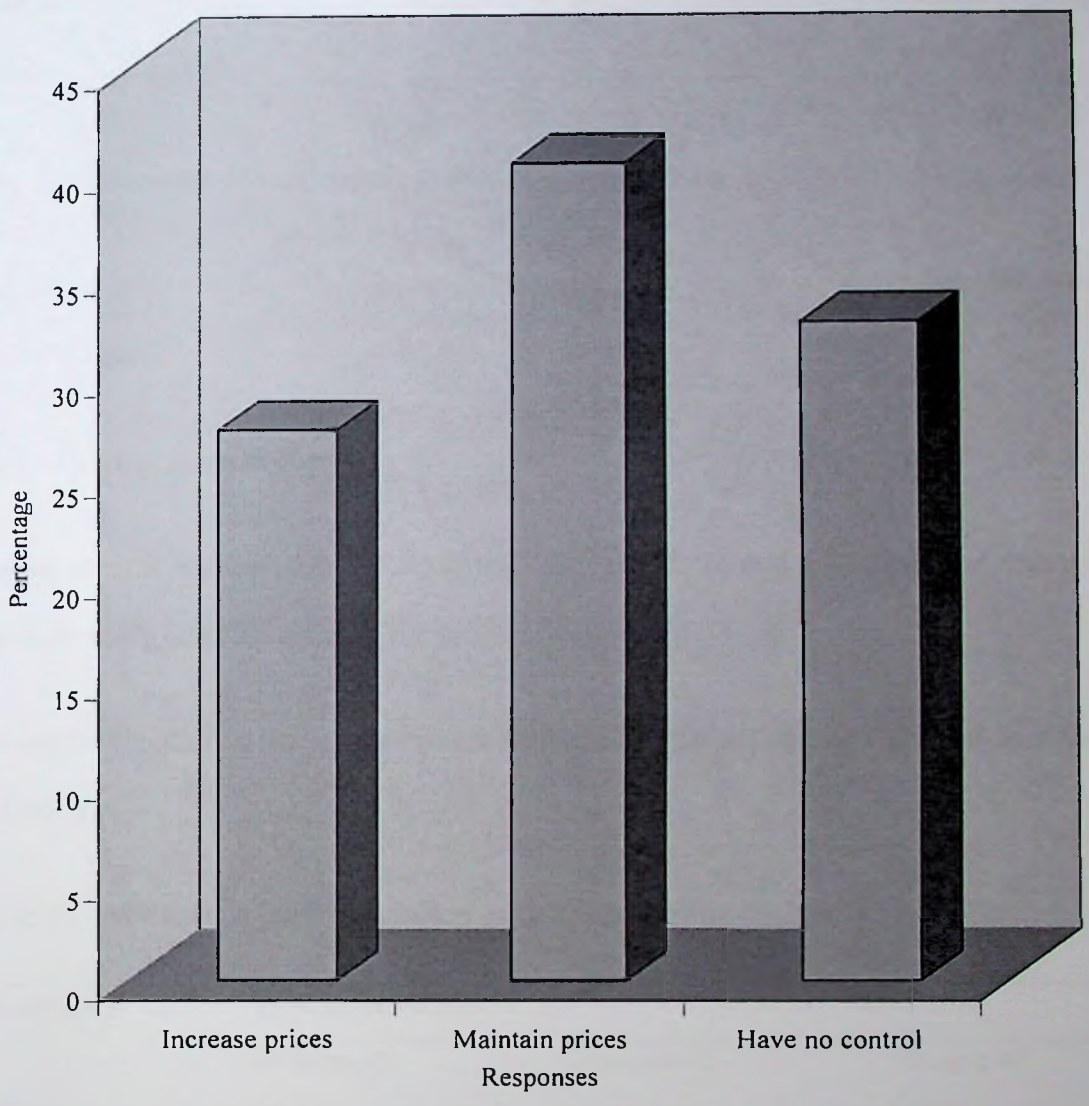
When there was no buyer for raw milk 88 %(n=66) make ghee and 11% drink the milk. The responses responses according to herd size strata when there are no milk buyers were as shown in Table 11. No significant numbers of farmers were pouring milk when it was in excess. Majority used it for making ghee. A kilogram of ghee was sold at Ug. Shs. 6,000. Forty litres of raw milk from Ankole cattle was required to make 1 Kg of ghee, whereas 80 litres of raw milk from Friesian cattle was required to make 1 Kg of ghee.

Table.11. Percentage responses of farmers when there are no buyers

Responses	Small	Medium	Large
Making ghee	65.2	69.2	80.9
Family use	37.5	15.4	9.5
Nothing done (pouring)	0	15.4	4.7

Farmers in the different herd size strata had different coping mechanisms when there are many buyers. The majority maintained prices even when there were many buyers. Their response was as shown in Fig. 2.

Fig 2. Percentage responses of the farmers to many buyers of milk



4.7.3.2. Milk buyers' responses to milk price fluctuations

Dairy plant managers set lower price limits when prices fall and set upper limit when price rise. This only happens for farmers who belong to Ankole Dairy Products (ADAP) Cooperative society.

4. 8. Economics of cattle milk production enterprises

The major inputs in cattle production enterprises were labour, buildings for calves and disease control.

4.8.1 Disease control costs

Disease control costs included tick control using acaricides and treatment. The treatment was done using antibiotics, dewormers and trypanocides.

The acaricides used in tick control were: Milbtraz®, Renegade® and Decatix® as shown in Table 12.

Table 12. Percentage use of acaricides in tick control

Herd category	Type of acaricide		
	Milbitraz®	Renegade®	Decatix ®
Small	58.3	8.3	29.2
Medium	30.4	21.7	47.8
Large	52.6	10.5	36.8

Milbtraz® and decatix were commonly used. Decatix® commonly used by medium herd owners, whereas Milbtraz® mainly used by large and small herd owners. The mean

volume of acaricide spray used per adult cattle was 1.6 litres and 0.7 litres for calves. Average costs per lire of acaricides were Ug. Shs. 25,000, Ug. Shs. 40.000 and Ug. Shs. 90,000 for Milbtraz®, Renegade® and Decatix® respectively.

The annual total disease control costs were as shown in Table 13.

Table 13. Annual disease control costs (Ug.Shs.'000) and percentange contribution of each disease control strategy to total disease costs

Input	Herd size categories		
	Small	Medium	Large
Acaricide costs	105.2±42.3 (24%)	211.4±24.3 (24.3%)	272.4±22.8 (21.3%)
Antibiotics costs	165.3±29.7 (37.7%)	275.7±28.6 (31.8%)	405.1±26.9 (31.8%)
Dewormers	99.1±8.6 (22.6%)	267.5±9.6 (31.5%)	405.1±26.9 (31.5%)
Trypanocides	68.5±4.6 (15.6%)	117.1±4.0 (15.3%)	195.6±5.1 (15.3%)
Total costs	438.4	871.8	1,275.7

4.9.2. Labour

The labour was in form of milking, herding, spraying and bush clearing. Family was supplementing paid labour especially in watering, herding and spraying. Details on labour costs per household in different herd category were as shown in Table 14..

The major labour costs in small and medium herd sized farms were incurred in bush clearing, while for large sized farms it was in herding.

Table 14 . Total labour costs (Ug.Shs'000)

Input	Herd size categories		
	Small	Medium	Large
Herding	368 (33.1%)	558 (30.1%)	754 (53.9%)
Milk delivery	260 (23.4%)	422 (21.6%)	212 (15.1%)
Bush clearing	484 (43.5%)	944 (48.3%)	432 (30.9%)
Total	1,112	1,954.0	1,398.0

4.9.3. Building costs

There were costs incurred in building roofed calf pens and unroofed open boma in the various herd strata. The details were as shown in Table 15.

Table 15. Average costs (Ug.Shs) for building calf pens and open boma.

Input	Herd size categories		
	Small	Medium	Large
Roofed calf pens	31,250 (60.7%)	32,240 (59.1%)	34,215 (58.4%)
Open bomas	20,263 (39.3%)	22,265 (40.8%)	24,325 (41.5%)
Total	51,513	54,505	58,540

4.9.4. Feeding

Cattle were raised on local pasture, but only supplemented with mineral salt licks. Annual costs incurred in purchase of mineral licks were as shown in Table 16.

Table 16: Annual costs (Ug. Shs) incurred in purchase of mineral licks

Input	Herd size categories		
	Small	Medium	Large
Mineral salt licks	46,333	96,450	154,255

4.9.5. Total input costs of cattle dairy enterprises

The total input costs were as shown it Table 17 .

Table 17. Total input costs (Ug.Shs.'000) for dairy cattle enterprises

Input	Herd size categories		
	Small	Medium	Large
Disease control costs	438 (27,4%)	871 (30.3%)	1,275 (46.8%)
Labour	1,112 (69.5%)	1,954 (67.9%)	1,389 (51%)
Building costs	51 (3.2%)	54 (1.9%)	58 (2.1%)
Feeding	46 (2.9%)	96 (3.3%)	154 (5.7%)
Total costs	1,209	2,104	1,610
Cost per head of cattle	37.8	33.9	12.5

4.9. Outputs of cattle milk production enterprises

The major outputs from milk cattle enterprises were milk and live cattle sales.

4.9.1. Milk output

4.9.1.1. Fluctuations of milk prices

The average price for milk was found to be Ug. Shs 266±12, 263 ±9. and 176±10.4 for the small, medium and large herd size strata respectively. The mean prices for the dry season were 322±8. 320±9 and 200 for the small, medium and large herd size strata respectively. Whereas in the wet season the mean prices were 267±15, 267±11 and 155±19 for the small, medium and large herd size strata respectively. Monthly variation of milk prices were as shown in Fig. 3. There was a geographical difference in prices offered to farmers. Farmers in the large herd size stratum sold milk at prices lower than their counter parts in the small and medium herd size strata.

4.9.1.2. Seasonal variation of daily milk yield, number of lactating cows and daily milk sales

The mean seasonal daily milk yield, daily milk sales, milk prices, number. of lactating cows, daily herd milk yield (litres/day at any given time in the wet and dry season for each herd size stratum were as shown in Table 18.

4.9.1.3. Seasonal variation of daily income from sale of milk

Daily milk per capita home milk consumption was 0.7 litres and average household size was 13 people. Average daily income due to milk sales during dry season were as shown in Table 19. Meanwhile for wet season, the average daily incomes due to milk sales were as shown in Table 20.

During wet season, if prices were stabilized, the daily income from milk sales were expected to rise by 20.9% for small herd categories, 19.8% fro medium herd size households and 29% for lsrge herd size households. The variations of daily income with price stabilization to dry season price were as shown in Figure 3. For large herd size households, if pricing of milk is made to be Ug.Shs 320, the daily income from milk sales is expected to rise by 111.3%. The non-saleable milk during wet season was estimated to be 16% for small herds, 13% for medium and 29% for the large herd sized households. The farmers in the large herd stratum will get more money if the prices were stabilised.

Table 18: Average milk yield, price and number of lactating animals per herd size stratum in the wet and dry season.

Herd size category	Mean seasonal daily herd milk yield (litres)		Overall daily milk sales (litres/day)	Overall milk price (Ug.Shs)	Mean number. of lactating cows	Mean milk yield (litres/day)	
	Wet	Dry				Wet	Dry
Small	49.2±16.2	31.7±12.2	32.2±8.8	266±12	10.3±0.6	3.8±0.6	2.4±0.4
Medium	125.2±14.9	75.7±10.7	100.4±13.2	263±9	23±1	5.6±0.7	3.4±0.5
Large	103.2±2.2	68.4±13.4	64.2±14	176±10.4	39.3±2.9	2.6±0.5	1.8±0.5

Table 19: Average and ranges of daily milk sale income (Ug. Shs) per household during dry season

Household herd strata	Daily income ranges		Average daily income
	Lower	Upper	
Small	3,392	11,273	7,332
Medium	17,920	24,768	21,344
Large	9,200	14,560	11,880

Table 20: Average and ranges of daily milk sale income (Ug. Shs) per household during wet season

Household herd strata	Daily income ranges		Average daily income
	Lower	Upper	
Small	6,408	15,059	10,733
Medium	27,047	35,004	31,025
Large	14,260	14,942	14,601

Fig. 3. Monthly fluctuations of milk prices among different herd size strata groupings

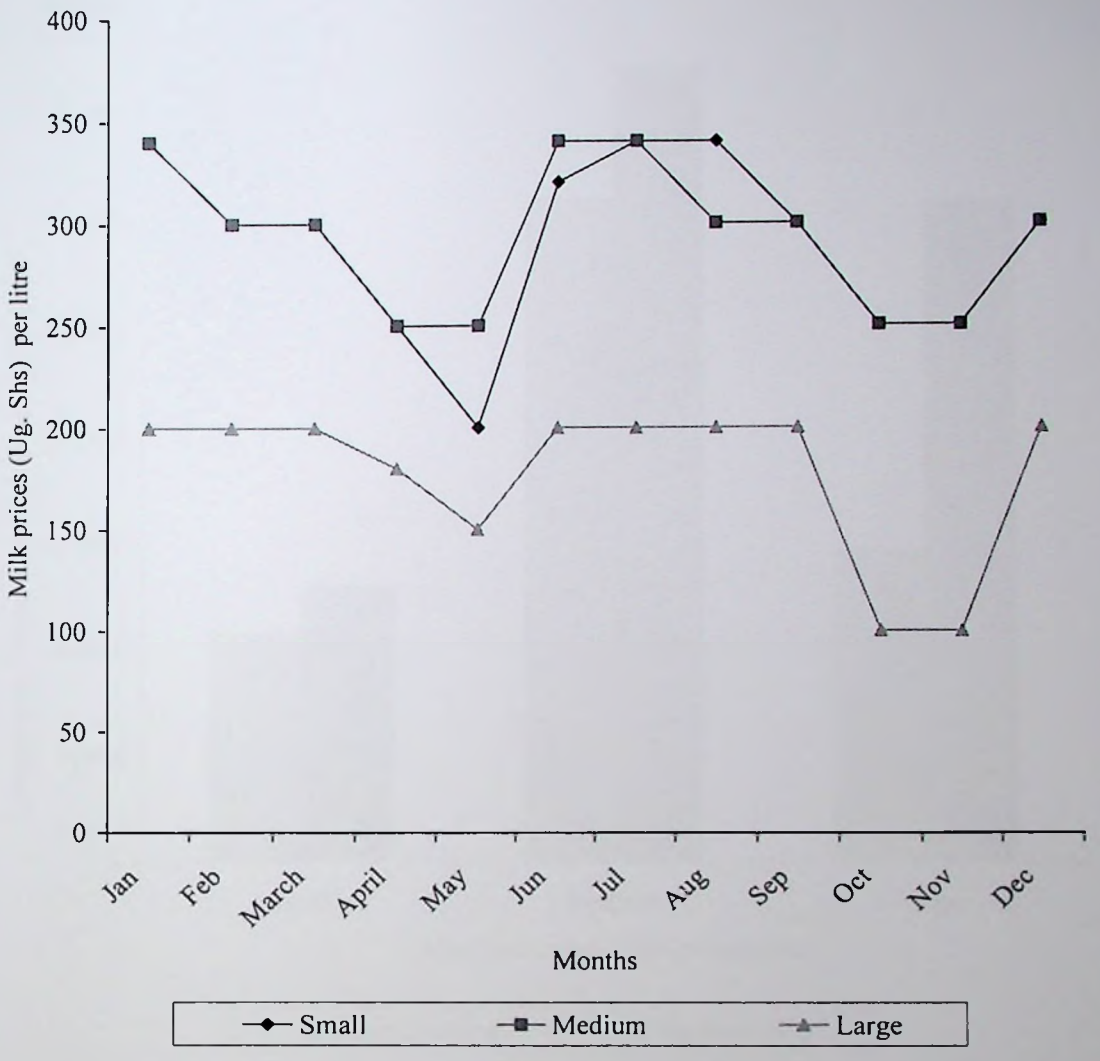
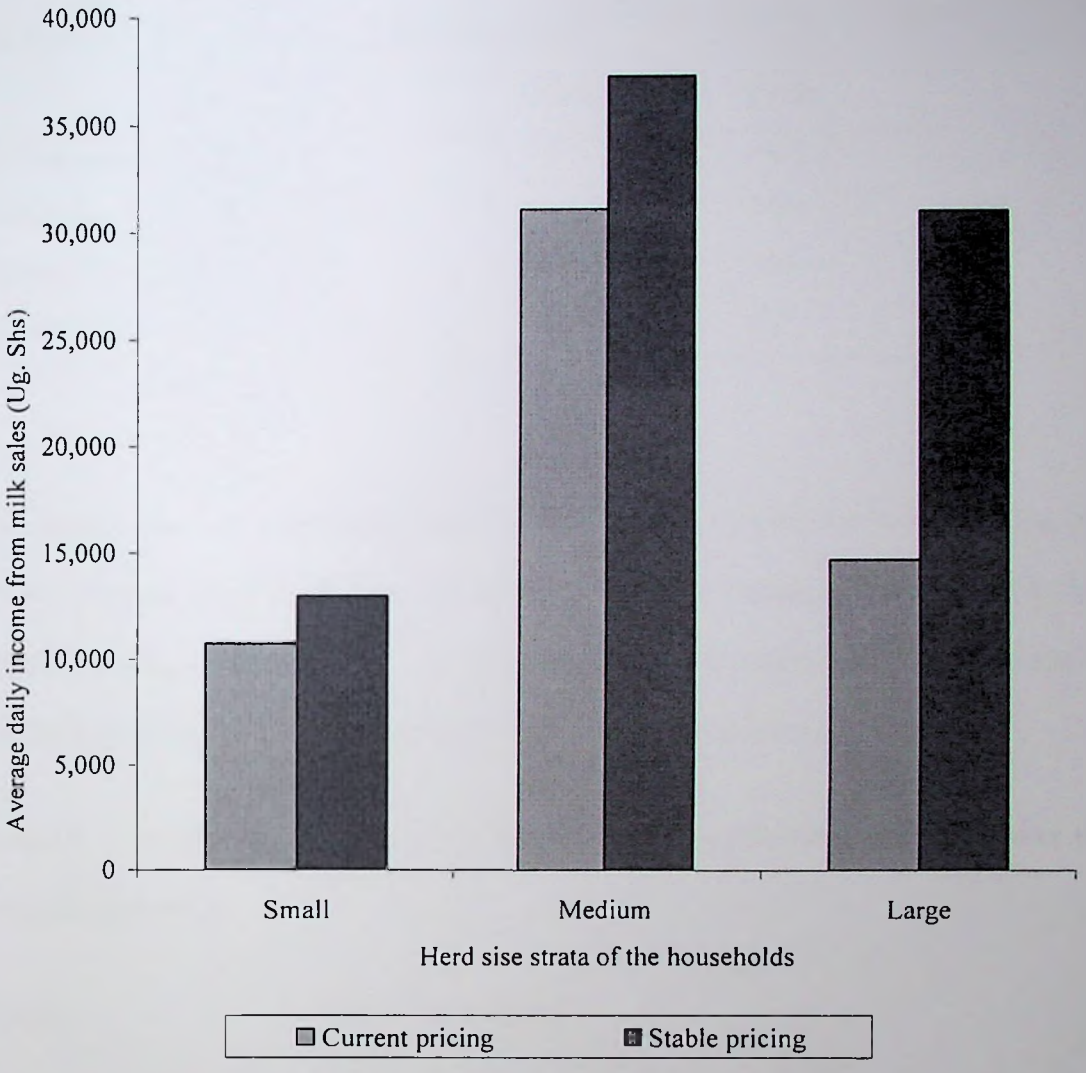


Fig. 4. Variation of daily income during rainy season with stabilisation of pricing.



4.9.2. Output from live cattle sales

The criteria used by farmers for selecting animals for sale were as shown in Table 21 . Selection of cattle for sale for both small and medium herd strata was based on unwanted bulls (50%); whereas in large herds it was culling due to old age (38.1%).

Table 21. The percentage of farmers who using a particular criteria for selecting cattle for sale.

Criteria	Herd size categories		
	Small	Medium	Large
Bad temperament	8.3	7.7	14.3
Culling due to old age	20.8	38.5	38.1
Unwanted bulls	50	50	30.1
No particular criteria	20.8	3.8	4.7

The average cost for adult cattle was Ug. Shs 322,300, whereas for steers was Ug Shs 115,400; heifers Ug. Shs 300,000; Incalf heifer cross Ug Shs500,000 and bulls Ug. Shs 450,000. Average price was Ug. Shs 337, 500. Details of income derived from annual live cattle sales and annual milk sales per herd strata were as shown in Table 22.

Table 22. Average annual output (Ug. Shs '000) from cattle sales and milk sales per household per strata

Criteria	Herd size categories		
	Small	Medium	Large
Annual Live cattle sales output (Ug.Shs.)	1,012.6 (24.5%)	1,687.7 (14.9%)	3,712.9 (47.4%)
Annual milk sales (Ug.Shs.)	3,126.3 (75.5%)	9.637.9 (85.1%)	4,124.2 (52.6%)
Total	4,138..9	11,325.6	7,837.1

4.9.3. Gross margin analysis milk cattle production enterperises

The details of gross margin analysis were as shown in Table 23.

Table 23. Average Gross margin (Ug. Shs) of dairy enterprises per household per herd size strata.

Item	Herd size categories		
	Small	Medium	Large
Total outputs	4,138,913	11,325,588	7,837,126
Total variable costs	1,209,000	2,104,000	1,610,000
Gross margin	2,929,913	9,221,588	6,227,126
Mean land acreage	58.6	99.2	239.5
Gross. margin/acre	49,998.5	92,959.6	26,000.5

CHAPTER FIVE

DISCUSSION

5.1. Characterisation of milk producing cattle enterprises

The milk production enterprises were cattle based, mainly of indigenous long horned Ankole Sanga cattle and their crosses with Friesian breeds. These were smallholder cattle production systems with an average of 76 heads of cattle per household giving a stocking density of 3.6 acres per unit head of cattle. This stocking was lower than what was than the recommended of 2 acres per cattle unit (Njoka, 1985). It was lower than what was reported for pastoral households settled in nearby Ankole Ranching Scheme (Ocaido, 2003 and Ocaido *et al.*, 2008). This implied that there was enough grazable land in Burunga sub county. The stocking cattle density was decreasing with increasing cattle herd sizes (Table 2) being highest with large herd sizes (6.5 acres per cattle unit). This was because farmers in the large herd sizes had excessive land which was largely bush, which needs to be cleared. The pattern of stocking density was contrary to what was observed with pastoral households settled in the nearby Ankole Ranching Scheme, where stocking was increasing with increasing herd size ((Ocaido, 2003 and Ocaido *et al.*, 2008). The stocking density of the large herds was similar to what was reported for ranches of Ankole Ranching Scheme in the same district (Ocaido, 2003)

The medium herd sized kept mainly upgraded Ankole-Friesian breeds, followed by small herd sized households (Table 5). The large herd sized farms were keeping mainly

indigenous long horned Ankole Sanga cattle. Almost all (90.5%) medium herd sized farms had kept improved cattle for milk production. This explains the high milk yield per cow of 5.6 litres during rainy season observed with medium herd sized farms, followed by 3.8 litres with small farms and 2.6 with large herd sized farms (Table 18). These yields are higher, in comparison with yields observed with the pastoral herds in Ankole Ranching Scheme of 2.1 litres per lactating cow (Ocaido *et al.*, 2005), agro-pastoral areas of Soroti, Uganda (Ocaido *et al.*, 2005), Masai herds in Kenya (Nge'the, 1993), Darfur herds in Sudan (Kerven, 1987 and Fulani herds in Niger (Wagenaar *et al,*. 1986) and Nigeria (Jansen, 1990). The average age of first age of calving (Table 7) was lower than the what had been reported Chamberlain (1989) for Ankole cattle (42-50 months) and Ankole-Friesians (30-45 months) and falls with in the range for what has been reported for Friesians (24 -30 months). The cattle age of first calving, calving interval and lactation length (Table 7) agrees with what had earlier been reported in the for cattle in the nearby Ankole Ranching scheme (Ocaido, 2003). The average calving interval of cattle of 16.7 months found in the area, was higher than the recommended. It is recommended that in an ideal dairy production system, a cow should produce a calf per year (Chamberlain, 1989).

The cattle herd structure had a high proportion of female cattle, which was purposely geared towards production of calves and milk. This was true with pastoral herds elsewhere for Masai in Kajiado, Kenya (Nge'the,1993), Fulani (ref, Darfur, Bahima (Ocaido, 2003 and Otim *et al.*, 2004). This was contrary to what was observed in mixed crop –livestock production systems in Soroti, Uganda (Opolot, 1998 and Ocaido *et al.*, 2005) and in Zimbabwe where cattle herd structure was reflecting a need for traction

The large herd sized cattle keepers kept cattle as a way of livelihood (Table 3). This was because farmers in this stratum were pastoralists or they had a pastoralist background, keeping cattle for subsistence, only selling surplus milk. The majority of them were illiterate (Table 1) hence did not appreciate the need for optimum land acreage utilisation, and were keeping local long- horned cattle which gave little milk. Meanwhile cattle keepers with medium herds were in cattle keeping enterprise, because it was profitable. Most (80.8%) of farmers had primary and secondary education, hence had optimized land use and were keeping relatively high milking improved dairy cattle.

The major problems of farmers were drought, water scarcity and bush clearing. These constraints were similar to those reported by sedentary pastoralists now settled in the Ankole Ranching Scheme (Ocaido, 2003). Majority of the farmers lacked water during the dry season because they had small water tanks which cannot hold water throughout the year. Bigger permanent water dams need to be dug either manually or excavated using bull-dozer tractors. This exercise is expensive, needing facilitation by giving soft loans need to be given to farmers.

Drugs for treatment and low income from milk sales were not major problems facing the cattle keepers (Fig. 1) contrary to the reasons why this study was designed. Low income from milk sales was slightly more of a problem of small and large herd sized farms not with medium sized households (Table 9). This agrees with the finding of this study that

medium sized farmers were making more money than small and large herd sized farms (Table 23).

Farmers were using local cross bred or exotic bulls for breeding. No farmer used Artificial Insemination (AI). Farmers in the large herd size stratum used local long-horned Ankole bulls as sires, the farmers in the small and medium herd size strata mainly used purely exotic or crosses between Friesian and Ankole bulls (Table 8). A.I was not being used because they were few AI technicians and farmers did not know how to detect cows on heat. However, the large herd sized farmers lacked enthusiasm of improving their herds for milk production since they were still using their indigenous Ankole bulls. Elsewhere arguments against A.I. were that natural mating is more effective than AI in getting cows pregnant and AI technicians and farmers had difficulty in detecting cows on heat (Naidoo *et al.*, 1982). Natural mating runs a risk of in-breeding when a bull with good traits is kept on the farm for a long time and it mates with its close relatives. Genetic inbreeding genetic results in decreased production, reduced fitness and low fertility (Hodges, 1985). To avoid in- breeding, all farmers raised their replacement stock by ex-changing bulls from other herds.

5.2. Marketing channels of milk

From the results, 32.5 per cent were members of dairy cooperatives. The rest sold their milk as individuals. According to Jorgen and Lusato (1994) dairy cooperatives have to operate as business enterprises rather than as social or political entities. Enabling policy and legal frame work is essential for effective producer cooperatives involvement in dairy development. The duo added that the involvement of key players such as women is central to success of emerging dairy cooperative ventures.

5.3. Constraint analysis of milk marketing

Milk vendors especially pickup milk traders responses to why they buy raw milk at such low prices attributed the cause to be due to long distance, seasonal roads, poor roads, and quality of milk. This concurs with the findings of Chamberlain, (1989) and MAAIF, (2000) regarding raw milk marketing infrastructure, Lack of all-weather roads hinders community development. A poor road network not only means that poor farmers cannot reach health care facilities, school, and markets, but that services such as security bodies and suppliers, cannot reach the community. Of equal importance, lack of transport isolates communities and also contributes to poverty. Roads and transport still make collection and distribution difficult. Access to scattered and distant small farms is often no more than a rough milking track. Transport methods range from head load to bicycles and, motor vehicles.

The difference in prices offered to farmers had a geographical bearing. Farmers in the large herd size strata were remotely and sparsely located, with poor access roads; whereas

farmers in the small and medium size herd strata are located near trading centres with comparatively good access roads where pick-up truck milk vendors come to buy milk. The farmers in the small and medium herd size strata are located near trading centres where dairy plants have coolers, so they can easily sell milk at relatively competitive prices. The difference in prices offered to farmers had a geographical bearing. Farmers in the large herd size strata were remotely and sparsely located, with poor access roads; whereas farmers in the small and medium size herd strata are located near trading centres with comparatively good access roads where pick-up truck milk vendors come to buy milk. The farmers in the small and medium herd size strata are located near trading centres where dairy plants have coolers, so they can easily sell milk at relatively competitive prices. The difference in prices offered to farmers had a geographical bearing. Farmers in the large herd size strata were remotely and sparsely located, with poor access roads; whereas farmers in the small and medium size herd strata are located near trading centres with comparatively good access roads where pick-up truck milk vendors come to buy milk. The farmers in the small and medium herd size strata are located near trading centres where dairy plants have coolers, so they can easily sell milk at relatively competitive prices. The difference in prices offered to farmers had a geographical bearing. Farmers in the large herd size strata were remotely and sparsely located, with poor access roads; whereas farmers in the small and medium size herd strata are located near trading centres with comparatively good access roads where pick-up truck milk vendors come to buy milk. The farmers in the small and medium herd size strata are located near trading centres where dairy plants have coolers, so they can easily sell milk at relatively competitive prices. The difference in prices offered to farmers had a

Literacy levels

The results showed that a big number of the respondents were illiterate, (see table 1). This has a tremendous effect on livestock production because new innovations in technology require farmers to be able to read and write at least a few instructions on the manuals of the technologies or techniques in milk handling. Failure to read and write may lead to exploitation by opportunists and detrimental misuse by misinterpretation of instructions. Further more, it may necessitate hiring someone to manage the farm, leading to expenses which could otherwise be used for additional investments on the farm. A small number of farmers had basic ordinary level of education, and only few had studied above ordinary level. Lack of basic education was identified as a major constraint to marketing of raw milk in a way that it affects record keeping, which is a basic requirement for accountability and improved production. On the other hand, bargain for increment in raw milk prices requires formation of dairy cooperative societies. This however involves a lot of documentation in registration, minutes recording and obligatory record keeping. Illiterate people tend to avoid such organizations by choice or out of ignorance.

Absence of cooperative

The absence of dairy cooperative gives chance for exploitation by the pick-up milk vendors who had monopoly to determine the price to offer for raw milk.

Responses by dairy plant manager were when prices fall, they set lower price limits, and when they rise they set upper limits. This only happens for farmers who belong to dairy cooperative society. Normally prices fall during the rainy season when there is a lot of milk and some roads are impassable. This leads to over exploitation of the dairy farmer

by pick-up truck milk vendors. The pick-up trucks milk vendors have the monopoly to decide the price to give to farmer per litre of milk. This definitely affects livestock production as a sector because it doesn't take into account the cost of inputs farmers incurred to produce milk. Upper limit prices for raw milk are usually offered to farmers in the dry season when there is comparatively little milk yield. However only 32.5% of the farmers from all the stratified categories were members of dairy cooperative societies called Ankole Dairy Products (ADAP), the rest sold to pick – up truck milk vendors thus making them susceptible to price exploitation.

Lack of incentives given for quality milk

The quality of milk was graded using the lactometer test though no incentives were given to farmers with high quality milk. Failure to give incentives to farmers with high quality milk has a negative implication in the morale of the farmers who would otherwise work hard to maintain the high quality of milk. In the long run, the country cannot expect milk because of its poor standard quality on the international markets hence the milk demand remains for only the local market leading to low buying price According to the East African Standards (67:1999) of the East African Community, regarding specification for un processed (raw) whole milk, un processed (raw) milk refers to normal, clean and fresh secretions obtained by practically emptying the udder of a healthy cow, properly fed and kept but excluding that got during the first seven days after calving. The declaration farther stipulates that the following principal compositional requirements be followed:-

Chemical: milk shall contain not less than 3.3per cent milk fat and not less than 8.5 per cent milk solids non-fat. It shall not contain added water, preservatives or other added

substances; nor shall any proportion of a natural constituent be removed. If price incentives are given to farmers with high quality milk, it will bring competition amongst farmers hence improving livestock production especially in the dairy sector.

5.3. Economics of cattle milk production enterprises.

Farmers with large herds of Ankole type are those who prefer quantity of cattle to the quality cattle of the exotic type. Farmers have to choose between keeping many animals of long-horned Ankole breed which yield little milk, and keeping a few crosses which yield higher milk per lactation, but lose out on the prestige of having many cattle, that is desired in a pastoralist community.

Never the less, although farmers in the small and medium herd size strata earn reasonable money from milk sales, the farmers in the large herd strata get additional income from the sale of live cattle(table 20). Farmers in large herd strata sell more than twice the number of cattle than those in small and medium herd strata. The local long-horned Ankole breeds tend to be more resistant to tropical diseases compared to the Frisian crosses breed. So the farmers who keep the local long-horned Ankole breed have the advantage of low disease incidence per head of cattle unlike their counter parts who keep Friesian crosses. However, White, (1981) stated that no tropical breed can be seen as a specialized dairy type. He further agreed that they are only considered such because they produce more milk than others. With good management, the best herds of tropical cows can produce 2000-2500 liters per lactation. Though long-horned Ankole cattle are typical indigenous tropical breed, there were no Ankole cattle that produced such amount of milk per lactation.

5.3.1. Effects of input costs on animal husbandry

The farmers from different herd size strata raised their herds on natural pastures and did not supplement their calves nor use draft power. This could have been the reason why they did not achieve the speculated milk production potential of 2000-2500 litres per lactation as stated by White, (1981). It was also found that none of the farms supplemented the calf diet. According to Khan Fattallah (1985) regarding care for calf, there is a carry-over effect of balancing nutrients in the early life. He said that the weakest link in most dual and multi-purpose large ruminant production systems is the rearing of the calf. Under pastoral conditions, with wet and dry seasons, young stock post-weaning are subjected almost invariably to a deficiency of protein relative to energy in the absorbed nutrients from the digestive tract. This results in reduced feed intake and consequently energy deficiency.

In societies that depend on milk as a dietary staple food, the young calf and people compete for the available milk supply. The reduced amount of milk available for the calves can be highly detrimental, particularly in this study area where the herd is grazing available. Thus the calf suffers both counts: an imbalanced basal diet together with a reduction in the supply of by-pass nutrients from milk.

The major inputs in dairy production enterprises were herding, milk delivery. Bush clearing, building calf pens and disease control costs. Disease control involved deworming, buying trypanocides and antibiotics (tables 13, 14, 15, 16 and 17).

Labour was in form of milking, herding and bush clearing family labour supplemented paid labour especially in watering herding and spraying (table 14). It was found that the

cost of antibiotics, acaricides and anti- trypanasomoses remains a big part of the farm expenditure that would be used for improving livestock production.

From the results, it was observed that prices for raw milk fluctuated at low prices with a mode of Ug.Shs. 250. For example farmers required to sell 100 litres of milk to buy 1 litre of Milbitraz (the most used acaricide as found in this research). A farmer had to sell 100 litres of milk to buy a litre of Albendazole 10% for deworming. A farmer had to sell 40 litres of milk to buy one bag of mineral salt lick. At the above rate of expenditure, farmers responded as follows as regards fluctuations in prices and its effects on livestock production:-

Fifty three point two percent of the farmers said that they had to sell live cattle on addition to income from milk to sustain farm activities. Twenty seven point three per cent said that they had to sell cattle to earn a descent living away from raw milk sales; whereas 19.5% could not develop their farms using income from milk sales exclusively.

The expenditure for treating trypanasomosis and acaricides usage remains high on all categories of farms visited. This is mainly because the study area (Burunga sub-county) is near Katonga wildlife game reserve, where wild animals always come from and graze on cattle farms especially at night, hence leaving ticks on the pastures. Most farms were found to be using Milbitraz® (Amitraz 12.5%) (table12); followed by Decatix® and Renegade®. The people in this study area regularly use accaricides. This is contrally to what Van Soest (1982) found. He found that in almost all production system in developing countries, animals are either herded when grazing, and held over night in yards or houses, or intensively supervised as in the tethered husbandry systems. Under these conditions, ecto- parasites are often controlled by hand picking.

The costs for deworming are also high. The study findings agrees with what Van Soes (1982) observed that Endo-parasites are always major problems, particularly for the young animal. Older animals are resistant to most endo-parasites with the exception of liver flukes.

The major outputs in dairy enterprise were milk and live cattle sales.

Milk sales - The farmers form stratified herd size category sold milk to get income (table 18). The overall milk prices were Ug.Shs. 266±12, 266±9 and 176±10.4 for the small, medium and large herd strata respectively.

Despite the fluctuations in price for raw milk, 37.6% of the farmers believed that dairy enterprise is still a profitable business and it is good (table 3). However, its farmers in the medium herd size strata who mainly say it is profitable.

Live cattle sale- Though farmers sold live cattle under different criteria overall majority selected unwanted bulls (table 19).

From table 21, it can be seen that the gross margin (GM) is positive in all the three herd size strata categories. This implies that the dairy enterprise is profitable. However, the small herd size stratum is the most optimum since it shows a bigger GM per acreage (table 21).

5.1. Fluctuation patterns of milk prices

5.2. Impact of fluctuation patterns of milk prices on household income and profitability of cattle enterprise

Most of the medium herd size stratum farmers said that it was profitable to do dairy farming. It was identified that the farmers in this stratum were keeping dairy crosses, hence could be getting better profits. This stratum had the most educated farmers (table 1), and were optimally using their grazable land (table 2). Comparatively a low number of respondents (11%) observed that fluctuations in milk prices affect performance of their farms. For many farmers, income from raw milk sales cannot sustain farm activities; of these, 65.4 %(n=26) were from the medium herd size strata as compared to the 54.2 %(n=24) and 52.3(n=21) from the small and large herd strata (table 3).

Different farmers responded differently when asked the effects of raw milk prices fluctuations on their farms (table 10). Where as the overall majority of farmer (53.2%) said that income from raw milk sales could not sustain farm activities farmers in the large herd size category were outstandingly very high at 29% out of the 53.2%. this is because the majority keep local long horned Ankole which give little milk (table 5), engage in the dairy production enterprise as a way of life other than as a profit making business (table 3) use local Ankole bulls for sires (table 8) and have biggest problem of water scarcity (table 9). However, they herd to sell live cattle to counter farm expenditures.
Twenty seven point six percent overall of the farmers have to sell live cattle to manage farm expenditures. This is quite a big effect on the future of livestock production in terms of numbers as there would be the future replacement stock.

During the dry and rainy season, it was found that the average amount of milk sold per day increased from 32 litres to 49 litres respectively. However, raw milk prices fluctuated

down wards to from Ug. Shs. 340 to Ug. Shs 150 per litre. It is quite frustrating to the farmer because at the time when there is more milk to sell the price falls.

From figure 1, though there could be many raw milk buyers in the rainy season, 27.3% increased the prices; 40.3% maintained the prices even when the number of buyers increased; whereas 32.5% had no control over prices.

It is in the rainy season that helminthes, trematodes and cestodes multiply in the environment and on pastures, so deworming is paramount. In the rainy season bushes grow very fast, and require clearing; in the rainy season, ticks multiply and ready to attach on livestock. It is also in the rainy season that the frequency of acaricide spraying should be increased because rains wash away the acaricide from the cattle. However, it is at this time as mentioned above when big expenditures are expected that milk prices are lowest. This affects livestock production processes negatively.

Nevertheless, dairy plant managers said that when prices fall, they set a lower limit so those farmers do not suffer great fluctuation in milk prices. This only happens for those farmers who are members of the dairy cooperative society, (Ankore Dairy Products-ADAP). When more milk is produced in the rainy season, farmers who belong to the dairy cooperative society are in good business hence in position to improve livestock activities like buying more cattle of better breed, bush clearing, buying drugs and paying farm laborers.

A farmer requires approximately 1.2 Million shillings putting up a reasonable rain water catchments dam. For a farmer in the small herd stratum for example, this requires selling 4,800 litres of milk at 250 Shs. each. Since the average farmer sold 32.2 litres a day (table

18), it takes 150 days (5 months) to save that amount. In most cases therefore, farmers wishing to excavate rain water catchments dams have to sell cattle to cover the costs. This affects livestock production in terms of numbers; when income from milk sales is insufficient to cover excavation costs.

Bush clearing to create paddocks and palatable pastures was ranked high as another major problem encountered on farms (table 9). On farms with small herd size for example, the average annual cost for bush clearing was found to be 484,375shs. This means that it requires selling 1821 litres of milk at 266shs. Since on average a farmer in the small herd size stratum for example sold 32 litres per day, it would take 57 days to save that money. At that level of expenditure, many farmers find the fluctuation in prices for raw milk as an impediment to bush clearing due to low income from milk sales to cater for good animal husbandry practices and reinvestment in livestock production. This affects livestock production because the bushes compromise pasture growth. The presence of bushes on the farm, especially if they cannot be penetrated forces animals to crowd and over graze particular places causing bare grounds and eventually soil erosion when it rains. The bushes are also a habitat or reservoir for parasites like Tse-Tse flies.

Thirty two point five percent overall (n = 77) were members of dairy cooperative society. Fifty four point two percent of farmers in small strata herd size, 30.8% in medium size herd and 19% in large herd size belonged to dairy cooperative societies. The overall number of farmers in all strata who belong to dairy cooperative societies is small.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1. Conclusions

(i)-The constraints to marketing of raw milk identified were: low prices, lack storage facilities, and long distances from producer to customer areas, poor seasonal roads and lack of access to equitable credits facilities. Scarcity of water during the dry season was found to be the most pressing problem.

(ii)- The relevant authorities cannot feel the response of farmers of Burunga sub-county to the fluctuations in prices for raw milk. This is because the farmers do not speak in a unified voice through a cooperative society.

(iii)- The input costs do not decrease even when milk prices fluctuate between the wet and dry seasons; hence a farmer at times required to sell live cattle to make ends meet.

(iv)- The income from raw milk sales is so little to allow re-investment in the livestock business after paying for the input costs, thus crippling good animal husbandry practices.

(v)- Nevertheless, many farmers were still optimistic in the dairy industry despite the fluctuations. This is evidenced by the rate of incidences were farmers buy dairy bulls to cross with long horned Ankole cattle and the positive gross margin (GM) outcome.

6.2. Recommendations

i) Farmers should be encouraged to form or join dairy cooperative societies as government and private organizations prefer helping groups and not individual farmers.

ii) Farmers intending to go into dairy production business should desist from the tendency of having many low quality heads of cattle and opt for few improved breeds that give more milk.

iii) Encourage gender equity in the ownership of livestock and an equal share in income from livestock product sales.

iv) Calves should be housed in roofed calf –pens to avoid diseases that cause late maturing.

v) Improve Nutrition to reduce calving interval from 16 months to12 months.

vi) Ensure mating weight of 400kg for Friesian heifers at AFC for eventual high milk yields.

vii) Government should provide excavators to dig Valley dams in a cost-sharing scheme where farmers buy only fuel.

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UGANDA SHOWING KIRUHURA DISTRICT

Format for Determination of sample size: Effects of fluctuation in price for raw milk on livestock production in Burunga sub-county, Kiruhura district- Uganda.

N	S	N	S	N	S
10	10	220	140	1200	289
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	25	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	195	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	1000	274	50000	381
200	132	1050	278	75000	382
210	136	1100	285	100000	384

Note: N is population size; S is sample size (Krejcie and Morgan, 1970).

EFFECTS OF FLUCTUATIONS OF PRICES OF RAW MILK AND ITS IPMLICATIONS TO LIVESTOCK PRODUCTION IN BURUNGA SUBCOUNTY, KIRUHURA DISTRICT

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Introduction:

In light of government programs like plan for modernization of agriculture (PMA) and poverty eradication action plan (PEAP), a study to bring out effects of fluctuations of prices of raw milk to livestock production is relevant.

REASONS FOR CHOOSING BURUNGA SUBCOUNTY

A substantial amount of milk and beef consumed in urban centres and towns comes from the rural cattle corridor areas. Therefore, Burunga subcounty which lies in the rural cattle corridor gives a good sample area for such a study.

ANTICIPATED BENEFITS TO RESPONDENTS.

By responding to this questionare, respondents put their views and suggestions in the "same basket" to be presented to authorities who will help in making necessary adjustments.

Biodata.

1. What is your name.....gender.....age.....
2. What do you do for a living a) dairy farmer b) mixed farmer
3. Why did you choose the activity in 2.....

Livelihood

4. Size of ranch.....
5. Perimeter of fenced ranch.....
6. Perimeter of un-fenced ranch.....
7. Name the type and number of livestock in your ranch.....

a) Cattle .....b) goats.....c) others

8. What is the herd structure of your cattle a) lactating……..b) dry cows….. c) Heifers beyond 2 years…….. d) Heifers 1-2 years…… e) bulls……..

9. Employment on the ranch:

category	Number employed	Wage/monthly	Annual payments

10. Have you got a loan from the bank or any financial institution? A) Yes b) No

11. What problems do you face in the ranch……

12. Which 3 do you consider most important……

13. How do you control ticks on your ranch a) dip b) spray c) others specify

14. What do you hope to achieve by controlling ticks……..

15. What age do you begin tick control?……

16. What product do you use for tick control?

17. At what rate do you mix the product in 16 with water……..

18. How much volume of the diluted spray do you use per animal?

a) Adult ……

b) Medium ……

c) Calves……..

19. What is the price of the product?

Milk production and marketing

20. What is your milk production?

a) Rainy season……

b) Dry season ……..

21. At what price do you sell the milk per litre?

22. At what price do you sell your animals?

a) Adult ……..

b) Heifer ……

c) Bull……..

23. What criteria do you use to select animals for sale?

24. How much is a kilo gram of meat?

25. From the record of the last four years, what are the prices (costs) of drugs you commonly use to treat or control diseases?

26production parameters

Parameter	Local breed	Cross breed	Exotic breed
Age at 1st calving			
Calving interval			
Lactation period			
Milk yield/ cow			
Service per conception			
Breeding method			

*1=A12= Local bull 3= cross breed bull 4 exotic bull

27. A) annual birth…….. b) Annual death……

28 weaning age (months)……..

29 .calf housing a) No housing b) open enclosure) roofed pens

30. Annual farm production and off-take

category	output	Unit price	Annual sales	Herd growth
Calves				
Heifer				
In- calf heifers				
Adult cows				
bulls				

Thanks