RELATIONSHIP BETWEEN FARMERS' EDUCATIONAL ATTAINMENT AND MILK PRODUCTION IN ELDAMA-RAVINE DIVISION, KOIBATEK DISTRICT, BARINGO COUNTY

BY

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E55/12837/09

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF EDUCATIONAL MANAGEMENT, POLICY AND CURRICULUM STUDIES, SCHOOL OF EDUCATION, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF EDUCATION OF KENYATTA UNIVERSITY

2011

DECLARATION

This is my original work and has not been presented for a degree or an award in any University.

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DEDICATION

This dissertation is dedicated foremost to the Almighty God who gave me the physical strength and mental capacity to undertake this project. Special dedication is to my family for financial and moral support.

ACKNOWLEDGEMENT

I would like to acknowledge the entire Kenyatta University community for providing an enabling environment for learning and forming the basis for this research. I am deeply indebted to my lecturers Dr. Ogeta and Dr. Nyerere for guiding the research work to be carried out. Special regards goes to my colleagues for their moral support.

ABSTRACT

Although education in Kenya has been offered for several years, several million of Kenyans are still poor and faced with acute food shortage and starvation. Failure to address the mismatch between education and agricultural production may worsen the situation. The purpose of the study was to determine whether Kenya's education system was able to transform its students to be economically productive especially in dairy production and hence fostering rural development in Koibatek district. The objective was to determine the effect of the level of education and use of appropriate technology in milk production. The study adopted a diagnostic approach using descriptive correlation design to investigate the relationship between farmers' level of education and milk production and to find the possibility of increasing milk production through effective quality education. The location of the research was the catchment areas of Sabatia Farmer's Cooperative Society in Eldama Ravine Division of Koibatek District, with a target population of 700 active members, 9 management and 3 supervisory committee members and 29 members of staff. A sample size of 248 members, 6 management and 2 supervisory committee members and 23 staff members were selected. Structured questionnaire was used to collect data from the dairy farmers, committee members and staff members. The collected data was analyzed using descriptive statistics using means, coefficients, frequencies, and percentages with the aid of the statistical package for Social Sciences (SPSS) to determine whether there exists a statistical relationship between level of education of a farmer and quantity of milk produced. The results were presented using tables, diagrams, figures, percentages and in words. Summary of major findings, conclusions and recommendations were made as well as areas for further researches were put forward. The findings of the study would be useful to education programme developers and educational planners in developing education relevant to agricultural growth and hence contributing to rural development, poverty reduction and economic growth as well as the realisation of the vision 2030.

ABBREVIATIONS

AGMs	-	Annual General Meetings
ERAP	-	Educational Research and Publication
FAO	-	Food and Agricultural Organization
IBRD	-	International Bank of Reconstruction and Development
IDA	-	International Development Agency
IIEP	-	International Institute for Educational Planning
ILO	-	International Labour Organization
ILRI	-	International Livestock Research Institute
JASPA	-	Jobs and Skills Programme for Africa
K.C.C	-	Kenya Cooperative Creameries
KARI	-	Kenya Agricultural Research Institute
MDGs	-	Millennium Development Goals
NCERT	-	National Council of Educational Research and Training
PEV	-	Post Election Violence
SFCS	-	Sabatia Farmers Cooperative Society
UNESCO	-	United Nations Educational Social and Cultural Organization
WFP	-	World Food Programme
SPSS	-	Statistical Package for Social Sciences

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CHAPTER ONE

1.0 INTRODUCTION

This chapter presents the background to the study, statement of the problem, the purpose of the study, research questions, hypothesis, significance of the study, theoretical and conceptual frame work.

1.1 BACKGROUND TO THE STUDY

It is estimated that 1.2 billion people in the world are classified as poor and live in extreme poverty (people who live with less than one dollar per day). This population approximately equals to the population of China, slightly greater than that of India and about four times that of USA. 70-75% (840 million) in developing countries is in the rural areas. They are got in the vicious cycle of being unable to access the services and opportunities that might take them out of poverty. Among them are education, gainful employment, adequate nutrition, infrastructure, and communication because they are poor. It is estimated that for the next two decades the majority of the population in the developing countries will continue to be in rural areas. In other words the development challenges will continue to be related to rural trends and conditions (UNESCO, 2003).

Although MDGs targets to eradicate extreme poverty and hunger by 2015, the continued neglect of rural development priorities can lead to a host of other problems that can undermine achievement of national development goals. Such problems include illiteracy, spread of HIV/AIDS and other endemic diseases as well as increase “pushed-out” migration to urban areas (FAO, 2003).

In Kenya, like other developing countries, the overall problem is one of poverty, with increasing rates of population growth and unemployment. The majority of the population make their livelihood in agriculture but most of them have inadequate income. On the other hand economic growth rate is relatively low and its rate of labour absorption has not been high enough to accommodate all the unemployed. Inequality in wealthy distribution has been a long standing problem in Kenya (Rodgers, 1985). The problem of poverty in Kenya is particularly a rural one and has the following dimensions: poor smallholders, migrant farmers, squatters, landless, without adequate employment, poor pastoralist who farm (living stone, 1981).

The agricultural sector employs about 85% of the rural labour force, generates over 60% of the foreign exchange earnings and contributes over 30% of the GDP. In contributing to the foreign exchange earnings it also provides a strong support to the country's industrial development, which relies heavily on imported inputs. The focus of rural development in Kenya are therefore on agricultural development particularly the small scale traditional subsectors, and more specifically food production to feed the country's teeming population (Ibid, 1985).

Since 70% of the worlds poor are rural and many depend on agriculture and natural resources for income and survival, rural development becomes central to poverty reduction (FAO, 2003). While recognizing the value of other development efforts, some consider that agriculture development remains the most powerful instrument to reduce rural poverty.

IBRD and IDA strategy document clearly states that poverty reduction objectives will not be met unless rural poverty is quickly reduced. While there is at present no single solution to the alleviation of rural poverty, education and training are critical elements. Education and

training are two of the most powerful weapons in the fight against rural poverty and for the rural development (FAO, 2003). It is expected that farmers with basic education are more likely to adopt new technology and become more productive. With basic education, they are better equipped to make more informed decisions for their lives and their communities and to be active participants in promoting the economic, social and cultural dimension of development.

The World Bank development report (1984), suggested that it might be better to study the inputs, the outputs and the outcomes of education. Outcomes refer to the external effects of the output i.e. the ability of the students to be socially and economically productive when they eventually enter the wider world of work (Ayot, 1992).

Some studies carried in India reveals non-significant differences among the values of mean lactation milk yield of the herds owned by dairy men possessing various educational statuses. (Gangasare and Karanjkar, 2009). Sosamma (1993) concluded that educational status did not influence the quantity of milk.

Karanja (2003) noted that milk production in Kenya has stagnated at around 2.5 billion litres per annum. In Koibatek District most of the milk cooperative societies have not been active while others have stopped operating and/or providing marketing services prompting their members to join other societies. This is because of the effects of drought and the fact that most members have not revitalized their cooperative societies after the 2008 post election violence. Among other things the seasonality of some societies owing to weak financial strength and low membership, have impacted negatively on their operations leading to closure of business. Sabatia Farmers Co-operative Society (SFCS), the only one active in

Eldama-Ravine Division and the most active in the entire Koibatek District has been the longest serving society. The annual milk produced and supplied to the society has been fairly constant for over 45 years. The literacy levels of most farmers are low and a majority is in the age bracket of between forty and eighty years.

It is from this background that the research intended to put into perspective the relationship between the level of education of the outcomes (farmers) and their production in dairy farming.

1.2 STATEMENT OF THE PROBLEM

Kenya like other developing countries is faced with the problem of poverty, with increasing rates of population growth and unemployment. The majority of the population make their livelihood in agriculture but most of them have inadequate income hence remain poor.

Although there is no single solution to the alleviation of rural poverty, education and training are critical elements. It is expected that farmers with basic education are more likely to adopt new technology, become more productive and make more informed decisions. Despite several decades of experiences in educational programmes in Kenya, several millions of Kenyans are faced with acute poverty, food crisis and starvation.

Since Kenya is an agricultural economy, it implies that the impact of education has not been realized in the agricultural sector, especially in Eldama Ravine division Koibatek District. SFCS has been in operation for the last 45 years (1965-2009) but no significant trend is observable in annual milk production, despite the increase in the number of suppliers to the society. The low output has been attributed to poor infrastructure, competition, price fluctuation, unpredictable weather, livestock diseases, low level of education for most

farmers, poor breed of cows, lack of artificial insemination (AI) services, cultural aspects among others. The literacy levels of most farmers are low, and a majority of them are in the age bracket of between forty and eighty years.

Although one can argue that population increase might have exerted pressure on land due to more settlement and thus affecting its viability for dairy farming, it does not take into account the infusion of additional stock of knowledge and experience in the region. It is expected that with improved technology and increased literacy levels, including the effect of education externalities due to more educated members of households, more efficient dairy techniques would be employed leading to higher annual production per member. The shortfall calls for a critical look at the level of education of farmers supplying milk to the society vis-a-viz the amount of milk produced in order to solve the problem of low milk production. Failure to address the mismatch between education and agricultural production, food insecurity in Kenya will be imminent and more severe.

1.3 THE PURPOSE OF THE STUDY

The purpose of the study is to investigate the various trends in milk production and education levels of dairy farmers with the aim of determining whether the Kenya's Education System has the capacity to transform its learners into productive farmers in dairy industry hence rural development in Koibatek District

1.4 OBJECTIVES OF THE STUDY

1. To determine the relationship between the level of education attained and milk production.
2. To analyse the application of modern techniques in milk production.
3. To establish the relationship between level of education and application of technology.
4. To determine the problems associated with milk production and strategies for containing these problems.

1.5 RESEARCH QUESTIONS

The research set out to explore the following questions

(i) What is the relationship between the level of education and milk production?

(ii) Which knowledge and skills do farmers have that are necessary in dairy farming?

(iii) What modern techniques are employed by farmers in the dairy industry?

(iv) What is the farmer's perception of dairy farming as a business?

(v) What problems do milk producers experience and what are the possible remedies?

1.6 HYPOTHESIS

The study had the following research hypothesis.

Ho_1: There is no relationship between level of education and milk production.

1.7 SIGNIFICANCE OF THE STUDY

The study was to identify the problem of low milk production in Koibatek district as well as opportunities for dairy growth. Increased productivity in the dairy sector would translate to

enhanced farm incomes, nutrition, reduced poverty and a good supply of dairy products to the growing urban population.

The findings would be used by education programme developers to improve the quality of education by finding appropriate ways of incorporating rural development and food security in basic education curriculum and thence making education to be at the service of agriculture and rural development.

The study would also form a reference point for educational planners in seeking ways of developing education relevant to agricultural production and contributing more effectively to rural development, curbing migration to cities, poverty deduction and hence economic growth of the country.

1.8 LIMITATIONS

The study was carried out in Eldama-Ravine Division of Koibatek District, Baringo County of Kenya. The results may not represent a true picture of the situation in other parts of the country. The location has a low financial implication on the researcher.

1.9 DELIMITATIONS

Although the research was conducted in Eldama Ravine Division, the study only covered Sabatia Farmers co-operative Society milk catchment areas and only those farmers registered to supply milk to Sabatia Farmers Cooperative Society were involved.

1.10 ASSUMPTIONS OF THE STUDY

The study assumed that all other factors of production, except labour, in dairy farming were constant and that respondents provided accurate information.

1.11 THEORETICAL FRAMEWORK

The study was premised on the theory based on statistical findings that supported the fact that the level of agricultural productivity is significantly related to the education of the farm workers and that the pattern of demand for a strategic input is significantly influenced by the education of the farm workers (Pandit, 1969).

The development theoreticians of the 1960s viewed agricultural growth as the principal force driving the nation's development. Arthur Lewis (1954) wrote, "If agriculture is in a slump, it offers only a stagnant market and hampers the development of the rest of the economy; if agriculture is neglected, it becomes more difficult to develop anything else. This is the fundamental principle of balanced growth".

The question of which factors were favourable to an increase in agricultural productivity, Schultz (1961) observes that education explains the greater part of total factor productivity (FAO, 2003). Human capital theory regards education as an investment "like any other" and as a generator of externalities e.g. individuals make individual choices concerning their education, but this choice has a strong economic impact through the resulting increase in total factor productivity.

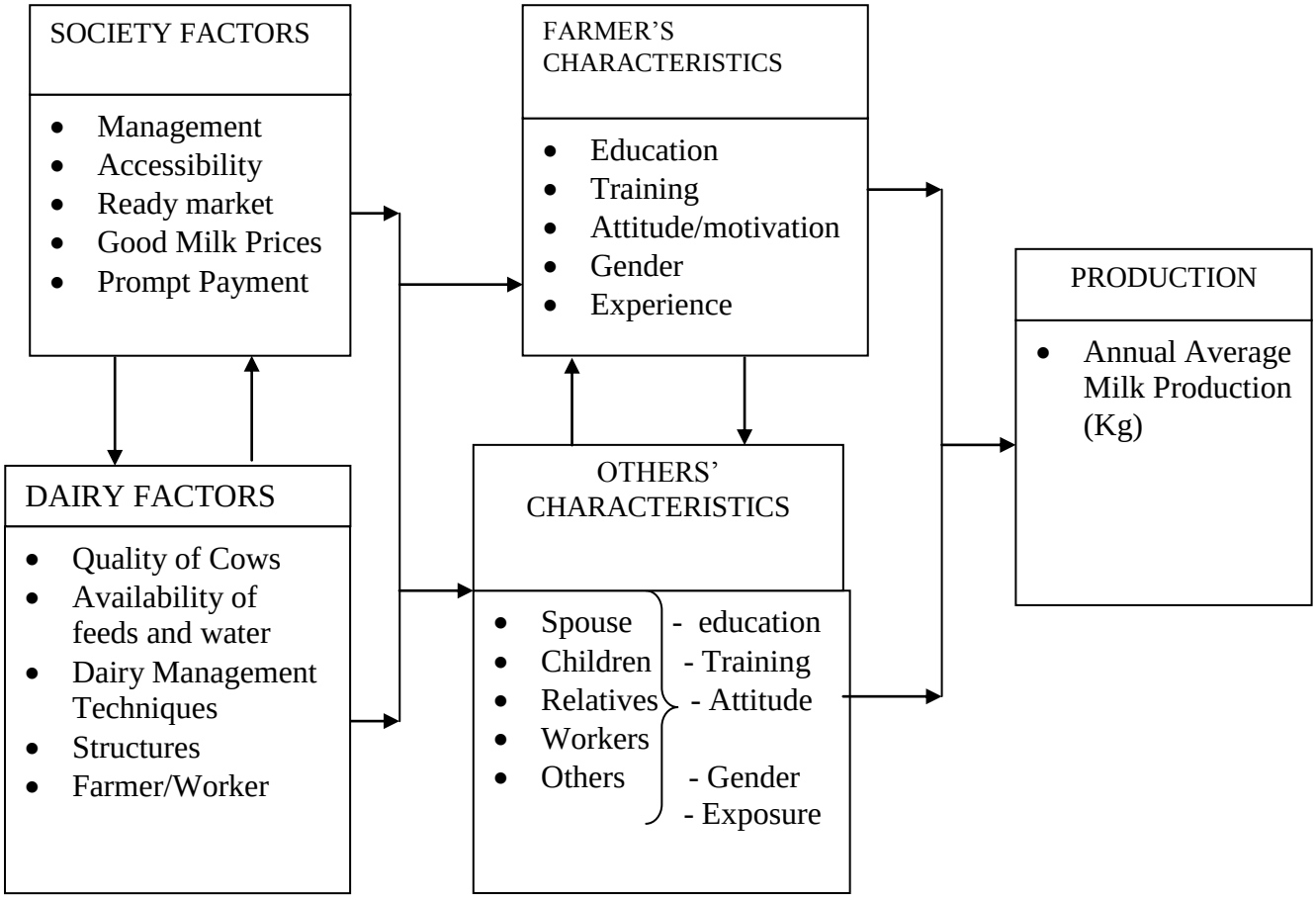
Empirical demonstrations of the relationship between education and agricultural productivity in developing countries showed that educational level of the agricultural labour force has an

influence on agricultural productivity. The relationship may take three forms. First, education can improve the quality of farmers by enabling them to produce more with their available stock of production factors (other than labour). Secondly, education can increase the efficiency of resource allocation. Third, education can help farmers to choose more effective means of production by adopting new techniques (FAO, 2003).

1.12. CONCEPTUAL FRAMEWORK

The model below shows the conceptual framework adopted for the study on correlate factors that affect milk production in Sabatia Farmers Co-operative society (fig. 1.1).

Fig 1.1: Correlate factors that affect milk production in Sabatia



Source: Researcher

The above framework shows the factors that influence the amount of milk produced by dairy farmers. Among the factors are: reliable and accessible market offering competitive price; the quality of cows, availability of feeds and water; and the farmer's education and training which affects the quality of labour, efficient resource allocation and use of appropriate technology. Although these factors play a complementary role in milk production, education and training are expected to play a more significant role in influencing the level of output.

1.13 OPERATIONAL DEFINITIONS OF TERMS

Agriculture - practice of crop husbandry.

Bivariate correlation - correlation involving two variables.

Catchment areas - areas around Sabatia farmer's co-operative society where farmers are and supply milk to the society.

Dairy farming - rearing cows with the aim of producing milk.

Farmers - people practicing crop and animal husbandry.

Heterogeneous - characterised by diverse aspects or elements.

Lactation milk yield - the amount of milk produced when the cow is in the milk producing stage or period.

Livestock farming - domestic animal husbandry for economic benefits.

Questionnaire - a set of questions/statements used to gather information from respondents for research purposes.

Rural areas - generally open areas with low population densities and residents are largely dependent either directly/indirectly on primary production activities as their principal if not their only source of livelihood.

Smallholders - the farmers whose operations are in small scale due to limited space and capital.

CHAPTER TWO

2.0 REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The chapter gives a literature review of related concepts and empirical facts. It deals with conceptual and empirical literature looking at issues relating to climate change and agriculture; education and rural development; education, agriculture and food security; and education and milk production.

2.2 CLIMATE CHANGE AND AGRICULTURE

Even though developing countries have historically contributed less to emissions and most continue to have small carbon footprint, as a group they will suffer earliest and most from harmful shifts in the environment. The poorest in particular are heavily dependent on agriculture for food and incomes. Agriculture is the economic sector most sensitive to climate change, including through water stress. The poor have fewer resources in finance, technology and existing infrastructure to adapt to what lies ahead. Some studies estimate that for every 1^0 rise in average global temperature, annual average growth in poor countries could drop by 2-3%, with an associated cost in human development and basic survival. It is estimated that fall out from climate change kills 300,000 people a year, including through the spread of diseases and malnutrition and seriously affects another 325 million (Barbara and Gretchen, 2009).

Thomson (2010), points out that Kenya was plunged into a state of emergency in 2009 as one of the world's most serious hunger locations forcing 3.8 million people into depending on international food. While exceptional weather pattern was its main cause, the food security crisis was the culmination of many years of mismanagement of the agriculture sector and its associated climate risk.

2.3 EDUCATION AND RURAL DEVELOPMENT

A community cannot foster development without an educated population. In view of this a dual approach should be adopted by combining, as much as possible, the rural development perspective with educational issues (UNESCO, 2003).

Despite decades of effort to improve education and development for rural people especially the poor, the broad picture remains as follows:

- 3 billion people live in rural communities, mainly in countries with low per capita incomes and high rates of poverty. Most make their small incomes from small scale agriculture and forms of self employment and many needs the assistance of their children in sustaining their households.
- Nearly I billion people (2/3 of them women and most rural) are unschooled and unable to access information for development. In several countries rural illiteracy rates are two to three times higher than urban rates.
- 130 million children are not in school, most are in rural.
- Drop out rates form rural primary schools remain unacceptably high. Large promotions of drop outs have not mastered basic skills sufficient for daily use and further development.
- 211 million children and adolescent are informs of child labour that will lead to large proportions of them becoming illiterate adults.

FAO and UNESCO through IIEP, in reviewing the current relationship between education, rural development and poverty reduction, is concerned with countering the disadvantages that besets and continue to beset rural people in matters of quality of life i.e. Safe water supplies, infant mortality, life expectancy, health services, transport and communication. Studies have

shown that there is a challenge in ensuring that young rural people graduate equipped equally to take up a salaried job, or to develop some form of self or family employment that will yield them an adequate living. Rural development depends on education and education depends on rural development (UNESCO, 2003). Kenya's rural economic policies have been fragmented across government departments leaving small farmers with limited access to credit, technical advice or direct financial support (Thomson, 2010).

2.4. EDUCATION, AGRICULTURE AND FOOD SECURITY

Studies show that traditional vocational agricultural education at the secondary level of schooling has not adjusted with the changing times and with rural development needs. It has either not noticed or neglected the emergence of needs and demands for skills in new areas such as environment and natural resources management, biotechnology, agribusiness and other related in enhancing rural livelihoods. This implies that several reforms will be required of traditional agricultural education at the secondary level if it is to contribute to rural development (UNESCO, 2003).

Although rural development encompasses much more than agriculture, it must not be forgotten that in most developing countries farmers, female and male, still constitute a major population of the labour force. They also remain very important to the economy and food security in their society. They therefore must have the education and training to be fully professional and be able to appraise and if appropriate, incorporate new technologies into their production. Further more, poor small–scale farmers are often unable to respond to marketing opportunities or to adapt to situations of excessive production because of inadequate comprehensive professional education. The 1982 conference of Ministers of Education and Ministers responsible for economic planning of member states of Africa stated that education policies since the 1960's reflect a concern with putting education, at all

levels, at the service of agriculture and rural development. It must be given a "rural orientation" to encourage more pupils to pursue agriculture activities, in order to foster the development of rural areas and as a result to curb migration to the cities (UNESCO, 2003).

In France a factor exacerbating the difficulties of working with farming households is their lack of sufficient literacy and numeracy to access and absorb the technical, legal and commercial information necessary to deal with their situation and to protect their interests (UNESCO,2003)

The knowledge of input-output relationship in India agriculture is rather meagre. Co-existence of a higher degree of complementarities along with pervasive substitution possibilities among agriculture inputs makes the input-output relations extremely complex. Quality of farm workers would depend on a number of factors like heredity, environment, nutrition levels and formal education. Among these the most promising and tangible is formal education. The variation in the level of formal education of the farm workers in different parts of India is no less striking than the variation in the level of agricultural productivity. Formal schooling may affect the individuals' attitudes, economic ambitions, effective working ability and receptivity to new ideas. Statistical findings tend to support the fact that the level of agricultural productivity is significantly related to the education of the farm workers and the pattern of demand for a strategic input like chemical fertilizers is significantly influenced by the education of the farm workers (Pandit,1969). Studies have shown that agricultural productivity is 7.4% higher on average for a farmer with four years of elementary education. This effect is stronger in an environment undergoing modernization than in traditional environment (UNESCO, 2003). Moock (1981) verifies the existence of a

positive relationship between education and labour productivity in maize production in Kenya.

According to WFP, 300 million of the World's children are chronically hungry. Approximately 170 million of these children attend school and try to learn while fighting hunger. Rural children often walk long distances to school on empty stomachs. Many cannot afford to bring food from home to eat during the day. They have problems concentrating on their lessons, while teachers report that breakfast deprived children fall asleep in class. The UN Development Assistance Framework for Kenya for the period 2009-2013 laments that the nutrition situation of the country's children has not improved in the last 20years. Although most food insecurity and poverty is located in rural areas where 67% of the population lives, UN agencies report a rapid urbanization of food poverty as Kenya's youthful population migrates to the cities in search of work (Thomson, 2010).

FAO is mandated to promote better agriculture, better food security, better nutrition and better natural resources and environmental management. This involves, promoting all the necessary supporting institutions i.e. land, infrastructure and perhaps even more so organizing appropriate education for all the people involved. It advocates the placing of education at the core of national development agenda and food security agenda by improving the quality of education, finding appropriate ways to incorporate rural development and food security in the basic education curriculum (UNESCO, 2003).

2.5 EDUCATION AND MILK PRODUCTION

The wide spread integration of livestock into the farming systems has contributed to the intensification of small holder agriculture and the absorption of new technology by the small-

holdings. In considering measures to increase the application of new technology in smallholder areas, development of livestock activities should be viewed as important. It is also necessary to ensure the preservation of existing livestock activities as population expands and the size of holdings diminish (Livingstone, 1981). The United States dairy herd produced 185 billion pounds of milk in 2007, up from 116 billion pounds in 1950. Yet there are more than 9 million cows in U.S. dairy farms- about 13 million fewer than there were in 1950(Wikipedia,2011-01-26).

New Zealand accounts for approximately 35% of the world trade in dairy products and 2% of the world dairy production. Total dairy export value has risen significantly over the last 13 years due to growing milk solids production, higher export prices and diverse range of export destinations. It has established a dairy education and innovation centre as well as having specialties in different areas of science and technology which include agriculture and horticulture in various universities. There are also rural high schools and colleges which teach courses on agriculture and horticulture.

Studies carried out in South Vietnam, to investigate the prerequisites for improving dairy production on smallholder farms and to identify strengths and weaknesses in management at farm levels, showed that certain prerequisites exist for improving dairy production since farmers were willing to attend further education courses. It recommended continuing professional education, mandatory training course for new farmers and improving initial training (Gautier, 2008).

In South Africa total milk production has remained relatively constant at around 2 billion litres per annum from 1997 to 2006. As a remedy training is emphasized as key to the future

which includes the need for research scientists and extension officers to support the dairy industry. Farm managers are the hub around which a dairy herd turns (Gertenbach, 2009).

In Kenya, the dairy sector is an important sector of the economy generating substantial income for the smallholders that produce more than half of the total milk production in the country. Dairy farming is a major enterprise for between 600,000 to 800,000 smallholder households. Moreover, an estimated 365,000 waged jobs are created at the farm level (12% of the national agriculture workforce) in addition to family labour. Other benefits include substantial employment opportunities in milk marketing and services related to dairy production e.g. almost 30,000 more jobs are generated by the marketing and processing of milk, mainly in the small scale informal sector (Baltenweck, Yaman and Staal, 2006)

The Kenya dairy industry has the potential for spurring substantial growth in the economy. The Kenya smallholder dairy project highlights the need for a supportive environment to aid the development of Kenya's dairy industry, which contributes significantly to employment, public health and the overall economy of the nation (Republic of Kenya, 2004). An international Association of Agricultural Economist Conference in Gold Coast, Australia in 2006 claimed that there was low dairy development, in spite of the improved dairy technologies and the positive agro-climate and market conditions in most parts of western Kenya. The Kenya economic survey indicates that the volume of annual marketed milk has increased steadily from 2003 to 2007. Milk cooperative societies as well as savings and credit societies have also increased (Table 2.1).

Ta**ble 2.1: Production and sale of dairy products and societies (2003-2007).**

Year	2003	2004	2005	2006	2007
Milk production (million litres)	203	274	340	361	423
Sales (Kshs. Million)	1290	1500	1933	2247	2395
Milk cooperative societies	239	241	249	252	258
Savings and credit societies	4200	4474	4678	4876	5122

Source: Republic of Kenya, 2008.

Enrolment for agriculture and livestock related courses at various levels have been rising from 2003-2007 (Table 2.2).

Table2.2: Enrolment in Agriculture Training institutes 2003-2007.

Year	2003			2004			2005			2006			2007		
Gender	M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
Degree level	2970	1050	4020	3915	1387	5302	3589	1383	4972	3474	1576	5050	4257	1744	6001
Diploma level	1279	539	1818	1532	675	2207	1008	384	1392	1422	576	1998	1586	775	2341
Certificate level	194	72	266	181	96	277	207	84	291	207	107	314	210	112	322
Animal heath training	256	111	367	268	109	377	253	117	370	238	133	371	259	119	378
Short term vocational courses	98	33	131	94	32	126	111	43	154	93	34	127	142	62	204

Key: M- Male. F- Female. T- Total

Source: Republic of Kenya, 2008

However, later studies carried out in Marathwada region of Maharashtra India, on status of milk production and economic profile of dairy farmers revealed that there is no significant difference among the values of mean lactation milk yield of the herds owned by the dairy men possessing various educational status. The data on the lactation milk yield animals of 196 dairy farmers having varying levels of education was collected and analysed (Table 2.3).

Table 2.3: Milk Production as related to level of education

Education Level	Frequency	Mean Lactation Milk Yield (Litres)	Coefficient Variation Percentage
E1	07	1857.42	56.10
E2	38	1952.08	40.10
E3	57	2509.33	55.16
E4	49	2487.37	45.16
E5	30	2484.37	43.09
E6	12	1806.25	38.77
E7	03	2477.67	30.50
196			F Value at 5% level 1.906 Ns

Source: Gangasagare and Karanjkar, 2009.

The table reveals non-significant difference among the values of mean lactation milk yield of the herds owned by the dairymen possessing various educational statuses. The number of observations for these categories varied drastically. Educational status of the dairy farmers is not the criteria to reflect the lactation milk yield. Sosamma (1993) concluded that educational status did not influence the quantity of milk. Gunlu (2003) also revealed non-significant differences among the milk production cost of various educational statuses. This was

attributed to the fact that the dairy farmers in India maintain milk animals as a complementary business to agriculture and that farmers look at dairy farming as a subsidiary and not a commercial business (Gangasagare and Karanjkar, 2009).

2.5.1 Status of Milk Production in Koibatek District

Milk producers in Koibatek District market raw milk through thirteen (13) registered milk cooperative societies found in four (4) divisions i.e. Eldama-Ravine, Mumberes, Torongo and Esageri divisions (Appendix 1). About 2% of the producers make individual deliveries to New Kenya Cooperative Creameries (K.C.C) Eldama Ravine Branch.

Most of the cooperative societies have not been active while others have stopped operating and/or providing marketing services prompting their members to join other societies. This is because of the effects of drought and the fact that most members have not revitalised their cooperative activities after the 2008 post election violence (Appendix 2).

Among other things the seasonality of some societies owing to weak financial strength and low membership, have impacted negatively on their operations leading to closure of business. The few dairy marketing societies in Koibatek District which have survived the test of time are Kiplombe, Sabatia, Mumberes, Torongo and Mwachon. Sabatia Farmer's Cooperative Society (SFCS), the only one active in Eldama-Ravine division and the most active in the entire Koibatek District has been the longest serving society.

2.5.2 Sabatia Farmer's Cooperative Society

The society was registered in 1963, and assumed its full operation from 1965 to date (Appendix 3). Its mandate is to collect, transport and market raw milk on behalf of the farmers. Initially the society used to market milk to the Kenya Cooperative Creameries, but

currently, about 95% of the milk is sold to Brookside Dairies which offer better prices and cooling services at the society. The remaining 5% is sold in a milk parlour at Eldama-Ravine Township which not only attracts higher pay rates, but also satisfies the local demand for the product. The society also provide credit facilities to farmers, such as dairy inputs as well as other farm inputs like fertilisers, seeds, barbed wire rolls, iron sheets among others. It also facilitates cash advances and loans to farmers through Baringo Farmers' Sacco Society, where farmers are the main stakeholders.

SFCS has about 2400 registered members drawn from three settlement schemes identified as routes and their environs. i.e Perkera Scheme(Route 101), Solian Scheme(Route 102) and Kabiyet Scheme(Route 103), an area of approximately 196 SqKm. Other milk suppliers are from Saos- Kibias location.

The region has fair to very good climatic conditions and good arable volcanic soils making it suitable for both dairy and crop farming. The presence of well drained murram road networks makes it easy for collection of milk at various points using tractor drawn trailers.

The activities of the society are coordinated from one central station; the SFCS head office, which is located about 5km from Eldama-Ravine town and 500m east of Eldama-Ravine-Nakuru road. The society is run by nine (9) management and three supervisory committee members elected by members during AGMs. It has also twenty-nine (29) staff.

The literacy levels of most farmers are low, and a majority are in the age bracket of between forty and eighty years. It is from this background that the research intends to put into perspective the relationship between the level of education of outcomes and their production in dairy farming.

SUMMARY

The review elaborates conceptual and empirical literature on the consequences of climate change on agriculture and human life. It shows the interdependence of education and rural development emphasizing on how education, agriculture and food security influenced each other and how they can be harnessed to achieve economic growth and poverty reduction. It postulates the need to give education a rural orientation and finding appropriate ways to incorporate rural development and food security in the basic education curriculum.

Empirical studies have shown that the quality of farm workers depend on formal education because education affects individuals attitudes, economic ambitions, effective working ability and receptivity to new ideas, indicating a positive relationship between education and labour productivity. Further more, statistical findings support the fact that the level of agricultural productivity is significantly related to the education of the farm workers and that the demand for a strategic farm input is significantly influenced by education of the farmer.

However, studies carried out in marathwada region of Maharashtra India, on status of milk production and economic profile of dairy farmers, revealed that there was no significant difference among the values of mean lactation milk yield of the herds owned by the dairy men possessing various educational statuses (Table2.3).

In Kenya, the low dairy development in parts of Western Kenya in spite of the improved dairy technologies as well as positive agro-climatic and market conditions left a lot to be desired. In Koibatek district, there was no clear significant trend in annual milk production and supply to SFCS, despite the increased number of suppliers and several years of experiences in formal educational programmes.

Therefore contradictions brought about by the different studies and findings as well as the low development in the dairy industry in Kenya created an avenue for further research. From the controversies and the grey areas, the researcher intended to investigate whether there was a relationship between the level of education of a farmer and the amount of milk produced in Koibatek district, Baringo Country of Kenya.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research design, target population and sample selection, research instruments and methods of data collection and analysis.

3.2 RESEARCH DESIGN

The design was a case study of Sabatia Farmers Co-operative Society using a descriptive survey. Descriptive research design is a scientific method which involves observing and describing the behaviour of a subject without influencing it in any way (Martyn, 2008). Borg and Gall (1989), note that descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and educators. According to Orodho (2003), descriptive survey designs are used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret for the purpose of classification. The focus of descriptive research is to provide an accurate description for something that is occurring (Martyn, 2008). In descriptive design the researcher observes and then describes what was observed. Since scientific observations are careful and deliberate, however, scientific descriptions are typically more accurate and precise than are causal ones (Babbie, 2001).

The study adopted a descriptive correlation research design to describe the statistical association between the level of education of farmers and the amount of milk produced.

Correlation research designs enable us to assess the degree of relationship that exists between two or more variables (Orodho, 2003). Bivariate correlation will be used to measure the relationships between the two variables and hence establish the degree and direction of their relationships.

3.3 VARIABLES OF INTEREST

Two variables were selected for the study. The level of education (independent variable) and the amount of milk produced (dependent variable). The variables had already occurred and the research attempted to determine the relationship and effects that were occurring between them, by establishing how the level of education influenced the amount of milk produced by the farmer.

3.4 STUDY LOCALE

The study was carried out within the catchments area of Sabatia Farmers' Cooperative Society (SFCS) in Eldama Ravine Division of Koibatek District, Baringo County of Kenya (appendix 9). SFCS is the only one active in Eldama-Ravine division and the most vibrant cooperative society in the entire Koibatek district and being the longest serving milk cooperative society makes it suitable for this study. This location was chosen because of availability of road network, security, limited time allocated for the research and has low financial implications on the researcher.

3.5 TARGET POPULATION

The population of all farmers who produced and supplied milk to Sabatia Farmers' Cooperative Society, the management and supervisory committee members as well as the staff constituted the target population. Sabatia Farmers cooperative society had a total membership of 2,400 who supplied milk to the society but only 700 were currently active and

were distributed in the three routes i.e. Perkera (route 101), Solian (route 102) and Kabiyet (route 103). There were 9 management and 3 supervisory committee members, 29 staff members. Therefore the target population was the 700 farmers, the 9 management committee members, 3 supervisory committee members and the 29 members of staff.

3.6 SAMPLING TECHNIQUE AND SAMPLE SIZE

3.6.1 Sampling Technique

Human population is quite heterogeneous because of differences in attitudes, experiences, behaviours, gender, age, education and training among others. Therefore a sample of individuals from a population must contain essentially the same variations that exist in the population. (Babbie, 2001).

Probability sampling was employed using interval ratio sampling technique. This sampling was to ensure that both new and old members in the population were equally represented in the sample. The population was first arranged according to milk supply codes starting from member number one to the last. Simple random samples were then drawn from the list at regular interval. Simple random sampling is the process of selection from a population that provides every sample of a given size an equal probability of being selected. The main purpose of using random sampling technique is that samples yield research data that can be generalized to a large population within margins of error than can be determined statistically. It also permits the research to apply inferential statistics to the data.

The limitation of simple random sampling is that some subjects will probably refuse to cooperate and others lost through attrition, hence leaving a sample that is not random (Orodho, 2004).

3.6.2 Sample Size

The required sample size for the farmers was obtained using the Krejcie and Morgan table of determining the minimum sample size for a give population size (Appendix 4). From the table, a population of 700 farmers permitted a sample size of 248 members to be selected.

6 management committee members, 2 supervisory committee members and 23 members of staff were selected in the sample (Table 3.1)

Table 3.1: Target population and Sample

category	**population**	**sample**	**Percent (%)**
Farmers	**700**	**248**	**35**
Management committee	**9**	**6**	**67**
Supervisory committee	**3**	**2**	**67**
Staff members	**29**	**23**	**79**

While precision is governed by the absolute numerical size of the sample rather than the proportion of the population sample, the sample needs to be enormous in size to yield very precise results. Singleton and Royce (1975) noted that while 2,000 – 3,000 is extreme upper limit of the sample size, the extreme lower limit is generally 30 cases for statistical data analysis, although most social researchers would probably recommend at least 100 cases (Orodho, 2004).

3.7 RESEARCH INSTRUMENTS

Structured types of questionnaires were employed to collect data. Three sets of questionnaires were used. The first set for the management and supervisory committee members of SFCS;

the second set for the staff members; while the third set was for farmers supplying milk to SFCS.

3.7.1 Management and supervisory committee questionnaire

This questionnaire gave details on historical background, the trend in membership and milk supply since inception to date. It showed the mode of milk collection, categories of farmers in terms of the amount of milk supplied, modes of payment and milk prices, and kind of motivation offered to farmers. The level of education of farmers, including the most appropriate level of education and experience required and how the society contributed to training of farmers were included. It also outlined the challenges that the society faced and possible solutions.

3.7.2 SFCS staff questionnaire

This type of questionnaire tried to elicit responses from the workers of SFCS on individual characteristics in terms of age, sex, designation, level of education and employment experience. It established the challenges they faced as employees of SFCS. The most appropriate level of education required for effective dairy farming as well as the challenges faced by farmers.

3.7.3 Farmer's questionnaire

Highlighted on specific aspects such as gender, number and breed of cows, the amount of milk produced per day, availability of feeds and water, dairy techniques employed, and marketing. It captured the membership in SFCS, the length of membership, consistency in milk supply and benefits obtained, problems faced in SFCS, level of education, how they perceived dairy farming and the challenges faced as dairy farmers.

The three sets of questionnaires mainly concerned the level of education attained by farmers and the amount of milk produced. There were close-ended questions which measured objective responses and a few open-ended questions which measured subjective responses. The close-ended questions elicited responses that gave rise to numerical data while the subjective responses formed the basis for formulation of useful recommendations of the study.

3.8 PILOTING OF THE INSTRUMENTS

A pilot study was conducted with selected farmers in Sabatia Farmers' co-operative Society in order to measure the validity and reliability of the research instruments. The farmers selected for the piloting will not be part of the study sample.

3.8.1 Validity

Validity is the degree to which an instrument measures what it purports to be measuring. Content validity is concerned with establishing whether the questionnaire content is measuring what it is supposed to measure. Expertise opinion from the researcher's supervisors was sought in determining the validity of the research instruments after which their recommendations were incorporated in the final questionnaire.

3.8.2 Reliability

Reliability is the consistency in producing a reliable result. Bell (1993) noted that piloting is one way of checking the reliability of instruments. The spit-half technique for assessing reliability was used. The questionnaires were administered to members and the scored items were divided into groups of even and odd numbers in each category of questionnaires.

3.8.2(a) Reliability scale analysis coefficient (alpha) for odd number variables.

Cronbach's Alpha	N of Items
0.7053	36

3.8.2(b) Reliability scale analysis coefficient (alpha) for even number variables.

Cronbach's Alpha	N of Items
0.7823	36

Reliability results upon testing the instruments yielded alpha reliability coefficients of 0.7053 and 0.7823 respectively. This was slightly above the alpha index of 0.7 as recommended by Birthound (2000). This meant that the responses given to the items of the questionnaire by the respondents were both consistent and well understood. The coefficients showed the reliability of the instrument and established the extent to which the contents of the questionnaire were consistent in eliciting responses from the respondents.

3.9 DATA COLLECTION TECHNIQUES

The researcher acquired a research permit from the National Council for Research and Technology (Ministry of Higher Education) authorizing him to carry out the research (appendix 8). The researcher took copies of the research authorization letter to the District commissioner (DC), District Agricultural Officer (DAO), District Education Officer (DEO)

Koibatek District and the Manager Sabatia Farmers' Cooperative Society notifying them of the research which was to be carried out in Eldama-Division. The researcher carried out the data collection in person assisted by field assistance that were selected and inducted on how to collect data using the questionnaires.

Milk supply codes from the sample were sequenced prior to the date of actual data collection. The sequencing was assisted by a field guide who helped in identifying the farmers in the field in order of their residence. This enabled smooth flow of events in the field during actual data collection. The field guide also assisted the researcher during the actual data collection in the field to identify the members in different milk collection points. Issuing and collection of questionnaires and packaging for analysis was carried out according to the schedule.

3.10 DATA PRESENTATION AND ANALYSIS

The data collected was organized and subjected to both qualitative and quantitative analysis. Quantitative data was analysed through descriptive statistics using means, standard deviation, coefficient of correlation, percentages with the aid of the Statistical Package for Social Sciences. Qualitatively data was analysed in narrative form by arranging the responses according to the main theme, research objectives and research questions. Inferences, conclusions and recommendations were then drawn.

The unit of analysis in this case was an individual member. As units of analysis, individuals may be characterized in terms of their membership in social grouping. These individuals are then aggregated and generalizations made about the population they belong to (Babbie, 2001). During the analysis, the relationships supporting or conflicting with the hypothesis

were analysed using Chi-Square to determine whether to reject the null hypothesis or accept the alternative hypothesis. The analysis was to determine a statistical relationship between the two variables i.e. Education level and the amount of milk produced. The intent was to find out whether the independent variable (level of education) predicted the dependent variable (milk production). The results were presented using tables, diagrams, figures, percentages and in words by explaining the significance of the results.

CHAPTER FOUR

4.0 DATA PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The purpose of this study was to investigate the relationship between the level of education and milk production. The study targeted a sample of 248 milk suppliers out of a population of 700 farmers. Data was collected using self-administered questionnaires. The data obtained were coded and analysed to yield the findings using scientific package of statistical package for social sciences (SPSS). The findings were presented in the form of tables and figures in the sections that follow.

4.2 DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Respondent's demographic information was organized as shown in table 4.2 below.

From the table it shows that (60.2%) of the respondents were males, while (39.8%) were females. The respondents who were in age bracket 30-39 years formed the majority (31.6%) closely followed by over 40-49 years (25.7%), 20-29 years at 19.9% and 50-59 years at 9.4%. Age bracket 60-69 were the minority (2.9%). As regards to length of membership to the society, majority of the respondents (43.9%) have been members between 0-10 years. The membership period of 11-20years and 21-30 years both shared at (21.6%) each.

Table 4.2 Demographics of the Respondents

Gender	Frequency	Percent
Male	103	60.2
Female	68	39.8
Total	**171**	**100.0**
Age	**Frequency**	**Percent**
No respondents	4	2.3
20-29 years	34	19.9
30-39 years	54	31.6
40-49 years	44	25.7
50-59 years	16	9.4
60-69 years	5	2.9
70-79 years	14	8.2
Total	**171**	**100.0**
Length of membership	**Frequency**	**Percent**
No respondents	4	2.3
0-10 years	75	43.9
11-20years	37	21.6
21-30 years	37	21.6
31-40 years	15	8.8
over 40 years	3	1.8
Total	**171**	**100.0**

4.3 CONSISTENCY AND CHALLENGES IN SUPPLYING MILK TO THE SOCIETY.

The respondents were asked for their opinion on the consistency and challenges while supplying milk to the society.

Table 4.3 (a) Consistency

Consistency	Frequency	Percent
No response	4	2.3
Always	101	59.1
Sometimes	38	22.2
Periodically	28	16.4
Total	**171**	**100.0**

Table 4.3(b) Reasons Consistency

Reasons	Frequency	Percent
No response	17	9.9
Seasonal milk production	63	36.8
Enough feeds to give my cow	29	17.0
Availability of milk due to breeding program	37	21.6
Good transport	7	4.1
Satisfied with society services	18	10.5
Total	**171**	**100.0**

Table 4.3(C) Benefits of Supplying Milk to SFCS

Benefits	Frequency	Percent
No response	8	4.7
Assured monthly income	116	67.8
Access to credit facilities	35	20.5
Advance payment before month end	12	7.0
Total	**171**	**100.0**

Table 4.3(d) Challenges Faced in Supplying Milk to SFCS

Challenges	Frequency	Percent
No response	14	8.2
Poor communication network	53	31.0
Large area coverage	10	5.8
Mismanagement in the society	70	40.9
Lower milk prices	24	14.0
Total	**171**	**100.0**

From the table 4.3(a) above one can depict that on consistency, a majority (59.1%) are always consistent in supply and (22.2%) sometimes supply or not while (16.4%) are periodic suppliers. We further realize that (21.6%) of the consistent suppliers stated availability of milk due to good breeding program as their reasons for consistency. 36.8% of the Periodic suppliers stated seasonal milk production as the main concern (table4.3 (b). In respect to

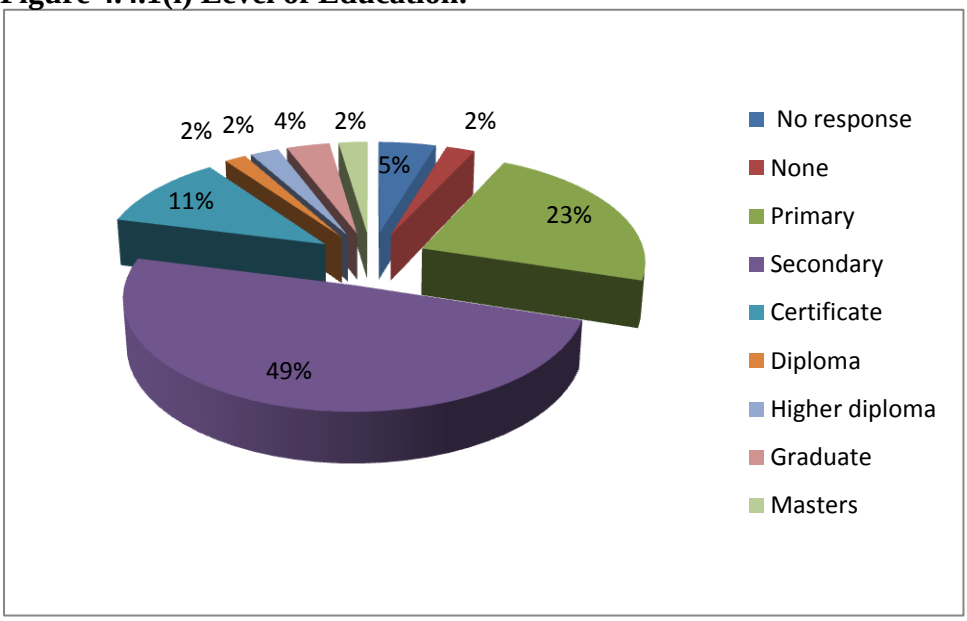
benefits derived by supplying milk to the society, majority of the respondents (67.8%) stated assured monthly income, (20.5%) stated access to credit facilities and (7.0%) stated advanced payment before month end(table 4.3(c)). On challenges faced, (40.9%) stated mismanagement in the society while (31%) poor communication network (table 4.3(d).

4.4 LEVEL OF EDUCATION AND MILK PRODUCTION

4.4.1 Level of Education and Other Training.

The first objective of the study was to determine the relationship between education attainment and milk production. The respondents were asked about their educational background and average milk production. The highest level of education of the respondents was sought as well as relevant course attended towards improvement of dairy farming (Fig.4.4.1).

Figure 4.4.1(i) Level of Education.



From the figure 4.4.1(i) above, majority of the respondents (49%) had secondary school education, (23%) primary school education, (11%) had attained certificate training while respondents with Masters Degree were (2%).

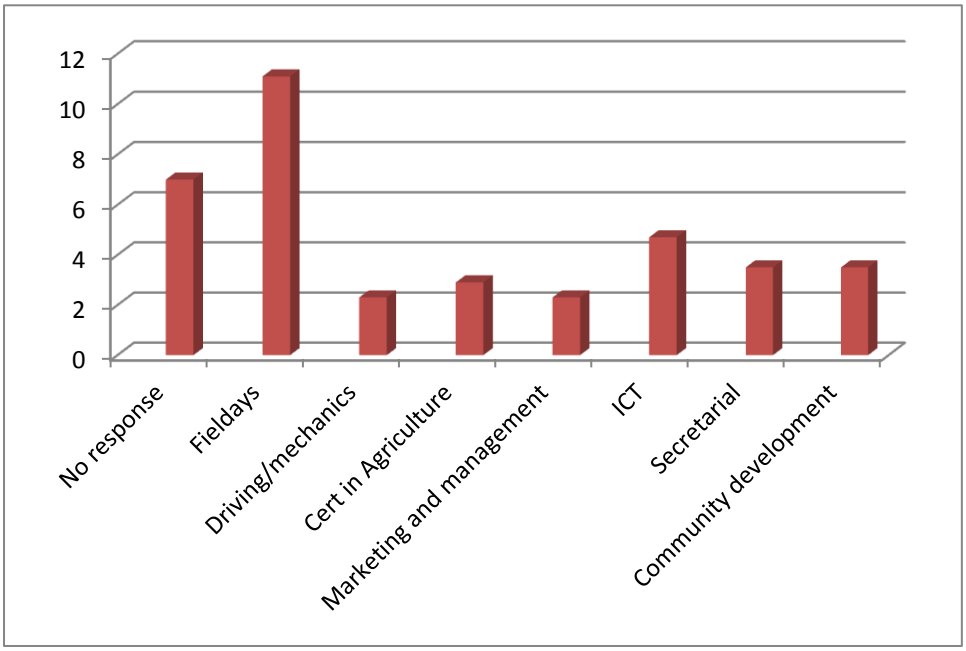
As regards to attendance to other courses, majority (59.6%) had not while only (33.3%) had (table4.4.1a).

Table 4.4.1(a) Whether Has Been Trained in Other Courses

Trained in Other Courses	Frequency	Percent
No response	12	7.0
Yes	57	33.3
No	102	59.6
Total	**171**	**100.0**

The respondents were asked to state other trainings undertaken and field day was highly ranked at (19.1%) followed by ICT (8%) and community development at (6%) (Figure 4.4.1(ii).

Figure 4.4.1(ii) Other Trainings Attended



The management committee and staff members of the society's opinion were sought on the Strength of relationship between education and milk production amongst their milk suppliers.

Table 4.4.1(b) Response of the Management Committee and Staff Members on the Strength of Relationship between Education and Milk Production

Response	Management committee %	Staffs %
None	8.3	34.8
Very strong	16.7	0
Strong	75.0	65.2
Total	**100.0**	**100.0**

From the table 4.4.1(b) above it shows that (75%) of management committee members indicated strong relationship while (65.2%) of the staff members shared the same sentiments. Table 4.4.1(c) was a cross tabulation on the level of education and daily average milk production per cow.

Table 4.4.1(c) Highest Level of Education and Daily Average Milk Production per Cow

	Daily Average Milk Production Per Cow											Total
Education Level	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	15.00	20.00	
None	0	0	0	0	4	0	0	0	0	0	0	**4**
Primary	4	0	4	8	0	4	8	4	5	0	0	**37**
Secondary	0	16	8	20	13	4	17	1	1	0	0	**80**
Certificate	0	0	0	4	7	0	4	0	0	0	0	**15**
Diploma	0	0	3	0	0	0	0	0	0	0	0	**3**
Higher Dip	0	0	0	0	0	0	0	0	0	0	4	**4**
Degree	1	0	4	1	0	0	0	0	0	0	0	**6**
Masters	0	0	0	0	0	0	0	0	0	4	0	**4**
Total	**5**	**16**	**19**	**33**	**24**	**8**	**29**	**5**	**6**	**4**	**4**	**153**

From the table4.4.1(c) above, it is shown that majority (80) of the respondents had secondary school education, closely followed by primary school education (37). However the highest producing respondents (20 litres) had higher diploma education (4), while the lowest producing respondents (2litres) had primary school education.

4.4.2 Regression Analysis of Education Level and Milk production

A regression analysis of the level of education and milk production was run as in table 4.4.2 below.

Table 4.4.2 Summary Model of Education Level and Milk production

R	R Square	Adjusted R Square	Std. Error of the Estimate
.282(a)	.079	.031	6.33995

Predictors: (Constant), Course attended, Gender, Level of education

The R value (multiple regression coefficients) of 28.2% indicated a relationship between (great deal of variance shared by) the independent variables and the dependent variable. The R square (coefficient determination) indicated a goodness of fit value of 7.9% of the variance in the dependent variable is explained by the independent variables in the model i.e. 7.9% of the variability in the success of average milk production is accounted for by the explanatory variable while 92.1% of the remaining could be attributed to the random fluctuation or other unspecified variables.

4.4.3 ANOVA

Table 4.4.3 Analysis of Variance

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	197.835	3	65.945	1.641	.190(a)
Residual	2291.116	57	40.195		
Total	2488.951	60			

a Predictors: (Constant), Course attended, Gender, Level of education
b Dependent Variable: Daily average milk production

The ANOVA table 4.4.3 describes the overall variance accounted for in the model. The F statistics test the null hypothesis that the expected values of the regression coefficients are equal to each other and that they equal zero. A value of F (1.641) and a small significance

level (p<.000) two tailed , indicate that the three predictor variables are not equal to each other and could not be used to predict the dependent variable milk production. Therefore we accepted null hypothesis (Ho), hence there was no significant relationship between Course attended, Gender, Level of education and milk production**.**

4.4.4 Coefficients of correlation

Table 4.4.4 Relationship Between Genders, Course Attended, Level of Education and Milk Production.

Variables	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	10.412	3.639		2.861	.006
Gender	2.882	1.836	.219	1.570	.122
Highest level of education	.362	.550	.100	.658	.513
Course attended	.438	.368	.166	1.190	.239

a Dependent Variable: Daily average milk production.

The model indicates that there was no significant relationship between Course attended, Gender, Level of education and milk production**.**

4.4.5 Milk Production

Table 4.4.5 Daily Average Milk Production

Volume of milk in litres	Frequency
2-10 Litres	20.4%
11.-20Litres.	60.8%
21.30Litres	7.1%
31-40 Litres.	0.6%
41.-50 Litres	1.2%
Total	**100.0**

From table 4.4.5 above a majority of the farmers (60.8%) produced an average of between 11-20 litres of milk per day while those who produced between 31-40 litres were the least (0.6%).

4.5 APPLICATION OF MODERN TECHNIQUES IN MILK PRODUCTION

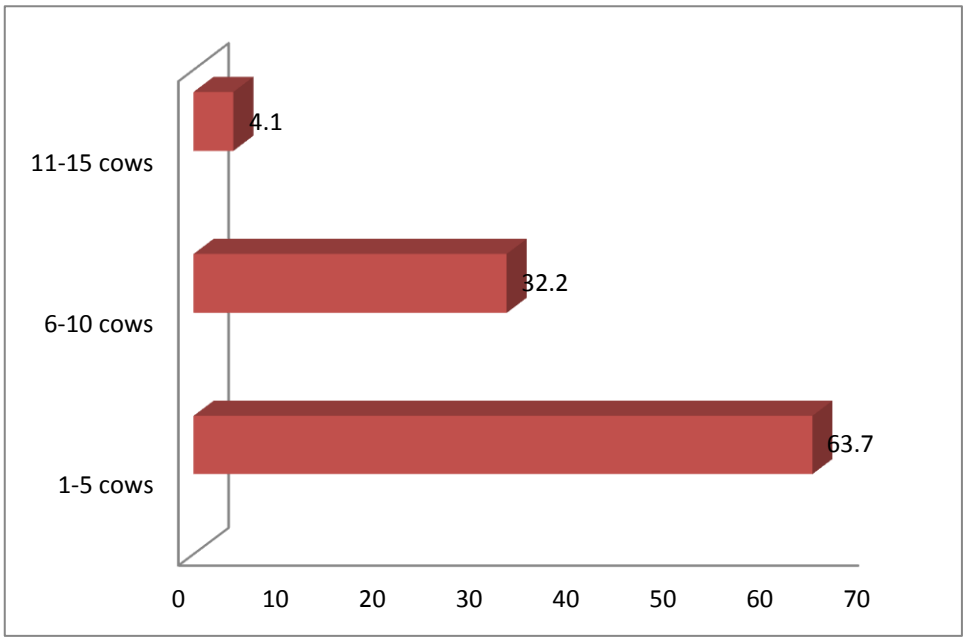
The second objective of the study was to analyze the application of modern techniques in milk production. The respondents were asked on their opinion of different kind of techniques used and their knowledge which gave the responses shown in table 4.5 (a) below.

Table 4.5(a) Application 0f Modern Knowledge in Milk Production

Variables	Have	Application
Knowledge on breeds and breeding	25.9%	63.2%
Knowledge on feeds and feeding	25.7%	63.2%
Knowledge on diseases and management	22.2%	60.8%
Knowledge on Calf rearing technique	73.1%	20.5%
Knowledge on pasture and fodder establishment	72.5%	20.5%
Knowledge on pasture and fodder preservation	56.1%	30.4%
Knowledge on planning and management	59.6%	14.6%

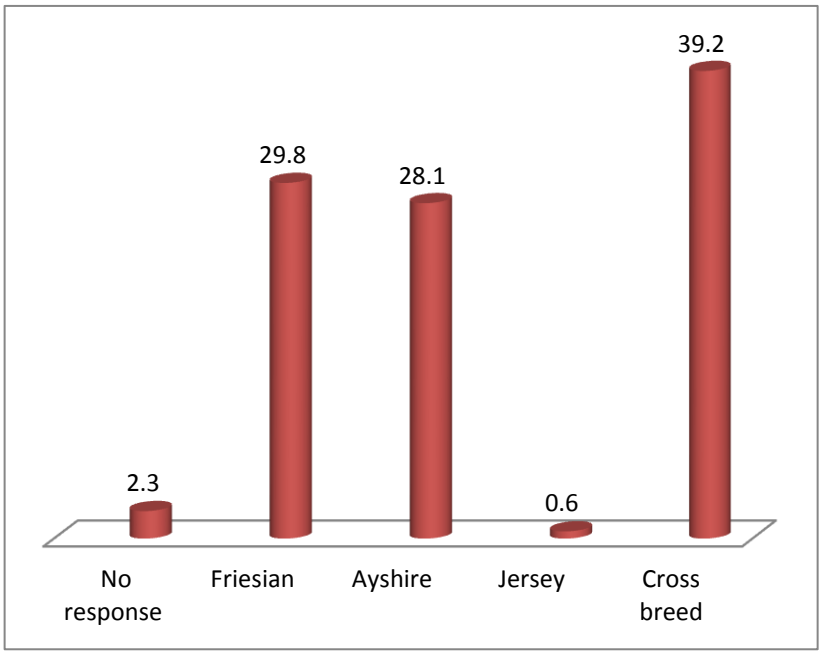
Although a majority of the respondents (73.1%) and (72.5%) had knowledge on calf rearing technique and on pasture and fodder establishment respectively, they least applied them at (20.5%). A few of the respondents (25.9%) and (25.7%) who had knowledge on breeds and breeding and on feeds and feeding respectively applied them most at (63.2%).

Figure 4.5(i) Herd Size



Most of the farmers (63.7%) had a herd size of 1-5 cows and (4.1%) of them had a herd size if 11-15 cows (figure 4.5(i)).

Figure 4.5(ii) Breed types



A majority of the respondents (39.2%) kept crossbreed cows, followed by those who kept Friesian (29.8%) and Ayrshire (28.1%). Those who kept Jersey breed were the least (0.6%) (Figure 4.5(ii)).

Table 4.5(b) Breeding Program

Breeding	Frequency	Percent
AI	59	34.5
Selected bulls	72	42.1
Any available bull	32	18.7
All the three	8	4.7
Total	**171**	**100.0**

Looking at the breeding programs (table 4.5 b), most of the respondents (42.1%) used selected bulls followed by those who used AI for breeding (34.5%). However, those who used the three breeding programs (AI, selected bull, and any available bull) were the least (4.7%). A cross tabulation was carried out on application of modern knowledge in milk production as shown in table 4.5 (c).

Table 4.5(c) Modern Knowledge in Dairy Production

Knowledge	N	Minimum	Maximum	Mean	Std. Deviation
Knowledge on breeds and breeding	152	1	2	1.71	.455
Knowledge on feeds and feeding	149	1	2	1.28	.451
Knowledge on diseases and management	142	1	2	1.73	.444
Knowledge on Calf rearing technique	160	1	2	1.22	.415
Knowledge on pasture and fodder establishment	159	1	2	1.22	.416
Knowledge on pasture and fodder preservation	148	1	2	1.35	.479
Knowledge on planning and management	127	1	2	1.20	.399
Valid N (leastwise)	122				

Knowledge on planning and management mean rated lowest(mean 1.2) and was the most common knowledge possessed by the respondents followed by Knowledge on Calf rearing technique and Knowledge on pasture and fodder establishment(mean 1.22 each). However, Knowledge on diseases and management was highest ranked (mean (1.73) and was the least popular knowledge possessed by the respondents.

4.6 APPLICATION OF MODERN TECHNIQUES AND LEVEL OF EDUCATION

The third objective of the study was to establish the relationship between level of education and application of modern techniques in milk production. The respondents were asked on their opinion of different kind of techniques used.

4.6.1 Application of Modern Techniques

Table 4.6.1 (a) Application of modern techniques

Technique	Very High	High	Medium	Low	Very Low	No Response
Artificial Insemination (AI)	40, (23.4%)	23, (13.5%)	79, (46.2%)	6, (3.5%)	9, (5.3%)	10, (5.8%)
Synchronized breeding program	12, (7.0%)	31,(18.1%)	43, (25.1%)	65, (38%)	7, (4.1%)	13, (7.6%)
Product value addition	11, (6.4%)	40,(23.4%)	61, (35.7%)	22, (12.9%)	11, (6.4%)	22, (12.9%)
ICT	12, (7.0%)	35,(20.5%)	55, (32.2%)	35, (20.5%)	9, (5.3%)	25, (14.6%)
Calf rearing	40, (23.4%)	63,(36.8%)	36, (21.1%)	14, (8.2%)	1, (0.6%)	17, (9.9%)
Stud book registration	20, (11.7%)	36, (21.2%)	21, (12.3%)	48, (28.1%)	25, (14.6%)	21, (12.3%)
Zero grazing	16, (9.4%)	28, (16.4%)	77, (45%)	18, (10.5%)	13, (7.6%)	19, (11.1%)
Embryo transfer	20,(11.7%)	29, (17%)	16,(9.4%)	35,(20.5%)	44,(25.7%)	27, (15.8%)

From the table 4.6.1 (a) above one can depict that calf rearing was widely popular amongst farmers (60.2%) distantly followed by artificial insemination (36.9%). However, the least popular techniques were embryo transfer (46.2%) and stud book registration (42.7%).

Table 4.6.1(b) Modern Techniques in Dairy Production

Technique	N	Minimum	Maximum	Mean	Std. Deviation
AI semen	161	0	5	2.43	1.144
Synchronized breeding program	158	1	5	3.15	1.036
Product value addition	149	0	5	2.80	1.103
ICT	146	1	5	2.96	1.030
Calf rearing	154	1	5	2.18	.944
Stud book registration	150	1	5	3.15	1.323
Zero grazing	152	1	5	2.89	1.030
Embryo transfer	144	1	5	3.38	1.448
Valid N (leastwise)	132				

On cross tabulation of modern techniques on milk production, the lowest rated technique was calf rearing (mean 2.18) and was the most popular technique applied by respondents closely followed by use of AI semen technique (mean 2.43). On the other hand the highest rated technique was embryo transfer (mean 3.38) followed by synchronized breeding program (mean 3.15). Therefore embryo transfer was the least applied technique followed by synchronized breeding program.

4.6.2 Correlation Analysis

Table 4.6.2 Correlation between Milk Production and Application of Modern Technique in Milk Production

Technique	Type of Correlation	Coefficient
Daily average milk production	Pearson Correlation	1
	Sig. (2-tailed)	.
	N	167
AI semen	Pearson Correlation	-.100
	Sig. (2-tailed)	.206
	N	161
Synchronized breeding program	Pearson Correlation	-.159(*)
	Sig. (2-tailed)	.046
	N	158
Product value addition	Pearson Correlation	.107
	Sig. (2-tailed)	.195
	N	149
ICT	Pearson Correlation	.017
	Sig. (2-tailed)	.843
	N	146
Calf rearing	Pearson Correlation	.141
	Sig. (2-tailed)	.081
	N	154
Stud book registration	Pearson Correlation	.122
	Sig. (2-tailed)	.138
	N	150
Zero grazing	Pearson Correlation	.014
	Sig. (2-tailed)	.863
	N	152
Embryo transfer	Pearson Correlation	.195(*)
	Sig. (2-tailed)	.019
	N	144

** Correlation is significant at the 0.05 level (2-tailed).*
*** Correlation is significant at the 0.01 level (2-tailed).*

From the table 4.6.2 above, one could depict that application of embryo transfer as modern milk production technique has the highest correlation with milk production (0.195), closely followed by use of calf rearing technique (0.141) and Stud book registration (0.122), Product value addition (0.107). Other factors with positive correlations were use of ICT (0.017) and

Zero grazing (0.014). On the other hand the modern dairy production techniques with no relationship with milk production were use of AI semen (-0.100) and Synchronized breeding program (-0.159)

4.6.3 Regression Analysis on Application of Modern Techniques and Level of Education

Table4.6.3 Model Summary on Application of Modern Techniques and Level of Education

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498(a)	.248	.212	1.317

a Predictors: (Constant), Stud book registration, Zero grazing, Synchronized breeding program, ICT, Embryo transfer, AI semen.

The R value (multiple regression coefficients) of 49.8% indicated a relationship between (great deal of variance shared by) the independent variables and the dependent variable. The R square (coefficient determination) indicated a goodness of fit. The value of 24.8% of the variance in the dependent variable is explained by the independent variables in the model i.e. 24.8% of the variability in the success of level of education is accounted for by the explanatory variable while 75.2% of the remaining could be attributed to the random fluctuation of other unspecified variables.

4.6.4 ANOVA

Table 4.6.4 Analysis of variance

model	Sum of Squares	df	Mean Square	F	Sig.
Regression	71.678	6	11.946	6.883	.000(a)
Residual	216.959	125	1.736		
Total	288.636	131			

a Predictors: (Constant), Stud book registration, Zero grazing, Synchronized breeding program, ICT, Embryo transfer, AI semen.
b Dependent Variable: Level of education.

The ANOVA table describes the overall variance accounted for in the model. The F statistics test the null hypothesis that the expected values of the regression coefficients are equal to each other and that they equal zero. A value of F (6.883) and a small significance level (p<.000) two tailed , indicate that the predictor variables are not equal to each other and could be used to predict the dependent variable level of education. Therefore we reject null hypothesis (Ho), hence there is significant relationship between application of modern techniques and level of education.

4.6.5 Effects of independent variable on the dependent variable

Table4.6.5 coefficients (a)

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Alpha	Std. Error	Beta		
(Constant)	6.146	0.567		10.831	0.000
AI semen	0.512	0.162	0.377	3.165	0.002
Synchronized breeding program	-0.632	0.151	-0.455	-4.184	0.000
ICT	-0.344	0.125	-0.240	-2.745	0.007
Embryo transfer	0.038	0.116	0.036	0.330	0.742
Zero grazing	-0.501	0.143	-0.323	-3.503	0.001
Stud book registration	0.064	0.115	0.057	0.555	0.580

a Dependent Variable: Level of education

The table above provided the effect of individual predictor variable on the dependent variable. The coefficients indicated the increase in the value of the dependent variable for each unit increase in the predictor variable. The standardized coefficients or beta column provided a common scale Z score (all variables have mean of zero and a standard deviation of one and are expressed in the same unit of measurement). These values gave the following regression model;

Y=6.146+0.377AIS-0.455SB-0.24ICT-0.323ZG

Y= Level of Education

AIS=AI Semen

SB=Synchronized Breeding

ICT= Information Communication and Technology

ZG=Zero grazing

The model indicated a positive relationship between education level and AI semen. Hence a unit increase in education level caused a 37.7% increase in usage of AI semen technology. However there was a negative relationship between synchronized breeding and communication technology with level of education. Hence a unit increase in education level caused a 45.5% decrease in usage of synchronized breeding technology, 24% decrease in usage of communication technology and 32.3% decrease in usage of zero grazing.

4.7 FARMERS' PERCEPTION OF DAIRY FARMING

The respondent's perception of the dairy farming was sought and the following results were obtained as shown in table 4.7(a) below.

Table 4.7(a) How farmers perceive dairy farming

Perception	Frequency	Percent
No response	9	5.3
Independent business entity	66	38.6
Complimentary business	80	46.8
Prestige	9	5.3
Traditional	7	4.1
Total	**171**	**100.0**

From table 4.7 (a) a majority of the respondents viewed the dairy farming as complimentary business (46.8%) while (38.6%) as independent business entity and only (5.3%) viewed dairy farming as prestige.

Table4.7 (b) Reasons for the choice made

Reason	Frequency	Percent
No response	9	5.3
Operating on its own	44	25.7
Mixed farming	19	11.1
Higher / boost income	83	48.5
Main source of income	16	9.4
Total	**171**	**100.0**

Most of the respondents (48.5%) who viewed dairy farming as complimentary business stated boosting of income as their argument (table4.7 (b)). A few respondents (11.1%) did dairy farming as a mixed farming practice while (9.4%) took it as the main source of income.

Table4.7(c) Evaluation on Profit Made

Response	Frequency	Percent
No response	7	4.1
Yes	155	90.6
No	9	5.3
Total	**171**	**100.0**

An evaluation on whether the respondents made profit or not, (90.6%) indicated that indeed there was profit while (5.3%) asserted that there was no profit as shown in table 4.7 (C) above.

4.8 PROBLEMS ASSOCIATED WITH DAIRY PRODUCTION AND THEIR REMEDIES

4.8.1 Problems

The fourth objective of the study was to determine the problems associated with milk production and their remedies. The respondents were asked on their opinion of the different kinds of problems and possible solutions. Tables 4.8 (a) and (b) below show the frequencies and the percentages of the respondents' problems and the suggested solutions respectively.

Table 4.8(a) Problems Faced in Dairy Production

Problems	Frequency	Percent
No response	5	2.9
Drought	108	63.2
Inadequate capital	8	4.7
Diseases	29	17.0
Lower milk prices	5	2.9
Mismanagement	8	4.7
Higher cost of inputs	4	2.3
Inadequate knowledge	4	2.3
Total	**171**	**100.0**

From table 4.8(a) above one can depict that drought accounted for (63.2%) of dairy farmers' challenges distantly followed by diseases (17%). Lack of capital and mismanagement of the society followed at (4.7%) each.

4.8.2 Remedies

Table 4.8(b) possible solutions

Possible Solutions	Frequency	Percent
No response	23	13.5
Borrow loan from Sacco	23	13.5
Provision of extension services	8	4.7
Irrigation of farm zero grazing	10	5.8
Fodder establishment/ preservation	62	36.3
Disease prevention	25	14.6
Good milk prices	11	6.4
Stock drug store at society	4	2.3
Improve on management at society	5	2.9
Total	**171**	**100.0**

As regards to suggestions to overcome their challenges, the table 4.8(b) showed that fodder establishment and preservation (36.3%) was the most preferred solution followed by disease prevention (14.6%) and borrowing loans from society(13.5%).

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION.

This chapter gives a summary of the study findings. It also presents the conclusion, recommendations, and areas for further research. The data were analyzed by use of Statistical Package for Social Sciences (SPSS) package to produce the descriptive statistics. Frequency tables and charts were used to describe the data and summary of major findings and conclusions were drawn as well as recommendations made on the findings.

5.2 SUMMARY OF RESEARCH FINDINGS.

The research findings were as presented in chapter four and the following summaries were made in light of the objectives of the study.

- Majority (60.2%) of the respondents were males, while females were (39.8%) of the sample. The respondents who were in age bracket 30-39 years formed the majority (31.6%) closely followed by over 40-49 years (25.7%). 20-29 years at 19.9% and 50-59 years at 9.4%. As regards to length of membership to the society, majority of the respondents (43.9%) had been members for between 0-10 years. The membership period of 11-20years and 21-30 years both shared at (21.6%) each.

- Majority (59.1%) were always consistent in milk supply, (22.2%) sometimes supplied or not, while (16.4%) were periodic suppliers. It was further realized that (21.6%) of the consistent suppliers stated availability of milk due to good breeding program as their reasons for consistency. (36.8%) of the Periodic suppliers stated seasonal milk production as a major concern. In respect to benefits derived by supplying milk to the

society, majority of the respondents (67.8%) stated assured monthly income, (20.5%) stated access to credit facilities and (7.0%) stated advanced payment before month end. On challenges faced, (40.9%) stated mismanagement in the society while (31%) Poor communication network.

- Most of the respondents (49%) had secondary school education, (23%) primary school education, (11%) had attained certificate training. Respondents with Masters Degree were (2%). As regards to attendance to other courses, majority (59.6%) had not while only (33.3%) had. The respondents were asked to state other training undertaken of which field day was highly ranked at (19.1%) followed by ICT (8%) and community development at (6%).

- Calf rearing was widely popular amongst farmers (60.2%) distantly followed by AI semen (36.9%). However the least popular was embryo transfer (46.2%) and stud book registration (42.7%).

- Majority of the respondents viewed dairy farming as a complimentary business to agriculture (46.8%) while (38.6%) as an independent business entity. Only 5.3% viewed dairy farming as a prestige. However (48.5%) of the respondents who viewed dairy farming as a complimentary business to agriculture stated boosting of income as their argument. In regards to making profits (90.6%) of the respondents make profits

- Drought accounted for (63.2%) of dairy farmer's challenges distantly followed by diseases (17%). Lack of capital and mismanagement at the society at (4.7%) each. As regards to suggestions to overcome their challenges, fodder establishment and

preservation (36.3%) was the most preferred solution followed by disease prevention (14.6%) and borrowing loan from society(13.5%).

5.3 CONCLUSION

This study has shown that there is no significant relationship between levels of education, Courses attended, Gender and milk production. In other words additional level of education and attendance of other courses did not affect the amount of milk produced. However, there was a positive relationship between education level and use of AI semen. Hence increase in education level caused an increase in usage of AI semen technology. There was too a negative relationship between synchronized breeding and communication technology with level of education. Hence a unit increase in education level caused a decrease in usage of synchronized breeding technology and decrease in usage of communication technology.

Drought, diseases, lack of capital and mismanagement of the society were the challenges faced by dairy farmers' in Eldama-Ravine Division, Koibatek District, Baringo County. Fodder establishment and preservation, disease prevention and advancement of loans by the cooperative society were the best solutions to address the farmers' challenges.

5.4 RECOMMENDATIONS

There is need for more women to be involved in dairy farming practices.

The youth in the age of 20-29 years who form the majority of the youth population should be sensitised on importance of dairy farming as a source of sustainable income.

The farmers need to be enlightened on the use of ICT and synchronized breeding technology in dairy farming in order to improve on milk production.

The farmers should be educated on best breeding programs so as to acquire quality breeds and achieve consistent milk supply.

Milk cooperative societies should be encouraged to strengthen advances and credit facilities to farmers to enable them purchase inputs in their farms, at the same time, prudent management of cooperative societies should be looked into in order to improve farmers' confidence in the societies. The road network within the cooperative societies should be improved to allow easy access to the society and the market in general. Post secondary training should be emphasised in the community in order to improve on use of technology and to enhance on milk production. There is also need to educate farmers to treat dairy farming as an independent business entity. The government through the ministry of agriculture and livestock should assist the farmers through establishment of irrigation programmes in order to reduce reliance on rain fed agriculture and guarantee farmers of constant animal feed on sustainable basis. Fodder establishment and preservation should be enhanced at farm levels.

5.5 SUGGESTIONS FOR FURTHER RESEARCH

1. Further research should be done to establish the best breeds suitable for the region.
2. Further study should be done to determine which level of education impacts positively on the level of milk production.
3. Further research should be carried out to establish which ICT package is appropriate in the dairy farming.

REFERENCES

1. Ayot,H.O. and Briggs,H. (1991). Economics of Education. ERAP.
2. Babbie, E. (2001). The practice of Social Research (9th ed). Wadsworth: Chapman University.
3. Baltenweck, I Yamano, T. and Staal, S.J. (2006). Dynamic changes in Dairy Technologies uptake in the Kenya Highlands. International Association of Agricultural Economists Conference (August, 12-18). Gold coast, Australia.
4. Barbara, A. and Gretchen, L. (2009). Climate Justice for a Changing Planet. A primer for Policy Makers and NGOS. Geneva.
5. Bell, A.W. (1993). Educational Research. New York: NY Publishers.
6. Borg, R.W. and Gall M.D. (1989). Educational Research: An introduction. New York: Longman Inc.
7. Gangasagare, P. T. and Karanjkar, L.M. (2009). Status of Milk Production and Economic Profile of Dairy Farmers in the Marathwada Region of Maharashtra. Department of Animal Science and Dairy Science. Adargh Mahavidyalay; Hingoli – 431513.
8. Gautier, P. (2008). Smallholder Dairy in Vietnam. Asian Veterinary and livestock Services. Chiang mai, Thailand.
9. Gertenbach, W. (2009). Dairy Farming in South Africa. Where to Now? Institute of animal Production.
10. Karanja, M.A. (2003). The dairy industry in Kenya. The post liberalization Agenda. Dairy Industry stakeholders' workshop. 27th Aug, 2002, Nairobi.
11. Kerlinger, F. N. (1973). Foundation of Behavioural Research. New York: Holt, Renehart and Winston.

12. Krejcie,R.V. and Morgan,D.W. (1970). Determining Sample Size for Research Activities. Journal of Educational and Psychological Measurements, 30, 607-610.
13. Livingstone, I. (1981). Rural Development Employment and Incomes in Kenya. ILO Office. JASPA.
14. Martyn, S. (2008). Descriptive Research Design. http://www.experiment-resources.com.
15. Moock, P.R. (1973). Managerial Ability in Small Farm Production. An analysis of Maize field in the Vihiga Division of Kenya. New York: Columbia University.
16. Orodho, J.A. (2003). Element of Education and Social Science Research Methods (2nd ed). Maseno: Vanezia.
17. Orodho, J.A. (2004). Elements of Education and Social Science Research methods. Nairobi: Masola.
18. Orodho,J.A. (2008). Techniques of Writing Research Proposals and Reports in Educational and Social Sciences. Maseno: Kanezja HP Enterprises.
19. Pandit, H.N. (1969). Measurement of Cost Productivity and Efficiency of Education. Madra: NCERT.
20. Republic of Kenya, (2004). The Kenya Smallholder Dairy Project. The Policy Environment of Kenya's Dairy Sector. KARI and ILRI
21. Rogers, J.D. (1985). Patterns of Rural Development and Impact on Employment and Income. ILO; JASPA.
22. Schultz, T.W. (1961, December). Capital Formation by Education. Journal of Political Economy.
23. Thomson, J. (2010, September). Crop Diversity and Food Security in Kenya. Onworld Guides. University of East London: Institute of Development Studies.

24. UNESCO, (2003). Education for Rural People. Aid Agencies Workshop. Italy: IIEP.

25. UNESCO, (2003). Education for Rural Development. Towards new policy responses. Paris: FAO.

26. wikipedia (2011-01-26). Dairy cattle-wikipedia. The free Encyclopaedia.

APPENDICES

Appendix 1: Registered Milk Cooperative Societies in Koibatek District.

DIVISION	**ELDAMARAVINE**	**MUMBERES**	**TORONGO**	**ESAGERI**
COPERATIVE SOCIETIES	Sabatia	Mumberes	Torongo	Esageri
	Sigoro	Nyakio	Mwachon	
	Arama	Kagema		
	Kabimoi	Sosit		
	Langas	Gilgil		

Source: Koibatek District cooperative societies' business indicators and data, 2010

Appendix 2: Dairy Marketing Societies

MILK COOPERATIVE SOCIETY	TOTAL MEMBERS	ACTIVE MEMBERS	SHARE CAPITAL	KILOS COLLECTED	GROSS SALES Kshs	MEMBERS PAYMENT Kshs.	%
1. SABATIA	2,417	1,200	6,269,500	1,473,278	36,468,990	30,495,273	84
2. TORONGO	1,748	600	1,720,838	712,648	17,897,127	15,189,043	85
3. MOGOTIO	1,200	400	1,780,700	231,817	6,711,863	5,047,877	75
4. KIPLOMBE	1,170	700	3,060,174	272,135	6,963,733	5,745,766	82
5. MUMBERES	700	600	1,258,400	1,393,796	32,428,642	28,121,357	86
6. MWANCHON	120	60	104,600	32,500	705,200	578,300	82
7. KIPTOIM	798	150	1,700,450	150,006	3,090,233	2,472,186	80
8. SIRWA	262	150	44,300	29,500	770,669	636,620	83
9. SIGORO	400	150	500,000	@@@@	-	-	-
10. ARAMA	459	120	698,500	@@@@	-	-	-
11. GILGIL	160		330,050	######	-	-	-
12. KAGEMA	310		470,000	######	-	-	-
13. NYAKIO	270		343,000	######	-	-	-
14. KABIMOI	1,140		545,675	@@@@	-	-	-
15. SOSIT	190		96,300	######	-	-	-
16. LANGA	500	120	794,200	@@@@	-	-	-
TOTAL	11,844	4,250	19,716,687	4,295,680	105,036,457	88,286,422	83

KEY

- @@@@ - EFFECTS OF DROUGHT
- ####### - MEMBERS HAVE NOT REVITALISED CO-OP ACTIVITIES AFTE

Source: Koibatek District Cooperative Societies.

Appendix 3: Milk Production per Financial Year from 1965 to 2009

YEAR	NO. OF KILOS
1965	1,085,840
1966	1,797,216
1967	2,922,307
1968	1,909,760
1969	1,419,536
1970	1,961,170
1971	2,093,912
1972	2,358,700
1973	2,113,570
1974	2,267,419
1975	2,113,570
1976	2,074,495
1977	2,395,038
1978	2,813,427
1979	2,686,575
1980	1,900,890
1981	2,098,836
1982	3,253,432
1983	2,883,339
1984	1,050,849
1985	1,743,088
1986	3,086,151
1987	2,529,287
1988	3,086,151
1989	2,898,122
1990	2,950,858
1991	2,780,910
1992	2,475,125
1993	2,850,615
1994	2,180,609
1995	2,010,503
1996	1,859,870
1997	1,381,080
1998	1,313,780
1999	1,078,500
2000	780,890
2001	1,255,734
2002	1,841,347
2003	1,919,525
2004	2,014,377
2005	2,079,325
2006	2,312,641
2007	2,842,918
2008	2,714,363
2009	2,288,767
TOTAL	97,474,417

Source: Sabatia Farmers' Cooperative Society Limited

Appendix 4: Minimum sample size from a given population

POPULATION SIZE	SAMPLE SIZE	POULATION SIZE	SAMPLE SIZE	POPULATION SIZE	SAMPLE SIZE
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	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	191	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	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Source: Krejcie and Morgan, 1970.

APPENDIX 5. QUESTIONNAIRE FOR SABATIA FARMERS' CO-OPERATIVE SOCIETY MANAGEMENT COMMITTEE.

SECTION A: General Questions

1. Complete the following

a) Sex : Male ☐ Female ☐

b) Age: 18 - 29 years [ ], 30 - 39 years [ ], 40 - 49 years [ ], 50 - 59 years [ ], 60 - 69 years [ ], 70 and above years [ ].

2. State your designation e.g. manager [ ], Supervisor [ ], Committee member [ ], X-Officio [ ].
3. When was Sabatia Farmers' Cooperative Society founded? _____
4. How many members: (i) at inception? _____ (ii) currently? _____
5. What are the entry requirements for membership?

   _____

6. How has been the trend in supply of milk by members since inception? Increasing [ ], decreasing [ ], constant [ ], fluctuating [ ]. Tick as appropriate.
7. What is the mode of milk delivery to SFCS cooler? Tick as appropriate and indicate the percentage. (i) Society itself collecting from farmers {[ ] -----%}, (ii) Hired private transporters {[ ] ---- %}, (iii) Farmers delivering by themselves {[ ]----- %}, (iv) Any other. Specify _____ {------ %}.
8. What are your modes of payment to farmers? Cash [ ], cheque [ ], account [ ].
9. What was the average price per kilogram of milk paid to farmers in the previous calendar year? Ksh._____
10. (a) Do you motivate your farmers through: (i) competitive milk prices? [ ]; (ii) Prompt payment? [ ]; (iii) cash advances? [ ]; (iv) credit facility? [ ]

    (b) Any other motivation? specify_____

SECTION B: Relationship between the level of education and milk production

1. How do you categorize your farmers in terms of the amount of milk they supply? Fill the table below.

Category of farmers	**Amount of milk per day (kgs)**	**Percentage (%)**
Very low suppliers	Below 5	
Low suppliers	5 – 14	
Medium suppliers	15 – 29	
High suppliers	30 – 49	
Very high suppliers	Above 50	

2. **(**a) What do you think is the most appropriate academic level for a farmer to be productive enough in dairy farming? (i) None [ ], (ii) primary [ ], (iii) secondary [ ], (iv) college [ ], (v) university [ ].

   (b) What (if any) other experiences or exposures are required of farmers to improve their productive capacities_____

   _____

   (c) Does SFCS offer some training to farmers? Yes ( ); No ( ). If yes state the nature of training_____

3. Select the strength of relationship between the farmer's level of education and the amount of milk they produce from the following?

   (a) Very strong relationship [ ], (b) Strong relationship [ ], (c) no relationship [ ], (d) Weak relationship [ ], (e) Very weak relationship [ ].

SECTION C (I): Knowledge and skills **required in dairy farming**

The table below shows the knowledge and skills required by dairy farmers. Give the percentage of the farmers who have these knowledge and skills and the percentage of those who apply them.

Knowledge and skills	**Farmers who have (%)**	**Farmers who apply (%)**
Dairy breeds and breeding programme		
Feeds and feeding schedule		
Dairy cow diseases and management		
Calf rearing techniques		
Pasture and fodder establishment		
Pasture and fodder preservation		
Planning and management		

SECTION C (II): Awareness of Dairy farmers of modern technologies in dairy farming

Indicate the level of awareness of dairy farmers of modern technology and state the percentage of farmers who apply that technology in the table below.

Technology	**Very High**	**High**	**Medium**	**Low**	**Very Low**	**Percentage (%)**
Sexed Semen AI						
Synchronized Breeding Programmes						
Product Value Addition						
ICT						
Calf Rearing Techniques						
Stud Book Registration						
Zero Grazing						
Embryo Transplant						

SECTION D: Farmers' perception of dairy farming.

1. The table below shows the perception of farmers in dairy farming. Give the percentage of farmers in each category.

Farmers' perception	**Percentage (%)**
Complementary business to agriculture	
Prestige	
Tradition/ culture	
An independent business entity	

2. (a) Among those who perceive their dairy farms as a business, do you think they make profit? Yes ( ), No ( ).

   (b) If your answer is yes, in your own opinion, how do you rate the profits they make?

   (i) Very high profit [ ], (ii) High profit [ ], (iii) Medium [ ], (iv) Low profit [ ], (v) Very low profit [ ].

SECTION E: Problems experienced in the society and possible solutions

1. What problems do you experience as management committee of the society?

   i. _____

   ii. _____

   iii. _____

   iv. _____

2. What could be the possible solution to the above problems?

   i. _____

   ii. _____

   iii. _____

   iv. _____

   Accept my sincere thanks for responding to my questionnaire.

APPENDIX6. SABATIA FARMERS' COOPERATIVE SOCIETY STAFF QUESTIONNAIRE

SECTION A: General questions

1. Complete the following

   (a) Sex: Male ☐ Female ☐

   (b) Age: 18-19 years [ ], 20-29 years [ ], 30-39 years [ ], 40-49 years [ ], 50-59 Years [ ], 60 and above years [ ].

   (c) Designation _____ (e.g. driver, clerk etc)

2. (a) What is your highest level of education attained? (i) None [ ], (ii) Primary [ ], (iii) Secondary [ ], (iv) college [ ].

   (b) If college what level? (i) Certificate [ ], (ii) diploma [ ], (iii) degree [ ].

3. For how long have you being working for SFCS? 0-10years [ ], 11- 20 years [ ], 21- 30 years [ ], 31- 40 years, [ ], over 40 years [ ].

4. Are you a dairy farmer yourself? Yes ( ), No ( ). If yes, where do you sell milk? To (i) SFCS [ ], (ii) new K.C.C. [ ], (iii) Hawkers [ ], (iv) Local Market [ ], (v) other society[ ].

SECTION B: relationship between the levels of education and milk production

1. (a) What could be the average level of education for most farmers who supply milk to SFCS? (i) None [ ], (ii) primary [ ], (iii) secondary [ ], (iv) college [ ].

(b) What do you think is the most appropriate level of education for a farmer to be productive enough in dairy farming? (i) None [ ], (ii) primary [ ], (iii) secondary [ ], (iv) college [ ].

2. Select the strength of relationship between the farmer's level of education and the amount of milk they produced from the following?

(a) Very strong relationship [ ], (b) Strong relationship [ ], (c) no relationship [ ],

(d) Weak relationship [ ], (e) Very weak relationship [ ].

SECTION C (I): Knowledge and skills required in dairy farming

The table below shows the knowledge and skills required by dairy farmers. Give the percentage of the farmers who have these knowledge and skills and the percentage of those who apply them.

Knowledge and skills	**Farmers who have (%)**	**Farmers who apply (%)**
Dairy breeds and breeding programme		
Feeds and feeding schedule		
Dairy cow diseases and management		
Calf rearing techniques		
Pasture and fodder establishment		
Pasture and fodder preservation		
Planning and management		

SECTION C (II): Awareness of dairy farmers of modern technologies in dairy farming

Show the level of awareness of dairy farmers of modern technology and state the percentage of farmers who apply that technology in the table below.

Technology	Very High	High	Medium	Low	Very Low	Percentage (%)
Sexed Semen AI						
Synchronized Breeding Programmes						
Product Value Addition						
ICT						
Calf Rearing techniques						
Stud Book Registration						
Zero Grazing						
Embryo Transplant						

SECTION D: Farmers' perception of dairy farming

1. The table below shows the perception of farmers in dairy farming. Give the percentage of farmers in each category.

Farmers' perception	Percentage (%)
Complementary business to agriculture	
Prestige	
Tradition/ culture	
An independent business entity	

2. (a) Among those who perceive their dairy farms as a business, do you think they make profit? Yes ( ), No ( )

   (b) If your answer is yes, in your own opinion, how do you rate the profits they make?

(i) Very high profit [ ], (ii) High profit [ ], (iii) Medium [ ], (iv) Low profit [ ], (v) Very low profit [ ].

SECTION E: Problems experienced in the society and possible solutions

1. What problems do you face as employees of the society?

   (i) _____

   (ii) _____

   (iii) _____

   (iv) _____

2. What could be the possible solution to the above problems?

   (i) _____

   (ii) _____

   (iii) _____

   (iv) _____

Accept my sincere thanks for responding to my questionnaire.

APPENDIX 7. QUESTIONNAIRE FOR MEMBERS SUPPLYING MILK TO SABATIA FARMERS' COOPERATIVE SOCIETY

SECTION A: General questions

1.Complete the following

(a) Sex: Male ☐ Female ☐

(b) Age: 18-19 years [ ], 20-29 years [ ], 30-39 years [ ], 40-49 years [ ], 50-59 years [ ], 60-69 years [ ], 70-79 years [ ], 80 and above years [ ].

2. As a member of Sabatia Farmers' Cooperative Society, did you have problems joining the Society? Yes ( ); No ( ).

3. If yes, state the nature of the problem_____

4. For how long have you been a member of Sabatia Farmers' Cooperative Society?

(i) 0-10years [ ], (ii) 11-20 years [ ], (iii) 21-30 years [ ], (iv) 31-40 years [ ], (v) Over 40 years [ ].

5. (a) How consistent have you been supplying milk to SFCS?

(i) Always [ ], Sometimes [ ]; Periodically [ ].

(b) Give reasons for your answer in 5(a) above_____

_____

6. Which among the following benefits do you get by supplying milk to SFCS?

(a) Assured cumulative monthly income [ ], (b) Access to credit facilities [ ]

(c) Advance payment before the month ends [ ], (d) others [ ].Specify_____

7. What are the challenges that you face in supplying milk to SFCS?

i. _____

ii. _____

iii. _____

iv. _____

SECTION B: Levels of education and milk production

1. (i) What is your highest level of formal schooling attained?

a. None (No schooling)	☐	f. Tertiary training (Higher National Diploma)	☐
b. Primary School Standard	☐	g. Graduate level	☐
c. Secondary School Form 4/6	☐	h. Post graduate level (masters)	☐
d. Tertiary training (certificate)	☐	i. Post graduate level (PhD)	☐
e. Tertiary training (ordinary diploma)	☐	j. Professor	☐

(ii) Is there any other training attended apart from those mentioned in (i) above?

Yes ( ), No ( ). If yes, specify: _____

2. (i) How much milk, on average, do your cows produce per day? _____ Kgs/litres.

(ii) What is the highest amount of milk produced per day? _____ Kgs/litres.

(iii) What is the lowest amount of milk produced per day?_____Kgs/litres.

(iv) What is your average production per cow per day? _____Kgs/litres.

SECTION C (I): Knowledge and skills required in Dairy Farming

1. The table below shows the knowledge and skills required by dairy farmers. Tick the ones that you have and the ones you apply in your farm.

Knowledge and skills	**Have**	**Apply**
Dairy breeds and breeding programmes		
Feeds and feeding schedules		
Dairy cow diseases and management		
Calf rearing techniques		
Pasture and fodder establishment		
Pasture and fodder preservation		
Planning and management		

2. (a) How many cows in total do you have? (i) 1-5 cows [ ], (ii) 6-10 cows [ ], (iii) 11-15 cows [ ], (iv) 16-20 cows [ ], (v) over 20 cows [ ].

(b) What breed? Friesian [ ], Ayrshire [ ], Guernsey [ ], Jersey [ ], cross breed [ ], others [ ]. (Tick as appropriate).

3. How do you breed your cows? Using (i) AI [ ] (ii) Selected bull [ ] (iii) Any bull available in the farm or neighbourhood [ ], (iv) A combination of the above three [ ].

4. (a) How do you feed the animals?

(i) Graze [ ], (ii) zero-graze [ ], (iii) semi-zero graze [ ].

(b) Apart from pasture / roughage, do you feed with concentrates such as dairy- meal, maize germ, bran, or others? Yes ( ); No ( )

If yes, specify._____

(c) Where do you get your feeds?

(i) pasture/roughages: own farm [ ]; buy [ ].

(ii) Concentrates: own farm [ ]; buy [ ].

(d) How accessible is your source of water?

(i) Very accessible [ ], (ii) accessible [ ], (iii) not easily accessible [ ].

5. (a) How do you feed the young calves

(i) Bucket feeding [ ] (ii) Suckling their mothers [ ]

(b) If you bucket feed, how much milk per calve per day? _____Kgs/litres

6. What dairy practices do you employ to ensure adequate disease prevention and control?

(i) _____

(ii) _____

(iii) _____

7. Do you keep some records in your dairy farm? Yes ( ), No ( ). If yes, what records?

(i) _____

(ii) _____

(iii) _____

(iv) _____

8. What structures do you have in your dairy? _____

_____

SECTION C (II) Awareness of modern techniques in dairy farming

What is your level of awareness of modern technology in dairy farming and state the percentage of your application in the table below?

Technology	**Very High**	**High**	**Medium**	**Low**	**Very Low**	**Percentage (%)**
Sexed Semen AI						
Synchronized Breeding Programmes						
Product Value Addition						
ICT						
Calf Rearing						
Stud Book Registration						
Zero Grazing						
Embryo Transplant						

SECTION D: Perception of dairy farming

1. (a) How do you perceive your dairy farm? As (i) an independent business entity[ ], (ii) complementary business to agriculture [ ], (iii) prestige [ ], (iv) tradition [ ]

   (b) Explain the choice you have made above. _____

   _____

   _____

   (c) If you think your dairy farm is a business, do you make profit? Yes ( ) No ( ).

   If your answer is yes, how do you rate the profit that you make?

   (i) Very high profit [ ], (ii) High profit [ ],(iii) Medium profit [ ],

   (iv) Low profit [ ], (v) Very low profit [ ].

(d) What else do you think you can do to increase you profit margin?

_____

_____

2. (a) If you compare dairy farming with crop farming which one according to you is better?

Dairy farming [ ]; crop farming [ ]; both [ ].

(b) Give reasons for your answer in 2 (a) above._____

_____

SECTION E: Problems experienced by milk producers and possible solutions

1. What problems do you face as a dairy farmer?

(i) _____

(ii) _____

(iii) _____

(iv) _____

2. What are the possible solutions to the above problems?

(i) _____

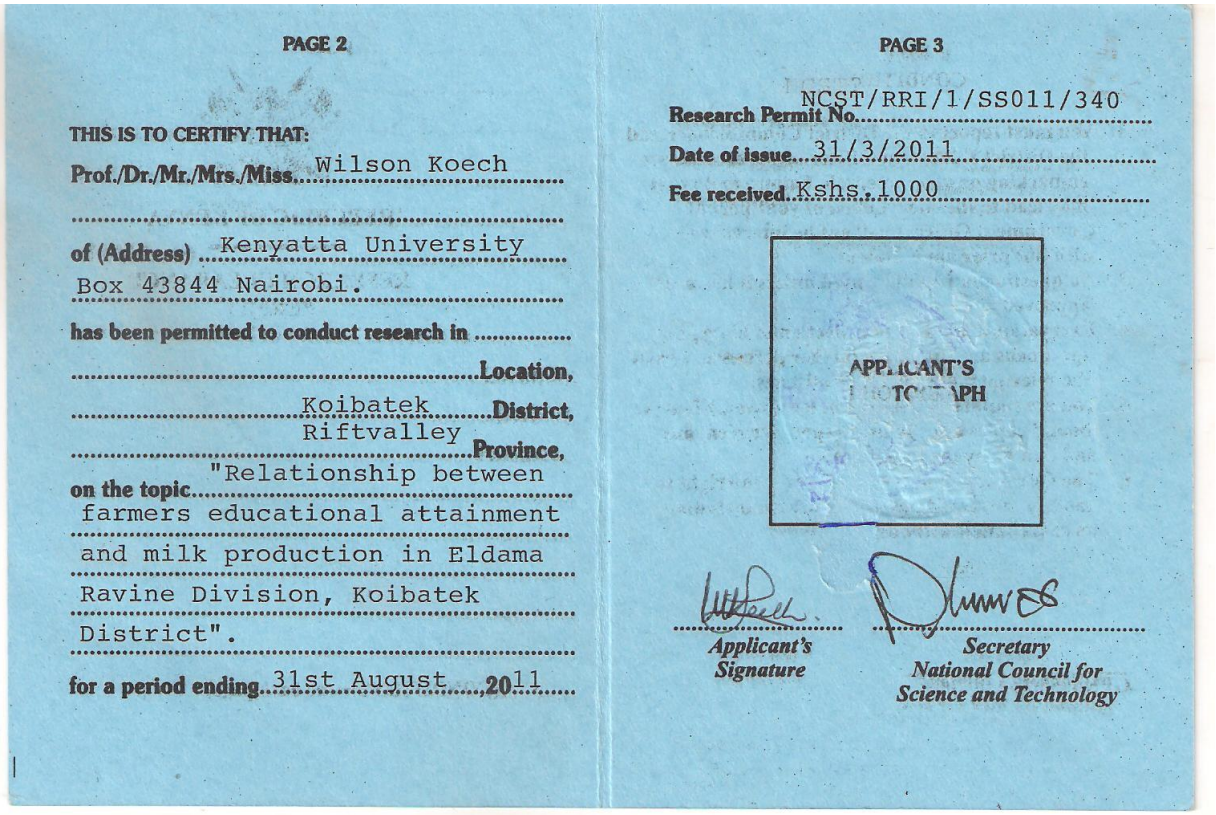
(ii) _____

(iii) _____

(iv) _____

Accept my sincere thanks for responding to the questions.

Appendix 8



PAGE 2

THIS IS TO CERTIFY THAT:

Prof./Dr./Mr./Mrs./Miss. Wilson Koech

of (Address) Kenyatta University
Box 43844 Nairobi.

has been permitted to conduct research in .....

.....Location,

Koibatek .....District,

Riftvalley .....Province,

on the topic "Relationship between farmers educational attainment and milk production in Eldama Ravine Division, Koibatek District".

for a period ending 31st August ,2011

PAGE 3

Research Permit No. NCST/RRI/1/SS011/340

Date of issue 31/3/2011

Fee received Kshs.1000

APPLICANT'S PHOTOGRAPH

Applicant's Signature

Secretary National Council for Science and Technology