FACTORS AFFECTING PRODUCTION OF DAIRY PRODUCTS IN KENYA: A CASE OF CO- OPERATIVE SOCIETIES IN KIAMBU COUNTY

GEORGE NJOROGE MBURU

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DECLARATION

Student Declaration

I declare that the work in this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author duly acknowledged.

Student Name: _____ Reg. No: _____

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I do hereby confirm that I have examined the dissertation of

George Njoroge Mburu

and have certified that all revisions that the dissertation panel and examiners recommended have been adequately addressed.

Sign: _____ Date: _____

Dr. Edward Owino

Dissertation Supervisor

ABSTRACT

Despite the growth in dairy farming over the years, there is a lot of imbalance in milk production experienced in different areas based on the approach from different farmers. The farmer's fails to understand the connection between dairy productivity and farming practices. The study sought to establish factors affecting production of dairy products in Kenya. The targeted population was 6,1018 dairy farmers members of co-operative society in Kiambu County, stratified random sampling was used in selection of sample the Study sampled 383 farmers from co-operative societies situated within eight constituencies in Kiambu County. The study collected primary data using structured questionnaires. Processing and analyzing of the survey data was carried using SPSS version 21. Data presentation was in form of tables to help interpret findings and generate conclusions. The study established that member's payment, dairy production resources and dairy production systems affect the production of dairy product. The study recommended that a dairy farmer who is the primary producers in the supply chain should also be given the opportunity to add value to their product by adopting methods of production that satisfy the demands of processors and customers, dairy production system should Lean to culture of continuous improvement, dairy farmers should implement new technologies and practices that are consistent with their goals, the policy with strong believe that farmers will gain and benefit like pay with performance and quality of daily product, establish the standards to determine farmers pay Protect farmers from negative consequences of dairy product and periodically review of the payment terms that does not create a culture of mistrust. The County Government needs to improve in extension services, access to affordable finance and facilitate investment of the supply chain in dairy farming.

Keywords: Dairy Products, SACCOs, Kiambu County

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DEDICATION

This work is dedicated to my family for their support during the study period

LIST OF ABBREVIATIONS

EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ILRI	International Livestock Research Institute
KCC	Kenya Co-operative Creameries
KDB	Kenya Dairy Board
MSEs	Medium and Small Enterprises
SDP	Smallholder Dairy Project
UHT	Ultra-High Temperature
VCF	Value Chain Financing

OPERATIONAL DEFINITION OF TERMS

Dairy Production: Is a class of Agriculture for the production of milk which is processed either at the farm level or at the dairy plant (Muriuki, 2010).

Dairy Products: are foods or drinks that are created from cow milk which can also be produced using goat or sheep milk. The milk is processed in the plant called dairy plant, which goes through process either pasteurization or homogenization (Benin at al 2003)

Large Scale Farmers: Are those farmers whose production is within the range of 50 to 250 kilograms of milk production and the cows are from 10 to 40 in numbers (Mumba C 2012).

Medium and Small Enterprises: Are business enterprises whose personnel are few, For medium the personnel range from 50 to 250 while small is that enterprises whose personnel range from 10 to 50 (Romney et al, 2004).

Payments Terms: Are the conditions under which the seller will complete the sale which includes, the period allowed to the buyer to pay off the amount due.

Production Resources. These are inputs used in production to produce output or finished goods this include machine, goods and materials (Lanyasunya et al, 2006)**.**

Production Systems: Comprise the element of system adapted in production of dairy product it can be small or large scale production system (Lanyasunya et al, 2006)**.**

Small holder farmers: are farmers with small or limited resources such as land, capital sill and small number of dairy producing animals (Phnom, 2011**).**

Small Scale Dairy Farmers: Are those farmers whose production is within 5-50 kilograms of milk produced and whose cows are 5 to 10 numbers (Herro,Nganga,Kingu J& Riddre, 2010)

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The Kenyan economy is supported to a large extent by the Agricultural sector which is a major contributor to the Gross Domestic Product (GDP). The Agricultural sector supports majority of Kenyans, 75% of whom earn their living from farming sector directly or indirectly. In Kenya, the Dairy Sector is the largest Agricultural sub-sector compared to other Agricultural farming. It contributes to 14% of Gross Domestic Products in Agricultural sector and when combined to Kenya National Goods Domestic Product it produces 3.5% (Government of Kenya – GOK, 2008). Dairy production is a major farm activity in Kenya, where it is regarded as a major smallholder, source of income, incorporating over 1.8 million smallholder farm households, who produce over 70% of all milk marketed (Smallholder Dairy Project-SDP, 2012). In 2005, the value of dairy production was estimated at Ksh 23.1billion equivalent to 14% of total value of agricultural production (Kodhek, 2009). In 2008, milk production was estimated at 2.3 billion litres of which 63% was marketed, 30% was consumed at home and the rest 7% fed to calves (Republic of Kenya, 2009). The value of this production is estimated at Ksh 35.2 billion equivalent to 25% of gross agricultural output recorded in 2010. Despite this significant contribution to the national economy and households incomes, the dairy industry is besieged by a number of technical, economic, institutional and financial problems, which seem to have escalated in the recent past **(**Export Processing Zones Authority EPZA, 2009).

Increased productivity in the dairy sector will not only enhance farm incomes, nutrition, reduce poverty but will also supply dairy products to the growing urban populations. On the demand side, local markets for milk and other dairy products continue to

rise, fuelled by rapid population growth and the process of urbanization. It is projected that by 2020 demand for milk in Kenya will rise to about 5.8 billion metric liters, 15% higher than the projected supply of about 5 billion liters (SDP, 2005). This calls for not only higher production but also better organization of the marketing chain.

In many countries in sub-Saharan Africa, including Kenya, there has been increasing desire to institute policy and institutional reforms to raise sector productivity and income growth. These concerns include the need to encourage private sector participation in providing farm inputs, financial and marketing services, and technical support (Nyariki & Thirtle, 2000). The reforms in the dairy sector in Kenya, for example, were aimed at meeting the dairy production requirements through the use of improved technologies, increased input use and creation of an enabling economic and institutional environment, with favourable dairy development policies. In addition, the reforms were expected to improve the availability of and access to inputs and products in the dairy sector. They were also meant to allow the forces of supply and demand to guide the production, distribution and marketing of various goods and services and therefore promote efficiency and economic growth (World Bank, 2008).

1.1.1 Factors Affecting the Production of Dairy Products

The dairy sector faces a number of challenges including; Financial, Economic, Production Resources, Production system, processing, marketing and Institutional Problem in dairy product production. These challenges affect the ability of the sector to compete in the domestic and international market (Wambugu & Opiyos, 2011). Kenyan milk production is by small-scale farmers and large-scale farmers. The small-scale farmers are those farmers who own one to five animals and produce about 80% of the milk produced in Kenya (Ministry of Livestock and Development – MLD, 2008). Dairy production is affected by resources available, which is the main to the production. Dairy farmers' access to loan is

equally a challenge, as they cannot offer the biological assets (cows) as security and poor financial records and credit history of the farmers. Unfair credit terms, high costs of animal feeds, artificial insemination and expensive dairy equipments are among other factors negatively affecting the industry. The production capacity of herds by both small-scale farmers and large scale producers is also influenced by the land size, labour, cost of feed, market pricing as well as the competition in the market by both small-scale and large scale institutions. The co-operatives are also facing a challenge of pricing wars with private processing plants that have sophisticated processing equipments and large market shares.

The revenue per cow produced is the key measure to determine how successfully a dairy operation cow can be financially success to the dairy operation. The causes of return vary from year to year depending on the price or payment paid to the farmer (Kevin C. Dhuyvetter, 2011). The Kenyan government through the Ministry of Agriculture has done a lot to improve the quality of breed. However, a lot of effort is needed to introduce new dairy products production systems which are more cost effective. This may include zero grazing system since the farm size continues diminishing as the population continues increasing resulting to less dairy products production (Karanja et al, 2003). Before dairy sector was liberalized, milk used to be transported by organized milk collection and bulking system in the formal market by individual dairy farmers and dairy co-operative societies. After the liberalization in 1990, the transport system collapsed, bulking of dairy product became complex and depended with milk processors, intermediaries sector and road network. This is still the current state. Since, there has also been an increase in farm input prices due to post election violence crisis combined with the world economic trend. The price of most dairy feeds went up dramatically up to 100 percent that is from Kshs.100 per bale of hay grass to Kshs. 200 per bale and above (Staal, Waithaka, Njoroge, Mwangi, Njubi & Wokabi, 2003).

In Kenya, smallholder dairy farmers dominate the dairy farming at the production level. There are more than 1 million smallholder dairy farmers (smallholder dairy protests (SDP), 2012) who contribute more than 70% of gross dairy product marketed. Other players in dairy production are co-operative societies and farmers groups who handle 40% of milk marketed (Muriuki, 2003). Input and service providers include agro-vets, breeder service providers, extension service provider and financial institution. Milk market liberalization policies was aimed at enhancing competition , which would improve efficiency in milk procurement, processing and distribution, which in turn would result into regular and more remunerative prices to the farmers. It was also hoped that the efficiency gains would translate into higher quality milk products and lower consumer prices (EPZA, 2005). Income from dairy is also the only year-long recurrent revenue from agriculture, though revenue flows do fluctuate with seasons (FAO, 2009). Fluctuations of payment to member affect the production of milk in Kenya, this influence member to sell their milk to informal markets (FAO, 2009).

1.1.2 Production of Dairy Products

Milk has certain features that distinguish it from other agricultural products and shape its production, processing and trade. As opposed to grains, milk is a bulky and heavy commodity which requires high-cost storage and transportation as it spoils quickly without cooling. Due to the fact that even the largest dairy farms cannot provide adequate quantities to supply a processing plant, but each single dairy farm only supplies a small quantity of the total milk processed, the dairy industries in many countries are organized along co-operative lines. Milk producer cooperatives bundle the interest and supply of a large number of dairy farmers and strengthen their bargaining power towards processors or even run their own processing plants (Food and Agriculture Organization, 2009). Over the last 24 years, total world milk production has increased by 32 percent; whereas per capita world milk production has declined by nine percent which indicates that world milk production has not kept pace with

the increase in world population. The decline in global milk production per capita can be attributed to falling production in the developed countries whereas per capita milk production in the developing countries has slightly risen over the last 24 years (IMF, 2008). As opposed to the trend towards intensification of milk production in developed countries, production growth in developing countries is to a large part due to increasing numbers of milk animals (and dairy farms) and only to a small part due to productivity gains.

In 2008, only 530 million liters of milk were processed in Kenya (Kenya dairy board - KDB, 2009). It is estimated that another 10.5% of milk produced is consumed by calves, 34.5% on-farm and 55% is marketed, including both formal and informal market channels. Valuing on-farm consumption at farm-gate price of 14 Ksh per litre, the informal market at 18-26 Ksh per litre and the formal market at 56 Ksh per litre, the value of the dairy sector could be approximately 73 billion Ksh. This represents approximately 4% of GDP and 19% of agricultural GDP. When valuing dairy as a source of livelihood, the statistics are equally imprecise. It is widely cited that about 70-80% of milk production comes from smallholders, with the remainder from larger producers, estimated at about 5,000. (Perline, 2009). The estimates of the number of smallholders vary across studies; however the number of 600,000 small scale holder farmers (Omore, 2009 & Kodhek, 2009) has been widely cited for many years. According to SDP, the Kenyan population has grown significantly over this period and the number is no longer valid. According to their revised estimate the number of smallholder dairy farms is much greater at about 1.8 million (ILRI, 2008). Kamau, Kimani and Obare (2012), noted that 70% of the country's milk production is from smallholder farmers and the dairy sub sector contributes about 3.5% of our country's GDP. In Kenya, dairy farming is an important source of livelihood for about 650,000 small-scale farmers (Perline, 2009). Smallholder dairy farmers have small herd sizes ranging between 1 to 3cows and small pieces of land, less than two hectares. Smallholder dairy farming is part of the agricultural MSEs in

Kenya and this sector has not been an exemption in the incentives program (Moran, 2009). The finance value chain intervention and production policies within the dairy sub -sector are aimed at increasing productivity and efficiency along the chain, initiating entrepreneurship, while emphasizing the concepts of market integration, competition, growth and efficiency (Karanja, 2003).

1.1.3 Kiambu County Dairy Farmers' Co-operative Societies

Kiambu County comprise of the following 12 sub-counties as outlined in Appendix II. However, there is no authorized and formal data on dairy co-operatives and production in Ruiru, Gatundu North, Thika and Juja sub-counties since the milk is produced and hawked to the informal sector. The other 8 constituencies produce 108.9 million litres per year with the majority of the milk being produced from one constituency, Githunguri, with 75.5 million litres leaving a balance of 33.4 million litres being produced from the other seven constituencies (Kiambu County Annual Report of Daily Co-operatives, 2013). The co-operative societies receive milk when it is raw where it is then processed and packed into fresh, mala, yoghurt, butter or ghee products. The county has 415 registered co-operative societies, 330 being active. Milk production has really improved at Kiambu County. The milk production in this county is produced by small scale dairy farmers and large scale dairy farming but on zero grazing system. The milk is marketed through co-operative societies and hawking around Nairobi. The farmers embrace different modern milk production technologies. However they have not realized the optimal production hence operating below the peak. Despite the growth of dairy farming in Kiambu County, there are a lot of problem experienced by the farmers. Based on the approach majoring of the dairy, farmers fail to understand the connection between the productivity and farming practices (Muchiri, 2007).

1.2 Statement of the Problem

Dairy farming is one of the leading Agricultural sectors in Kenya which contributes to the gross domestics products as well as enabling farmers earn an income from the sales of farm dairy products in the market. Despite the aforementioned economic benefits of dairy farming, the sector is faced with many challenges that deter it from realizing its full potential. Low incentives to farmers due to poor market prices, payment terms by the dairy producing firms as well as low dividend payments by the cooperative societies. In addition presence of middlemen in the industry has demotivated farmers since they buy farmers milk at low price leading to low productivity. (Wambugu,Kirimi and Opiyo, 2011). Fluctuation in milk prices, cost of feeds, production resources, milk supplies by farmers and market trends has also led to uneven profitability trends leading to financial challenges to the cooperative societies. This has resulted to financial distress for a number of dairy operations to many dairy farmers in terms of the milk prices, credit payment periods and also returns at the end of the year. These effects have thus increased the need and importance of benchmarking operations of the dairy farmers to study and establish factors affecting the production and dairy products (Dhuyvetter, 2011). Dairy farming and production system depends on policies in developed countries. In Africa and mostly in South Africa dairy farmers were mainly in the Witwatersrand, Durban, Cape Peninsula and other large consumers area prior to the 1950's, since the land was relatively not expensive. In those days cream farming was based on low cost, since farming was based on crop residue and relatively minimal accompanied by animal feeding.

The smallholder dairy farming sub-sector is an important component of the dairy and agriculture sector since it consists of 80% of the overall dairy farming sector (Karanja, 2013). The sector has been experiencing tremendous advancement since the early 1980s in areas of adoption of intensive dairy farming especially zero grazing, expanding market and

commercializing of the farm business (Smallholder Dairy Project, 2012). Despite this development, it is apparent that production at this level has been varying amongst smallholder farmers (Smallholder Dairy Project, 2005). Although some of the factors that lead to low profits have been identified, the institutional arrangements and management factors that are expected to have significant influence on production are still not well established. A review of empirical literature reveals limited studies that relate to factors that affect the production of dairy products in Kenya. Majiwa, Kavoi and Murage (2010) pointed out the importance of smallholder dairy production, emphasized the need to use intensive dairy farming methods and noted that lack of credit is a constraint facing the dairy farmers and thus negatively impacting dairy production. (Nyangito, *et al.*, 2004) found that smallholder producers received only a third of the total credit given to dairy farmers in Kenya yet they produce the approximately 80% of the total marketed milk. These studies did not address the factors affecting dairy farming in Kenya. Given this background, the study sought to establish the factors affecting production of dairy products in Kenya.

1.3 Objectives of the Study

The general objective of the study was to establish the factors affecting production of dairy products in Kenya with specific focus of members of co-operative societies within Kiambu County:

The study sought to address the following objectives

i. To establish the extent to which payment to members affect production of dairy products in Kenya
ii. To examine the extent to which production resources affect production of dairy products in Kenya

iii. To determine the extent to which dairy production system affects production of dairy products in Kenya.

1.4 Research Questions

The study sought to answer the following research questions

i. To what extent do payments to member affect the production of dairy products in Kenya?
ii. To what extent do production resources affect production of dairy products in Kenya?
iii. To what extent does dairy production system affect production of dairy products in Kenya?

1.5 Significance of the Study

The study intended to be of importance in exposing the factors affecting the production of dairy product in Kiambu County helping the country to realize how these problems can be minimized to improve the dairy farming sector

To the management of co-operative societies in Kiambu County, the findings of this study provide valuable insight to the various factors that affects the production of dairy products in Kiambu Dairies and how to improve the production.

To the Government of Kenya, the study is valuable in that it provide the general information on the state of the dairy sector and financial constraint that affect the dairy sector in Kenya, its production performance and recommendations for improvement. As policy makers, the government will find this study important in formulating policies in the dairy sector.

To potential investors, the findings of the study provide valuable insight to all those interested in entering and investing in the dairy industry. Potential investors will further use

the findings as a base to start their own analysis of the dairy industry in general. The research findings will be a treasure for the competitors in the dairy industry.

The study would also fill the gaps in the studies previously carried out by other researchers regarding the factors affecting the production of dairy product in Kenya and also enable other researchers to carry out the study beyond this scope

1.6 Scope of the Study

The study sought to establish the factors affecting production of dairy products in Kenya, and particularly the large, medium and small holder dairy farmers in Kiambu County.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the literature review on national strategies and organizational competitiveness. It summarizes the information from other scholars who have carried out their research in the same field of study. The chapter presents the theoretical review, empirical review, research gap, conceptual framework and review of research hypothesis.

2.2 Theoretical Review

The research sought to investigate factors affecting the production of dairy product in Kenya. It will be based on production theory, stakeholder theory and theory of farm diversification.

2.2.1 Production Theory

The score of production growth and production volume growth are explained below: Production is the process of creating wealth. It is defined as an activity that results in the creation of goods and services for the satisfaction of human wants Jorgenson et al. (2014). Production is not the same thing as manufacturing. Production result in the creation of utilities. According to Adam smith theory of economies, production is the conversion of inputs into outputs Jorgenson (2009). It is an economic process that uses resources to create a commodity that is suitable for exchange. This can include manufacturing, ware housing, sipping and packing. Production is a process and as such it works through time and space because it is a flow concept. Production is measured as rate of output per period of time. There are three aspects of production process including the quantity of the commodity produced, the form of the goods created and the temporal and spatial distribution of the commodity produced Schreyer's (2009). According to the production theory, Adam Smith

refer to inputs or resources as factor of production which is raw material, machinery, labour service, capital good land and enterprise. The marginal productivity theory of distribution claims that in a free markets economy the demand for a factor of production will depend upon its marginal products where marginal products is defined as the change in total product that is caused by or that follow the addition or subtraction of the marginal unit of the factor used in production process. With all other inputs held constants from its inception in the early nineteen century, the marginal productivity theory of distribution has been claimed by some economists to be a solution to the ethical problem of distributive justice to be a means of determining fairness in wages, profits interest and rent.

According to Saari (2006) defined Production growth is often as production increase of an output of a production process. It is usually expressed as a growth percentage depicting growth of the real production output. The real output is the real value of product produced in a production process and when we subtract the real input from the real output we get the real income. The real output and the real income are generated by the real process of production from the real inputs. Production model is a numerical description of the production process and is based on the prices and the quality of inputs and outputs. There are two main approaches to operationilize the concept of production function. We can use mathematical formula which are typically used in micro-economics or growth accounting, arithmetical model which is typically used in micro economics and management accounting, growth account by Hulten (2009).

2.2.2 Stakeholder Theory

The stakeholder theory addresses morals and values in managing an organization, (Shivers and Blackwell (2006). The stakeholder view of strategy is an instrumental theory of the corporation, integrating both the resource-based view as well as the market-based view, and adding a socio-political level. This view of the firm is used to define the specific stakeholders

of a corporation (the normative theory of stakeholder identification) as well as examine the conditions under which these parties should be treated as stakeholders. Hubbard (2000) argues that the normative base of the theory, including the identification of moral or philosophical guidelines for the operation and management of the corporation, is the core of the theory. Salter and Torbett, (2003) derive a typology of stakeholders based on the attributes of power (the extent a party has means to impose its will in a relationship), legitimacy (socially accepted and expected structures or behaviors), and urgency (time sensitivity or criticality of the stakeholder's claims). Nicholas, (2004) explores the implications of contentious relationships between stakeholders and organizations by introducing compatible/incompatible interests and necessary/contingent connections as additional attributes with which to examine the configuration of these relationships. Camey, (2005) argue, that the sources of power, legitimacy and urgency as they apply to family involvement in business, are particular to the family business, he acknowledge that, as a business form, family firms are subject to a wide range of stakeholder pressures that are similar to those faced by other business organizations. Dairy farming in the family can considered to have greater power in farming owing to the concentrated ownership of family members. Furthermore, even family members who hold no shares may be considered residual claimants to farming.

2.2.3 Theory of Farm Diversification

According to Johnson *et al* (2008) diversification is a strategy that takes an organization away from both its existing market and its existing product. In terms of farm diversification, this relates to exploitation of income generation opportunities that can support the income of the farm house hold and in turn the viability of the agricultural business (Boswah and MCele, 2009). In recent years diversification has become a popular strategy for those farmers who want to survive and be successful in the changing economic environment (Met lwee et al,

2006, Turner et al 2003; Defra 2010a) in practice, however, a farm diversifications are not always successful (Turner et al, 2003) and it would appear that research is required to both understand the issues better and to improve the rate of success. There are multiple measures by which to evaluate a diversification. Typical measurers include annual sales, turnover, market share, growth in output, number of employees, added value, value of the business, earnings per share or rate of return on equity (Matthews & Shulman, 2005) in addition typical internal measures might include the number of new products and various product quality ratings (Lahtine, 2009). It is apparent, therefore, that the success of diversification is determined by the measures applied and that this is dependent on business objectives.

In terms of farming, some measures used to determine the success of diversification are generic such as cash flow and profitability but others are more farming related and include reduced dependence on agricultural subsidies, more stable income, filling in with the farm business, satisfied customers and personal and family satisfaction (Clark, 2009 & Turner et al. 2003). Indeed, Turner et al (2003) found that four out of five farm diversifications were considered successful in the context of their own particular objectives. According to Rantamaki lahtment (2009) and Forsman (2004) successful farm diversification is frequently based on resources such as buildings, finances, human resources and machinery. Such resources need not be wholly owned by the farm but may be shared, as is often the case in agricultural cooperative, which may lead to an additional advantage in terms of farmers learning from each other (Lahtinen, 2009). The apparent importance of resources suggests that the RBT might provide useful insight into their role in underpinning farm diversification. At the heart of the RBT is the concept of organizational resources. It is tempting to think of resources as simply items such as land, buildings, vehicles and machinery. However, they may in fact be anything that constitutes a strength or weakness for a company (Wernerfelf, 1984). In this context, therefore, the term resources are all-compassing (Forsman, 2004) and

may include tangible, intangible and human resources. At an operational level the strategic value of a resource may be determined by impact on margin (Bowman & Ambrosini, 2007) and identified via a resource audit (Grant, 2008).

Tangible resources refer to physical resources such as land finance buildings and machinery. These resources appear on the company balance sheet and their values deteriorate over time (Matthews & Shulman, 2005). Intangible resources include production, marketing and manufacturing capabilities, corporate reputation and corporate culture. While classifying resources as either tangible or intangible is useful it also has its limitations. One of the most important resources of any business is its employees and especially their knowhow or local knowledge (Phelan & Lewin 2000). Human capital is difficult to classify while people are obviously tangible their training skill, experience judgment, intelligence and relations are not.

2.3 Empirical Review

Dairy production is done through large and small scale farmers in Kenya who are faced by a multiple of risk which contribute to high cost of production and low average production the factors cause low profit to the production and price fluctuation for farmers. In Kenya dairy farming is made up of more than 600,000 small holder dairy farms and large holder farms scattered in the country the dairy productions provide employment, the economy of scale help to spread risk which lower cost and reduce the risk. Some of the risks are fluctuating price of milk, feeding cost or price, hire labour and forage production (Muriuki et al 2003).

2.3.1 Payment to Members in Production of Dairy Product

The farming of rearing dairy cattle is expensive. The farmer gets low income because the product is marketed through middlemen and private processor. The prices paid to the farmers by the marketer and that paid by the milk consumers are different with a big margin. This

variation of price makes member remain poor and not able to alleviate themselves from the property. The middle men continue dominating the milk market in Kiambu County. The co-operative society which is owned by member produce more milk if compared to North rift with majority of it coming from Githunguri District (MOA 2009). According to Steal *et al,* (2006), dairy farmers sell their milk on cash or credit payment arrangements. In the study of analysis of determinant farmers' choice of milk marketing channel, it was found out that farmers' choice of the marketing channel was positively influenced by form of payments that is cash or monthly payments. The study revealed that households were less likely to select channels that paid cash or took milk on informal credit compared to channels that offered monthly payments or provided formalized credit terms (written contracts) which were more likely to be selected. The cooperative society contributes significantly to the development of small dairy farmers in Marketing their milk and providing farm inputs and services at very low costs. However co-operative have lost its functions when liberations started in 1992 due to competition, Inability to adapt change, poor payout, loss of money to KCC when it was originally liquidated, poor management and corruption(Omiti and Muma 2000).

Shiimi *et al.* (2010) observed that the payment arrangements for farmers by traders influence their produces channel. Farmers participating in the markets at a price they receive as revenue from traders by either cash on delivery or credit. Staal *et al.* (2006) noted that households were less likely to select channels that paid cash or took milk on informal credit compared to channels that offered monthly payments or provided formalized credit terms (written contracts). This is because farmers preferred receiving lump sum revenue from more reliable marketing channel. Direct payments affect labour allocation decisions in a more indirect way than price policies. Furthermore, their effect changes according to the nature of direct payments. This is because direct payments can be coupled to the production lever, to the amount of land or heads of livestock or can be decoupled from production. The size of

herds helps dairy farmers to shift to a well organized market channel. The large dairy farmers get price incentives or higher prices for their dairy product because of high bargaining power low transaction cost because of economic of scale. The number of animal kept by dairy farmers determines the production cost which determines the amount of working capital needed on the dairy farm. Large dairy farmers prefer selling their milk to channel that handle big volumes and pay the whole lump milk revenue to sustain the farm operations (Tsourgiannis et al. 2008).

In Kenya small holders and larger dairy farmers market tend to be concentrated in urban centre because market forces override many production factors. The dairy farmers need to establish elaborated governance structures and act collectively in dairy product collection processing and marketing of milk products, dairy farmers in Kenya focus on productivity, genetics nutrition and value chain development when planning the production of milk , the average milk selling price, total number of cows milked and farm acreage affects and influence farmers to sell their milk through diary co-operative channel(Sikiwa & Mugisha 2010)

2.3.2 Production Resources in Production of Dairy Products

Dairy farm can be referred as production which involves converting production input such as milking cow, labour, fodder into output in terms of milk and livestock related. The production of milk uses certain production technologies such as cow housing feeding technologies as well as milking and cooling processes the resources are expensive and out of reach for large and small scale farmers hindering they capacity to produce. Dairy farm production use similar technology but differ in farm management and environment, economy of scale and farm efficiency Lien and Hardaker (2010). Kanayo (2010) defined resources as assets both tangible and intangible used by smallholders to aid production. Major constraints faced by smallholders are the high relative costs of resources, mainly quality production

assets. Smallholders can be supported to be competitive when vertically integrated livestock food chains allow for provision of quality production assets (Donovan, 2010). Karanja (2003), in a study of the dairy subsector in Kenya indicated that assets are vital for any smallholder farmer; however the smallholder dairy farmer relies heavily on production assets due to the fragile nature of the production output. The farmer in Kiambu County experiences several challenges in dairy production i.e. poor payment and low prices paid to their produce. The lands sizes in this county are small which could not support dairy enterprises and commercial feed supplement. The farmer has to buy the animal feeds for their animals. This means the farmer in this area rear 4 cows on average yielding about 10litres each day (Economic Survey 2006). The milk produced is transported to Nairobi which is the main market for both raw and processed milk. The middle men and the processor operating in this market make higher profit while paying the dairy farmer low price since they buy the milk at the farm gate (Economic Survey 2006).

Production assets are the natural and physical (tangible) capital, which are regarded as key to inclusion in value chains, as they assist in improving the quality production (Buxton & Vorley, 2009). In their research on conditions that make value chains effective, Minten, Randrianarison, and Swinnen (2005), debated on the order of priorities to establish effective value chain and stated that it is inconceivable that any transformation of the agricultural sector could proceed without major attention being given to production assets. Altenburg (2006) studies on the benefits of smallholders in value chain participation suggest that a producer's assets are a critical factor in their ability to participate in and benefit from formal markets. It is with this understanding that Buxton and Volrey (2009), in their research on improving smallholder productivity indicate that the particular assets smallholders have access to, and are able to use effectively, are important to consider in assessing their ability to benefit from formalized markets and therefore the nature of value chain interventions. It's

important when designing an asset based value chain intervention to understand what assets the smallholders have access to and what will improve their production. This is reflected from the findings of Kim, Kurt and Theus (2009) who noted that it is crucial to understand the ways in which existing assets can be employed in value chains as well as the ability to substitute capitals and employ value chain strategies that compensate for the inadequacies of some asset profiles. Assets can be seen through three lenses. First, identifying pre-existing assets is important for evaluating the likelihood of a producer benefiting from a trading opportunity. Secondly, understanding the gap between available assets and those necessary to successfully benefit in the long-term in a particular market is critical to designing the upgrading strategy. Finally assets themselves are an indicator of poverty and thus a useful metric for evaluating and monitoring the impact of value chains on farmer growth (Bentley and Parrish, 2005).from this finding on the role of development agencies in value chain development, Roduner (2005), concluded that as modern farming techniques are geared to production of cash returns, a proportion of which can be reinvested to expand or improve the farmer's assets, donor organization may opt to fill in the asset gap to assist the smallholders commence the cycle.

2.3.3 Dairy Production System in production of dairy products

Milk production is complex processes which involve several variables, the input influence milk production which is essential to farmers. There are many factors affecting milk production mainly breed type of feeds, farming practices and system (Benin at al 2003). Small holder dairy farmers are those farmers whose herd size range from 1 to 10 cows (Herro, Nganga, Kingu, and De Riddre 2010). Medium scale dairy farmers are those farmers where herd sire range from 11 to 40 (Romney et al, 2004)Large scale Dairy farmers are those farmers whose herd size is more than 40 cows (Mumba 2012). Without processing, milk is difficult to handle, conserve and sell. In Kenya, as in many parts of Africa, unpasteurized

fresh milk is sold on the local market (Gran *et al.,* 2002; Bonfoh *et al.,* 2006). The problem is that the quality of this raw milk is uncontrolled, and the key issues for milk hygiene are not well described. Although fermented milk and butter are easier to conserve than raw milk, in rural areas raw milk is mainly sold in exchange for millet or other products, often by women (Querre, 2003). In traditional livestock production systems, milk is often processed by farmers into butter, fermented milk and cheese (Kagone, 2004). Some family processing units are set up (Le Troquer, 1993) with yogurt, fresh cream and pasteurized milk as the main products, sold in Kenya and neighboring countries. The increased demand for dairy products in urban areas in many countries has raised consumer awareness about product quality (Barron del Castillo, 1990), including nutritive value and hygiene. Under local conditions in Kenya, the hygienic quality of milk between farm and processing is not clearly controlled, and the condition of the milk when it reaches the consumer is often unknown. There are many licensed traders including mini dairy, cottage industries and cooling plant which number stand at 1,500 handling more than 80% of the total milk produced while co-operatives society and organized farmers group handle 40% of milk produced and marketed (muriuki, 2003)

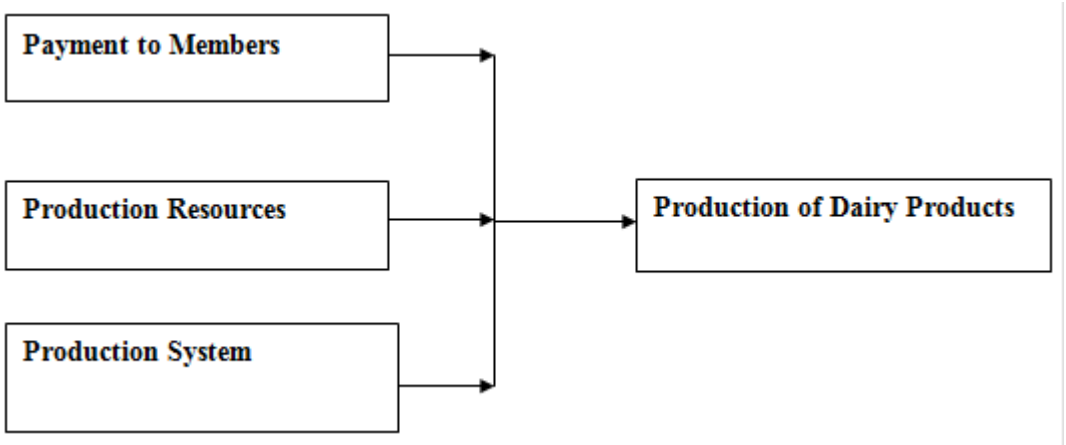
According to Vijay *et al*, (2009) both modern private dairy plants and traditional channels prefer suppliers from large farmers who can supply large quantities of milk. Tsougiannis *et al*. (2008) in the study of marketing strategies of agricultural producers in objective one Greek regions noted that the choice of milk marketing the channel especially processing plants channel was positively influenced by the volume of milk produced by the farmer per day. This is because of reduced costs on the sides of processors particularly transport and quality milk production since large volumes of milk are produced by big farmers that have access to veterinary services. The age of dairy farmers, membership in the co-operative societies, form of payment and price paid to farmers, value of milk produced,

lever of education of the dairy farmer and marketing cost influence the dairy farming system plus the milk marketing channel.Dairy farmers with large land are found to sell their milk through either private trader channel or co-operative and private owned processing company as opposed to small dairy farmers who sell their milk to individual customer channel (Staal et al. 2006).

2.4 Conceptual Framework

Conceptual framework is a scheme of concept (variables) which the researcher operationalizes in order to achieve the set objectives, Mugenda and Mugenda, (2003). A variable is a measure characteristic that assumes different values among subject, Mugenda and Mugenda, (2003). Independent variables are variables that a researcher manipulates in order to determine its effect or influence on another variable. (Kombo & Tromp 2006), states that independent variable also called explanatory variable is the presumed change in the cause of changes in the dependent variable. The dependent variable attempts to indicate the total influence arising from the influence of the independent variable (Mugenda & Mugenda, 2003). This is illustrated in Figure 1 below showing the two types of the variables.

FIGURE 1 Conceptual framework



2.5 Research Hypothesis

H_{o1}: Payment to Members has no significant effect on production of dairy product

H_1 : Payment to Members has a significant effect on production of dairy product

H_{o2}: Production Resources has no significant effect on production of dairy product

H_2: Production resources has a significant effect on production of dairy product

H_{o3}: Dairy Production System has no significant effect on production of dairy product

H_3: Dairy production system has a significant effect on production of dairy product

2.6 Operationalization of Variables

A description of the study variables and there measurement is presented in Table 1 below.

TABLE 1 Operationalization of Study Variables

Variable/ Variable Type	Indicator	Measure
Independent Payment to Members	• Payment terms • Payment period • Payment price	Credit Period (days)
Independent Production Resources	• Number of production equipments • Number of Milking machines • Cost of equipment	• Number of production equipments • Number of Milking machines
Independent Dairy Production system	• Type of production system • Small scale system • Large scale system	• No of cows per system
Dependent Production of dairy products	Quantity of milk Produced	Amount produced

Source: Author (2016)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides the methodology of the study. It gives the specific procedures that were followed in undertaking the study. The research design, population, sampling design, data collection methods and data analysis are described in this chapter.

3.2 Research Design

Research design refers to the method used to carry out a research. The research design that was employed is a descriptive research design. The major purpose of descriptive research design is to describe the state of affairs as it is at present. According to Mugenda and Mugenda (2008), a descriptive research is a process of collecting data in order to test hypotheses or answer questions concerning the current status of the subjects in the study. They point out that the purpose of a descriptive research is to determine and report the way things are done. Descriptive research was used to obtain information concerning the current status of the dairy farming in Kiambu County and to determine what exists with respect to the factors affecting the farmers. The method involved a range of activities ranging from the survey which describes the status quo and the correlation study which investigated the relationship between the factors and production. The design was preferred for as it allowed the use of descriptive statistics to describe the information or data collected. The characteristics of groups of numbers representing information or data are called descriptive statistics. According to Mugenda and Mugenda (2003) this type of research attempts to describe such things as possible behavior, attitudes, values and characteristics.

3.3 Target Population

According to Ngechu (2004), a population is a well-defined or set of people, services, elements, and events, group of things or households that are being investigated. This definition ensures that population of interest is homogeneous. The target population of this study was 61,018 dormant and active dairy farmers selling milk to the co-operative society within the Kiambu County. The number of farmers was obtained from Kiambu County Annual Reports for the Department of Co-operative (2013).

3.4 Sample size and Design

The study adopted a clustered sampling approach. The farmers were clustered into Eight (8) Co-operative Societies within Kiambu County as shown in Table 1. From the population, a sample size of 0.63% was picked equally from each Co-operative Society assuming that the population of farmers is homogeneous. Therefore, a total sample of 383 farmers were randomly selected from the Eight Co-operative Societies in Kiambu County as they deliver their milk to the collection centers on their respective Co-operative Society as shown in Table 1. The sample design of this study was based on Kothari's (2004) sample size determination formula below.

$$n = \frac{z^2pqN}{e^2(N-1)+ z^2pq}$$

Where: Z is the Z – value = 1.96

$Q = 1-P$

Where: n = is the sample size for a finite population

N= size of population which is the number of dairy farmers

p = Population proportion, considered as 0.50 in this study

q= 1-P

e = margin of error considered as 5% for this study.

$Z_{\alpha}/2$ = normal reduced variable at 0.05 level of significance z is 1.96

α = level of significance = 5%

$$n = \frac{1.96^2 \times 0.5 \times 0.5 \times 61{,}018}{0.05^2(61{,}018) + 1.96^2 \times 0.5 \times 0.5}$$

n= 383

TABLE 2 Dairy Farmers Population and Sample Size

Zones	Population	Sample Size	% of total Sample
Kiambaa	2,386	15	0.63%
Kiambu	5,372	34	0.63%
Githunguri	22,588	142	0.63%
Kabete	1,985	12	0.63%
Limuru	9,538	60	0.63%
Kikuyu	7,373	46	0.63%
Lari	11,521	72	0.63%
Gatundu	255	2	0.63%
Total	61,018	383	0.63%

Source: Author (2016)

In reference to the sample size of 383 it translate to 0.63% of the population and therefore 0.63% was used to get the sample size per zone as shown in Table 2.

3.5 Collection Instruments and Data Collection Procedure

The study used the primary data, which was collected through questionnaires that were administered by drop and pick method to the farmers of Kiambu county co-operative societies. The questionnaires were collected immediately after they had been filled. The structured questions were used in an effort to conserve time and money as well as to facilitate easier analysis as they are in immediate usable form. The structures of the questionnaire were derived from the research questions. The questionnaire was divided into four sections each covering each of the specific research question.

The questionnaire in appendix (1) contained open-ended and closed –ended questions that were constructed to address the three research objectives. The questionnaire had three sections with the first section seeking background information; the second collects data on factors affecting production of dairy products in Kenya. The study adopted a 5 point Likert scale where 1=Strongly Disagree, 2= Disagree, 3= Moderate, 4= Agree, 5 = Strongly Agree

3.6 Validity

The pilot test will be done to check the questionnaires face validity. The validity test was showing the extent to which a measure or a set of measure correctly represents the concept of the study. (Mugenda & Mugenda, 2003).The face validity test was undertaken by administering the questionnaire to the 10 dairy farmers who were excluded from the final survey, their feedback was used to remove vague questionnaire which improved the questions. Also the researchers selected the expert to review and determine whether the research truly measure what its intended to measure or how truthfully the research results will be.

3.7 Reliability

The instrument was tested for reliability. Reliability is a measure of degree to which research instruments yields consistent results or data offer repeated trials (Patton, 2002). To measure the reliability consistency the tester retest method was applied to measure the stability which was administered at different time to the same individual and standard. Test –retest was used by administering a test at two different points in time to the same individual to determine the correlation or strength of association of the two set of scores.

3.8 Data Analysis Methods

The coded data were analyzed using statistical measures including percentages, mean scores and standard deviations. The quantitative data was analyzed using descriptive statistics,

where the respondent content was put in prose form. The results were presented using frequency tables, charts and graphs. The analysis involved observation and detailed description of phenomena that comprised the object of study. The researcher used the data with an aim of presenting the research findings to establish the factors affecting production of dairy products in Kenya. In addition, the study conducted a factor analysis. The factor analysis equation

$$PDP = \alpha_i + \beta_1 PB + \beta_2 PR + \beta_3 DPS + \varepsilon_i$$

Whereby PDP = Production of dairy products, PB= Payment to Member, PR= production resources and DPS= dairy production system a, while β_1, β_2, and β_3, are coefficients and ε_1 is the error term, α_i is a constant in this equation that show the production of dairy product in the absence of other factors

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.1 Introduction

This chapter presents the results and interpretations of the study guided by the research objective of the study. Data analysis was done using descriptive statistical analysis and regression analysis. Descriptive analysis was used to address the profile of the production of dairy product while regression analysis was used to establish the research objectives of factors affecting production of dairy product in Kenya. ANOVA test was then used to compare the production of daily product with payments to members, access of incentives, production resources and dairy production system in Kenya. Out of the 383 questionnaires administered, 352 were filled and returned hence a 91.9% response rate. Mugenda and Mugenda (2003) indicated that a response rate of 50% is adequate for analysis 70% being very good. Therefore 91.9% response rate was very good to use.

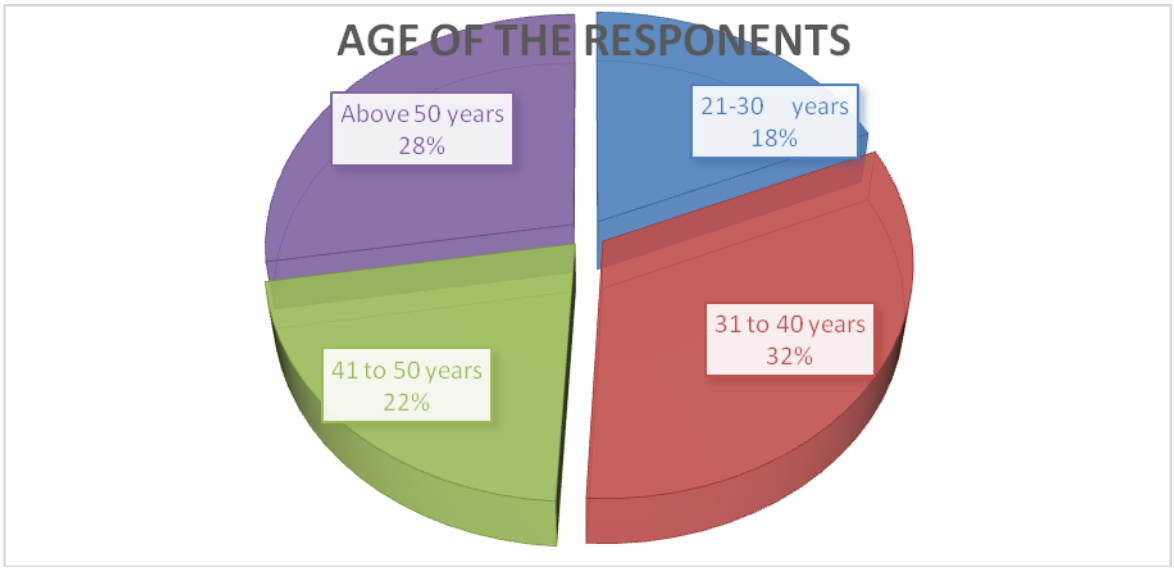
TABLE 3 Dairy Farmers Population and Sample and Respondent Rate

Zones	Population	Sample Size	% of total Sample	Response	% of respondent
Kiambaa	2,386	15	0.63%	13	3.39
Kiambu	5,372	34	0.63%	31	8.09
Githunguri	22,588	142	0.63%	135	35.27
Kabete	1,985	12	0.63%	10	2.61
Limuru	9,538	60	0.63%	56	14.62
Kikuyu	7,373	46	0.63%	42	10.96
Lari	11,521	72	0.63%	65	16.97
Gatundu	255	2	0.63%	0	0
Total	61,018	383	0.63%	352	91.91

Source: Author (2016)

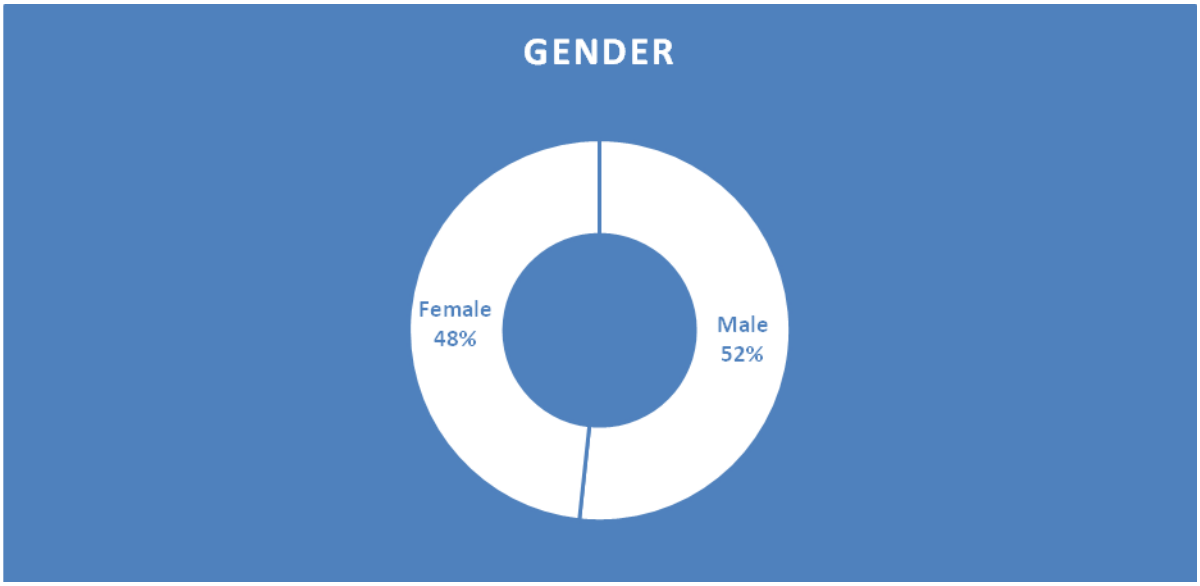
4.2 Demographic Profile of the Respondents

FIGURE 2 Age of the respondents



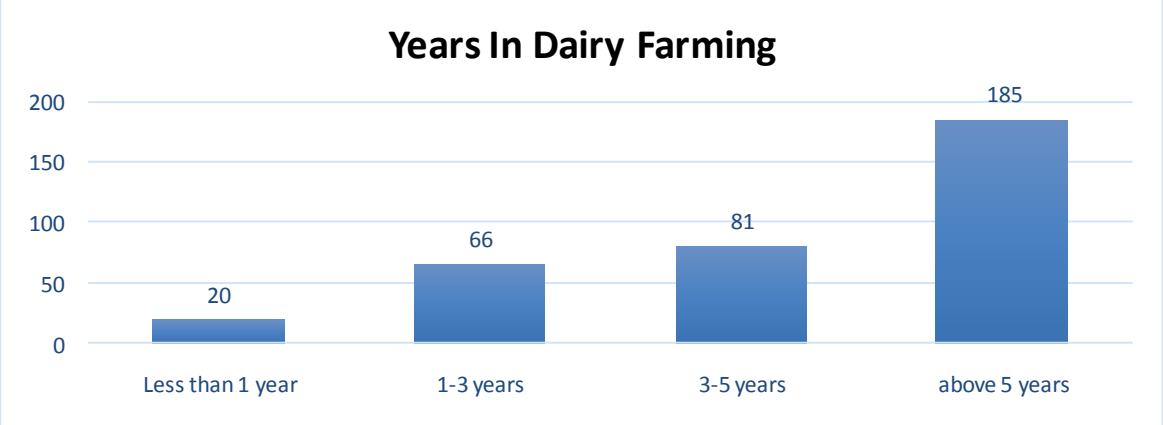
As shown in figure 2, majority of respondents were in the age bracket 31-40 years at 32.4%, followed by above 50years at 27.6%. Respondents of age bracket 41-50 years were32.4% and the least respondents were in the age bracket 21-30 years, with 18.5%. The results therefore imply that middle class age were actively involved in dairy farming

FIGURE 3 Gender



As regards to the gender, it was note in Figure 3 that majority of the respondents were male 52% while the female were closely at 48 %. This therefore indicates that more male farmers are engaged in dairy farming

FIGURE 4 Years in Dairy Farming



As shown in Figure 4, in regard to the farmers who had been practicing dairy farming as measured by the number of years in the sector, it was noted that the majority (52.6%) have more than five years in dairy farming, those farmers who had 3-5years were 23.6% while those with 1-3 years were 18.8%. While those farmers who started dairy farming in less one year were 5.7%. This indicated that majority of farmers had been practicing dairy farming for a long time and information they held was adequate enough to address the objectives of the research.

TABLE 4 Demographic Profile of the Respondents

		Frequency	Percent
Age of the respondent			
	21-30 years	65	18.5
	31 to 40 years	114	32.4
	41 to 50 years	76	21.6
	Above 50 years	97	27.6
Gender of the respondent			
	Male	182	51.7
	Female	170	48.3
How long have you been practicing dairy farming			
	Less than 1 year	20	5.7
	1-3 years	66	18.8
	3-5 years	81	23.0
	above 5 years	185	52.6
	Total	352	100.0

Source: Author (2016)

4.3 Factors Affecting Production of Daily Product

TABLE 5 KMO and Bartlett's Test

KMO and Bartlett's Test				
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.				0.781
Bartlett's Test of Sphericity		Approx. Chi-Square		2390.489
		df		300
		Sig.		0

Source: Author (2016)

The study used factor analysis to reduce the many variables to few factors. The study adopted The KMO (Kaiser-Meyer-Olkin) statistics and Bartlett's test of Sphericisity as pretest analysis. Table 5 shows KMO statistics of 0.781. Hutcheson and Moutinho (2008). endorsed KMO values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb, hence the value 0.781 shows that sample was adequate in this study. The Bartlett's test of Sphericity resulted in a p-value =0.000 and was considered significant

as it was less than threshold of 0.005(Tabachnich & Fidell, 2007). This meant that the variables in the data set were correlated and hence good for the factor analysis.

4.3.1Total Variance Explained

The initial solution was determined using Principal Component Analysis (PCA) method. The PCA method was preferred because it allowed for reduction of the data set to a more manageable size while retaining as much of the original information. Appendix iii shows that the unrotated solution revealed 25 components out of which four components explained 43.813 % of the variations leaving 56.187% of the variations unexplained. This necessitated factor rotation to explain the unexplained components

TABLE 6 Rotated Component Matrix

Rotated Component Matrix						
	Component					
Variables	1	2	3	4	Factor	Cronbach's Alpha
availability of credit facilities reinforces the demand for supply of farm inputs and advisory services, which then generate growth in production and demand for market services	0.726				Production resources factor	0.754
Modern farming techniques are geared towards production of cash returns, a proportion of which can be reinvested to expand and improve the farmer's assets,	0.684					
The following factors play a key role in increasing farmers productivity; provision of animal feeds , trainings, artificial insemination services and farm inputs	0.621					
Major constraints faced by Large, medium and Smallholder dairy farmers are the higher costs of dairy inputs, mainly quality production assets	0.61					
It is important when designing an asset based value chain intervention to understand what assets the Large, medium and Smallholder dairy farmer have access and what is needed	0.571					
Farmers participating in the markets at given price receive their revenue from traders by either cash on delivery or credit			0.75		Payments to member s factor	
Households are less likely to select channels that pay cash on delivery or take milk on informal credit compared to channels that offer monthly payments or provide formalized credit terms			0.623			0.587
Large, medium and Smallholder dairy farmers sell their milk through cooperative society and other private milk processor, which fails to consider the cost involved in production			0.62			
Large, medium and Smallholder dairy farmer relies on local cows to cut cost of production and semen				0.763		
In traditional livestock production systems, milk is often processed by farmers into butter, fermented milk and cheese				0.674	Dairy production system factor	0.422
majority of farmers do not adopt new technologies due to complication in term of management and cost involved				0.61		
In rural areas raw milk is mainly sold in cash or in exchange for millet and other farm products, often by women				0.566		
Extraction Method: Principal Component Analysis.						
Rotation Method: Varimax with Kaiser Normalization.						
a. Rotation converged in 7 iterations.						

Source: Author (2016)

An examination of the factors affecting production of dairy products in Kenya was undertaken .using the Principal Component Analysis (PCA) extraction method. This was then followed by a Varimax with Kaiser Normalization rotation method. From the procedures, four factors of production of the dairy product were identifies as shown in table 6. These factors are production resources, dairy product Production, Payments to members and daily productions. The Production resource was explained to a great extent by five variables. These were: availability of credit facilities reinforces the demand for and supply of farm inputs and advisory services which then generates growth in production and demand for market services of 0.726; Modern farming techniques are geared towards production of cash returns, a proportion of which can be reinvested to expand or improve the farmer's assets of (0.684).

The following factors play a key role in increasing farmer's productivity. These are: provision of animal feeds, trainings, artificial insemination services and farm inputs (0.621). Major constraints faced by Large, medium and Smallholder dairy farmers are the higher costs of dairy inputs, mainly quality production assets (0.61). It is important when designing an asset based value chain intervention to understand what assets the large, medium and smallholder dairy farmer have access to and what is needed (0.57). The second factor payment to members was explained to a great extent by three variables. These were: Farmers participating in the markets at given price receive their revenue from traders by either cash on delivery or credit (0.75). Households are less likely to select channels that pay cash on delivery or take milk on informal credit compared to channels that offer monthly payments or provide formalized credit terms (0.623) and Large, medium and Smallholder dairy farmers sell their milk through cooperative society or other private milk processor, which fails to consider the cost involved in production (0.62). The third factor dairy production system was explained to a great extent by three variables. These were: Large, medium and Smallholder dairy farmer relies on local cows to cut cost of production and semen (0.763); In traditional

livestock production systems, milk is often processed by farmers into butter, fermented milk and cheese (0.674) and majority of farmers do not adopt new technologies due to complication in term of management and cost involved (0.61), In rural areas raw milk is mainly sold in cash or in exchange for millet or other farm products, often by women (0.566).

In order to establish the reliability of the four factors extracted following the factor analysis process, the items that loaded on each factor were transformed into four new variables as productions resources, Production of dairy product, Payments to members and dairy productions system. To determine internal consistency of the factors the study used Cronchbach' alpha test of reliability. It was noted that productions resources factors had $\alpha = 0.754$, Production of dairy product factors had $\alpha = 0.740$, Payments to members factor had $\alpha = 0.0587$while daily productions system had $\alpha = 0.422$.One factors production resources had alpha values greater than 0.7 and hence were reliable in explaining the factors that affect daily product. The study observed that dairy product in Kenya was defined by the level of dairy productions resources.

4.4 Test of Research Hypotheses Using Regression Analysis

The study sought to establish the factors affecting production of dairy product. To undertake this, regression analysis was adopted in testing the research hypotheses. Assuming a linear relationship between production of dairy product and payments to members, production resources, and product systems, the study used the Ordinary Least Square (OLS) method of estimation. Using OLS, a regression line of best fit was sought. Regression analysis was used to model the relationship between production of dairy product and payments to members, production resources, and product systems. It was important in determining the magnitude of the resulting relationship and it was used to make prediction based on resulting model.

Before the regression analysis, the data was subjected to assumptions of regression analysis. First the data set was tested for normality. The three key variable; payments to members, production resources, and product systems were subjected to a normality test using stem and leaf graphical display and a normal distribution curve as shown in Appendix 4,5,6 and 7. The resulting stem and leaf display confirmed that the data set was normally distributed. Secondly, the data was tested for existence of muticollineraity. As indicated in appendix 8, the independent variables were correlated. The results showed a significant relationship ($p = 0.000$) with Pearson ($r = 0.405, r=0.275$). The weak relationship meant the data did not suffer from multicollinearity. The data was tested for linearity. The test for linearity using scatter plot revealed that the independent variables had linear relationship with the dependent variable as shown in Appendix IX.

The fourth assumption tested was that of equal variance (homoscedasticity). The residual plots showed that the error term (εi) was normally and identically independently distributed with mean zero and constant variance. This meant the error variance production of daily product was constant along payments to members, production resources, and product systems, this therefore indicated that the data did not suffer from heteroscedasticity and thus was homoscedastic. The data was therefore appropriate for regression as shown in Appendix X

4.4.1 Test of Correlation matrix for the production of dairy product

TABLE 7 Model Summary of Correlation matrix for the production of dairy product

		Production of daily products	Payments to members	Production resources	Dairy production systems
Production of daily products	Pearson Correlation	1	.379**	.349**	.247**
	Sig. (2-tailed)		.000	.000	.000
Payments to members	Pearson Correlation	.379**	1	.405**	.275**
	Sig. (2-tailed)	.000		.000	.000
Production resources	Pearson Correlation	.349**	.405**	1	.234**
	Sig. (2-tailed)	.000	.000		.000
Dairy production systems	Pearson Correlation	.247**	.275**	.234**	1
	Sig. (2-tailed)	.000	.000	.000	
**. Correlation is significant at the 0.01 level (2-tailed).					

Source: Author (2016)

The study used Pearson correlation coefficient (r) to determine the level of significance of the factor affecting production of dairy product in kenya. Coopers and Schindler (2003) posit that when the correlation coefficient (r) = ±1.00, there is a perfect (positive or negative) correlation between the variables. When r = 0.01 it shows that the relationship is quite weak and r = 0.9 indicates very strong correlation between the variables. When r = 0 it shows that there is no relationship between the variables. A correlation was considered significant when the probability value was below 0.05 (p-value ≤ 0.05). Table 7 shows that there was a significant relationship (p= 0.379) between production of daily product and payment to members at 0.05 level. The relationship production of daily product and production resources was significant (p= 0.349) at 0.05 level. There was a significant relationship (p= 0.247) between production of dairy product and dairy production systems at

0.05 level. The results gave an indication of the existence of a relationship betweenthe factor affecting production of dairy product in Kenya .

4.4.2 Effect of payments to member on production of daily products

TABLE 8 ANOVAs Test of Payment to Members

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.915	1	17.915	58.882	.000[b]
	Residual	106.49	350	0.304		
	Total	124.405	351			

a. Dependent Variable: production of dairy products
b. Predictors: (Constant), payments to members
Source: Author (2016)

Assuming a linear relationship between payments to member on production of daily products, the study examined the predicted model relating payments to member on production of dairy product as modelled in equation (1) below.

$$PDP = \alpha_1 + \beta_1 PB + \varepsilon_1 \quad \text{equation (1)}$$

Where:

α_1 was the estimate of the intercept;

ε_1 was the error term related with this regression equation;

β_1 was the beta coefficient of production of dairy product (PDP); and

PB represented payments to members.

PDP production of dairy product

The effect of relating payments to members and production of daily product was examined by testing the first research hypothesis (H_{01}) which stated that:

H_{01}: Payment to Members has no significant effect on production of dairy product

Following a simple linear regression analysis, an ANOVA output presented in Table 8 shows model one was significant (p-value = 0.00) at 0.05 level in explaining the linear relationship between payments to members and production of dairy products

TABLE 9 Model Summary Payments to Members

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.379[a]	0.144	0.142	0.55159
a. Predictors: (Constant), payments to members				

Source: Author (2016)

As shown in the Table 9, model one had coefficient of determination (R^2) = 0.144, indicating that 14.4% of the variation in payments to members was explained by the model leaving 85.6% of the variations unexplained. This meant that model one provided a weak fit

TABLE 10 Coefficients to Payments to Members

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.19	0.181		12.12	0
	Payments tomembers	0.4	0.052	0.379	7.673	0
a. Dependent Variable: production of dairy products						

Source: Author (2016)

Table 10 presents the coefficients of payments to member. In reference to model one, had a p-value of 0.00. The study therefore rejected the research hypotheses H_{01} at 5% level and observed that Payment to Members has no significant effect on production of dairy product

4.4.3 Effect of production resources on production of dairy products

TABLE 11 ANOVA Test production resources

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.128	1	15.128	48.452	.000[b]
	Residual	109.277	350	0.312		
	Total	124.405	351			

a. Dependent Variable: production of dairy products

b. Predictors: (Constant), production resources

Source: Author (2016)

Assuming a linear relationship between production of resources on production of dairy products, the study examined the predicted model relating payments to member on production of dairy product as modelled in equation (2) below.

$$PDP = \alpha_2 + \beta_1 PR + \varepsilon_2 \quad \text{equation (2)}$$

The estimators in equation (2) were defined as:

α_2 was the estimate of the intercept;

ε_2 was the error term related with this regression equation,

β_{11} was the beta coefficient of production resources and;

PDP represented production of dairy products.

PR represented production resources

The effect of relating production resources and production of dairy product was examined by testing the research hypothesis (H_{02}) which stated that

H_{02}: Production Resources has no significant effect on production of dairy product

Following a simple linear regression analysis, an ANOVA output presented in Table 11 shows model one was significant (p-value = 0.00) at 0.05 level in explaining the linear relationship between production resources and production of daily products

TABLE 12 Model summary for production resources

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.349[a]	0.122	0.119	0.55877
a. Predictors: (Constant), production resources				

Source: Author (2016)

In Table 12, model one had coefficient of determination (R^2) = 0.122, indicating that 12.2% of the variation in production resources was explained by the model leaving 87.8% of the variations unexplained. This meant that model one provides a moderate weak fit.

TABLE 13 Coefficients of production resources

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.213	0.196		11.297	0
	Production resources	0.367	0.053	0.349	6.961	0
a. Dependent Variable: production of dairy products						

Source: Author (2016)

Table 13 presents the coefficients of production resources. In reference to model one, we had a p-value of 0.00. The study therefore rejected the research hypotheses H_{02} at 5% level and observed that production resources had no significant effect on production of dairy product

4.4.4 Effect of daily production system on production of dairy products

TABLE 14 ANOVA test for dairy production systems

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.595	1	7.595	22.757	.000[b]
	Residual	116.810	350	.334		
	Total	124.405	351			

a. Dependent Variable: production of dairy products

b. Predictors: (Constant), dairy production systems

Source: Author (2016)

Assuming a linear relationship between dairy productions of system on production of daily products, the study examined the predicted model relating payments to member on production of dairy product as modelled in equation (3) below.

$$PDP = \alpha_3 + \beta_1 DPS + \varepsilon_3 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{equation (3)}$$

The estimators in equation (3) were defined as:

α_3 was the estimate of the intercept ;

ε_3 was the error term related with this regression equation,

$\beta_1$was the beta coefficient of production systems and;

PDP represented production dairy product.

DPS represented dairy production system

The effect of relating daily production system and production of dairy product was examined by testing the research hypothesis (H_{03}) which stated that:

H_{o3} : Dairy Production System has no significant effect on production of dairy product

Following a simple linear regression analysis, an ANOVA output presented in Table 14, shows model one was significant (p-value = 0.00) at 0.05 level in explaining the linear relationship between daily production system and production of daily products

TABLE 15 Model summary for dairy production systems

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.247[a]	.061	.058	.57770

a. Predictors: (Constant), dairy production systems

Source: Author (2016)

In Table 15, model one had coefficient of determination (R^2) = 0.061, indicating that 6.1% of the variation in dairy production systems was explained by the model leaving 93.1% of the variations unexplained. This meant that model one provide a moderate very weak fit

TABLE 16 Coefficients of production of dairy systems

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.848	.152		18.695	.000
	Dairy production systems	.242	.051	.247	4.770	.000

a. Dependent Variable: production of dairy products

Source: Author (2016)

Table 16 presents the coefficients of dairy production system. In reference to model one, had a p-value of 0.00. The study therefore rejected the research hypotheses H_{03} at 5% level and observed that dairy production system has no significant effect on production of dairy product

4.5 Evaluating of the Model Predicted by production of dairy product

TABLE 17 model summary for production of dairy product

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.452[a]	0.204	0.197	0.53348
a. Predictors: (Constant), production resources, dairy production systems, payments to members				

Source: Author (2016)

After establishing that payments to members, production resources, and dairy production system significantly influence production of daily product, the study sought a model that would provide the best fit in explaining the resulting relationship. The fitted regression model was presented

PDP = 1.1437+0.123DPS+0.269PB+0.226DPS……Equation (4)

Where:

PDP - production of dairy product,

DPS - dairy production system,

PB - payment to members

DPS- production system.

The integrated model in equation four above shows that model one had an $R^2 = 0.204$. This was interpreted to mean model one provided moderate a good fit implying production of

daily product value had a significant positive effect on daily production system, payments to members and production system. The $R^2 = 0.204$, further meant that 20.4% of the variations in the production of daily product was explained by three variables. This is as shown in table 17 above

TABLE 18 Coefficients of production of dairy product

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.437	0.229		6.282	0.00
	Daily production systems	0.123	0.049	0	2.506	0.013
	Payments to members	0.269	0.056	0.258	4.825	0.00
	Production resources	0.226	0.056	0.215	4.068	0.00
a. Dependent Variable: production of dairy products						

Source: Author (2016)

Daily production system had a beta value of $\beta_1 = 0.123$. This meant that on an integrated scale, a unit change in daily production system result in a 12% positive change in production of daily product. Payments to members had a beta value of $\beta_2 = 0.269$ which meant that on an integrated scale, a unit change in payments to members result in a 26.9% positive change in level of production of daily product. Production resources system had a beta value of $\beta_3 = 0.226$. This meant that on an integrated scale, a unit change in production resources result in a 22.6% positive change in of production of daily product. This is as shown in table 18 above

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter deliberates the summary of the finding in chapter four. Conclusion and recommendations drawn from these findings are conversed in relation to the objectives of the study which was to investigate on the factors affecting production of dairy products in Kenya

5.2 Summary of Findings

This section presents the summary of the study as per research objectives**.**

5.2.1 Findings on Payment to Members

The study sought to determine the effect of payment to members on the production of dairy products. The study established the existence of a positive effect of payment to members through farmers participating in the market at given price. House hold select channel that pay cash on delivery while the large, medium and small holder sell their milk to co-operative society or private processor which fails to consider their cost involved in production. This findings were found to be consistent with (Shiimi et al. 2006) which state that the payment arrangements for farmers by trader influence their produce channel and that farmers prefer the market at a price they receive as revenue (Steal et al 2006) noted that house hold are likely to select channel that pay cash or informal credit compared to that which offer monthly payment or formalized credit facility

5.2.2 Finding on Production Resources

The study sought to determine the effect of production resources in production of dairy products. The study established the existence of a positive effect in production resources though availability of credit facilities which reinforces the demand for and supply of farm inputs and advisory services which then generates growth in production and demand for

market services, Modern farming techniques are geared towards production of cash returns, a proportion of which can be reinvested to expand or improve the farmer's assets.The provision of animal feeds, trainings, artificial insemination services and farm inputs help farmers to increase the productivity, the other major constraints faced by Large, medium and Smallholder dairy farmers are the higher costs of dairy inputs, mainly quality production assets, It is important when designing an asset based value chain intervention to understand what assets the Large, medium and Smallholder dairy farmer have access to and what is needed. The findings were found to be consistence with findings of Roduner (2005) who argued that modern farming technologies are geared to production of cash returns which is reinvested to expand and improve farmers' asset. Kanayo 2010 stated that when designed an asset based value chain it's important to establish what farmers have access and what they need

5.2.3 Findings on Dairy Production System

The study sought to determine the effect of dairy production system on the production of dairy products. The study established the existence of positive effect on dairy production system that a farmer relies on local cow to cut cost. Traditional milk is often processed into butter, fermented. Also farmers sideline new technology because of management complication and milk is sold in exchange for millet or other product. The findings were found to be consistent with finding of (Grain et al 2002) and (Querre, 2003) that milk is sold in local market and also it's sold in exchange of millet and other products

5.3 Conclusions

The study concluded that there are three factors that affect the production of dairy products in Kenya. Results divulge that there have been a number of production factor in this sector which has impacted positively in the performance of dairy product in Kenya. Out of the three

factors, the factor with great effect was payment to members with 0.2669 followed by production resources with 0.226 while dairy production system had 0.125. This means all the three factors had an effect in production of dairy product**.**

5.4 Recommendations for Policy and Practice

The study wishes to propose that Dairy farmers' production systems need to be profitable. Dairy farmers, as the primary producers in the supply chain, should also be given the opportunity to add value to their product by adopting methods of production that satisfy the demands of processors and customers. This Guide gives individual dairy farmers proactive guidance on how these objectives can be achieved on their farm

Dairy production system should Lean to culture of continuous improvement, implement a daily production system designed for critical metrics of operational management which focus on local teams to drive improvements on daily production system. The production system is the key for farmer's accountability subsystem that enabled our culture of continuous improvement to daily function more efficiently at the daily farming level in a visible manner by reviewing and acting based on data and root cause analysis.

Most importantly, dairy farmers are in the business of producing food for human consumption so they must be confident in the safety and quality of the milk they produce. Good dairy farming practice underpins the production of milk that satisfies the highest expectations of the food industry and consumers**.** Dairy farmers should implement new technologies and practices that are consistent with their goals

In regard with payment to member policy, the study propose the following policy to adopted and implemented with aim of enhancing the production of daily product, the study has identify The formation of properly constituted producer groups should drive the adoption of transparent pricing formula in milk supply contracts. There is not a 'one-size-fits-all'

formula; however the parameters should be agreed between milk supplier and milk buyer, through the producer group

The policy with strong believe that famers will gain and benefit like pay with performance and quality of daily product, establish the standard to determine the pay to farmers, Protect farmer from negative consequences of dairy product and Periodically review of the payment terms that does not create a culture of mistrust and, at worse, a feeling of victimization at the farm gate. There are profitable dairy farms and unprofitable dairy farms the difference between the two is not simply a product of milk price paid by the buyer, nor location of farm, herd size or even milk yield. It is in the overall technical efficiency in operations which need to be adopted.

On production resources this study propose the following policies in regard with dairy product ,policy in milk handing and distribution channel, choice of breeds, availability of animal and feed resources all this need to be established with an aim of increasing production system and making it more reliable to farmers and customers . Feed and labour are significant costs to most dairy farm businesses and so improvements in these areas will have the largest impact on the financial sustainability of the enterprise. Sustainable businesses are adaptive to change and are prepared to seize opportunities to improve their operations as they arise

Traditional farmers employ outdated farming practices and lag behind emergent and commercial farmers on growth and productivity measures. This shortage of know-how stems from weak extension services and is exacerbated by poor-quality infrastructure that restricts the flow of information e.g. the high cost and low coverage of information and communications technology has reduced the flow of information to and from rural areas, the county government need to improve in extension services. Dairy productivity is constrained by poor-quality feed resources, diseases, limited access to markets and services e.g., health,

credit and training, In addition to a wider adoption of more advanced and effective animal husbandry practices, traditional farmers would also benefit from skills and incentives to improve market and investment decisions, such as timing sales based on prevailing prices, and weighing the costs/benefits of investing in improved animal health productivity

The availability of finance is a key input, as it enables farmers to increase the size of their herds, invest in fodder crops, and purchase drugs and veterinary care to increase output. Not surprisingly, dairy farmers who have access to banking services are more productive than those that do not have such access. Access to affordable finance also facilitates investment in other parts of the supply chain in dairy farming and main government need to address this gap

5.5 Limitations of the Study

The daily industry is very competitive and busy thus many respondents as the farmers had fear of disclosing some relevant information because of stiff competition in the industries other farmers are members of cooperative society and fear giving information which might affect their organization which act as source of marketing agent for their produce, It therefore took a lot of time to gather adequate data for this research through the respondents who were more cooperative than as originally anticipated.

Time allocated for the study was insufficient while holding a full time job and studying part time. This was encountered during the collection of material as well as the data to see the study success. However the researcher tried to conduct the study within the time frame as specified.

5.6 Suggestions for Further Research

This study only focused on production of dairy product and left out other macroeconomic factors impacting the overall dairy industry and farmer individual management skill for long

term daily production survival and improvement of production capacity .In order to obtain a conclusive decision, future studies should concentrate on other beef production to examine the effect beef production Kenya economy due that fact that largest part of farm in semi area in Kenya are practicing the beef production compared to daily production which is mainly practice in central Kenya and great rift valley region

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APPENDICES

Appendix I: Questionnaire

This questionnaire is designed to collect data to establish the factors affecting production of dairy products in Kenya. The data shall be used for academic purpose only and it will be treated with confidentiality it deserves. The respondents are highly encouraged and persuaded to respond to the statements in this questionnaire in the most truthful and objective way possible. Your participation in facilitating this study will be highly appreciated.

Kindly ticks in the space provided [ ] the correct answer or supply the required information where, required, please specify and elaborate.

PART A: GENERAL INFORMATION

1. Age of the respondent

   21-30 years ( ) 31 to 40 years ( )

   41 to 50 years ( ) Above 50 years ( )

2. Gender of the respondent?

Male [ ] Female [ ]

3. How long have you been practicing dairy farming?

   Less than 1 year [ ] 1-3 years [ ] 3-5 years [ ] above 5 years [ ]

PART B: PAYMENT TO MEMBERS

4. To what extent does Timely Payment to members affect production of dairy products in Kenya?

   Very great extent [ ]

   Great extent [ ]

   Moderate extent [ ]

Little extent [ ]

No extent [ ]

5. Kindly indicate your level of agreement with the following statements that relate to effect of Timely Payment to members on production of dairy products in Kenya?

   1=Strongly Disagree, 2= Disagree, 3= Moderate, 4= Agree, 5 = Strongly Agree

	Statement	1	2	3	4	5
6.	Farmers' choice of the marketing channel is influenced by form of payments that is cash or monthly payments					
7.	Households are less likely to select channels that pay cash or took milk on informal credit compared to channels that offer monthly payments or provide formalized credit terms					
8.	Farmers participating in the markets at given price receive their revenue from traders by either cash on delivery or credit					
9.	Farmers prefer receiving lump sum revenue from more reliable marketing channel					
10	Large and Smallholder dairy farmer sell their milk through cooperative society, which fail to consider the costly variable incurred by the farmers					

PART C: PRODUCTION RESOURCES

11. To what extent does Production Resources affect production of dairy products in Kenya?

Very great extent [ ]

Great extent [ ]

Moderate extent [ ]

Little extent [ ]

No extent [ ]

12. Kindly indicate your level of agreement with the following statements that relate to effect of Production Resources on production of dairy products in Kenya?
1=Strongly Disagree, 2= Disagree, 3= Moderate, 4= Agree, 5 = Strongly Agree

	Statement	1	2	3	4	5
13.	Large and Smallholder dairy farmer relays heavily on production assets due to the fragile nature of the production output					
14.	Major constraints faced by Large and Smallholder dairy farmer are the higher relative costs of resources, mainly quality production assets					
15.	It is important when designing an asset based value chain intervention to understand what assets the Large and Smallholder dairy farmer have access to					
16.	The following factors play a key role in increasing farmers productivity provision of animal feeds inputs, trainings, artificial insemination services and farm inputs					
17.	Modern farming techniques are geared to production of cash returns, a proportion of which can be reinvested to expand or improve the farmer's assets,					
18	availability of credit facilities reinforces the demand for and supply of farm inputs and advisory services, which then generate growth in production and demand for market services					

PART D: DAIRY PRODUCTION SYSTEM

19.To what extent does Dairy Production System affect production of dairy products in Kenya?

Very great extent [ ]

Great extent [ ]

Moderate extent [ ]

Little extent [ ]

No extent [ ]

20. Kindly indicate your level of agreement with the following statements that relate to effect of Dairy Production System on production of dairy products in Kenya?

1=Strongly Disagree, 2= Disagree, 3= Moderate, 4= Agree, 5 = Strongly Agree

	Statement	1	2	3	4	5
21.	unpasteurized fresh milk is sold on the local market only					
22.	In traditional livestock production systems, milk is often processed by farmers into butter, fermented milk and cheese					
23.	Large and Smallholder dairy farmer relies on local cows to cut cost production and semen					
24.	Majority of farmers do not accept new technologies due to complication in term of management and cost involved					
25	in rural areas raw milk is mainly sold in exchange for millet or other products, often by women					
26	access to credit permits a farmer to enhance efficiency by					

	overcoming liquidity constraints which may affect their ability to apply inputs and implement farm management decisions on time					
27	use of credit envisaged as a means of promoting technology transfer and the use of recommend farm inputs is key to production system development					

PART D: PRODUCTION OF DAIRY PRODUCTS

28 To what extent does production of dairy products is affected by Payment to members, production resources and production systems in Kenya?

Very great extent [ ]

Great extent [ ]

Moderate extent [ ]

Little extent [ ]

No extent [ ]

29 Kindly indicate your level of agreement with the following statements that relate to effect in production of dairy products in Kenya?

1=Strongly Disagree, 2= Disagree, 3= Moderate, 4= Agree, 5 = Strongly Agree

	Statement	1	2	3	4	5
30.	The payment to member affects the quantity of milk produced					
32.	The production resources affects the quantity of milk produced					
33.	The production system affects the quantity of milk produced					

Thank You

Appendix II: Registered Dairy Co-operative Societies in Kiambu County

SUB COUNTY	CO-OPERATIVE SOCIETIES
1. Githunguri Sub county	Githunguri Dairy Farmers Co-operative Society
2. Kabete Sub county	Kabete and Muguga Dairies Co-operative Society
3. Kikuyu Sub CountySociety	Kikuyu, Gikabura & Sigona Dairies Co-operative
4. Lari Sub County	Kiriita, Lari and Gatamaiyu dairies Co-operative Society
5. Limuru Sub County	Limuru Dairy Co-operative Society
6. Kiambu Sub County	Ndumberi Dairies Co-operative Society
7. Kiambaa Sub County	Kiambaa Dairies Co-operative Society
8. Gatundu Sub County	Mangu Processing ` Co-operative Society
9. Ruiru	NONE
10. Gatundu North	NONE
11. Thika	NONE
12. Juja	NONE

(Kiambu County Annual Report of Daily Co-operatives, 2013)

Appendix III: Total Variance Explained

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.163	20.653	20.653	5.163	20.653	20.653	3.134	12.536	12.536
2	2.432	9.726	30.380	2.432	9.726	30.380	2.970	11.879	24.415
3	1.721	6.882	37.262	1.721	6.882	37.262	2.698	10.794	35.209
4	1.638	6.551	43.813	1.638	6.551	43.813	2.151	8.604	43.813
5	1.340	5.361	49.174						
6	1.170	4.682	53.855						
7	1.082	4.330	58.185						
8	1.039	4.155	62.340						
9	.869	3.477	65.817						
10	.864	3.456	69.273						
11	.786	3.146	72.418						
12	.755	3.019	75.437						
13	.688	2.753	78.190						
14	.662	2.647	80.837						
15	.612	2.446	83.283						
16	.586	2.345	85.628						
17	.560	2.238	87.866						
18	.511	2.042	89.909						
19	.427	1.707	91.616						
20	.409	1.635	93.251						
21	.399	1.597	94.847						
22	.375	1.502	96.349						
23	.366	1.464	97.814						
24	.301	1.202	99.016						
25	.246	.984	100.000						

Extraction Method: Principal Component Analysis.

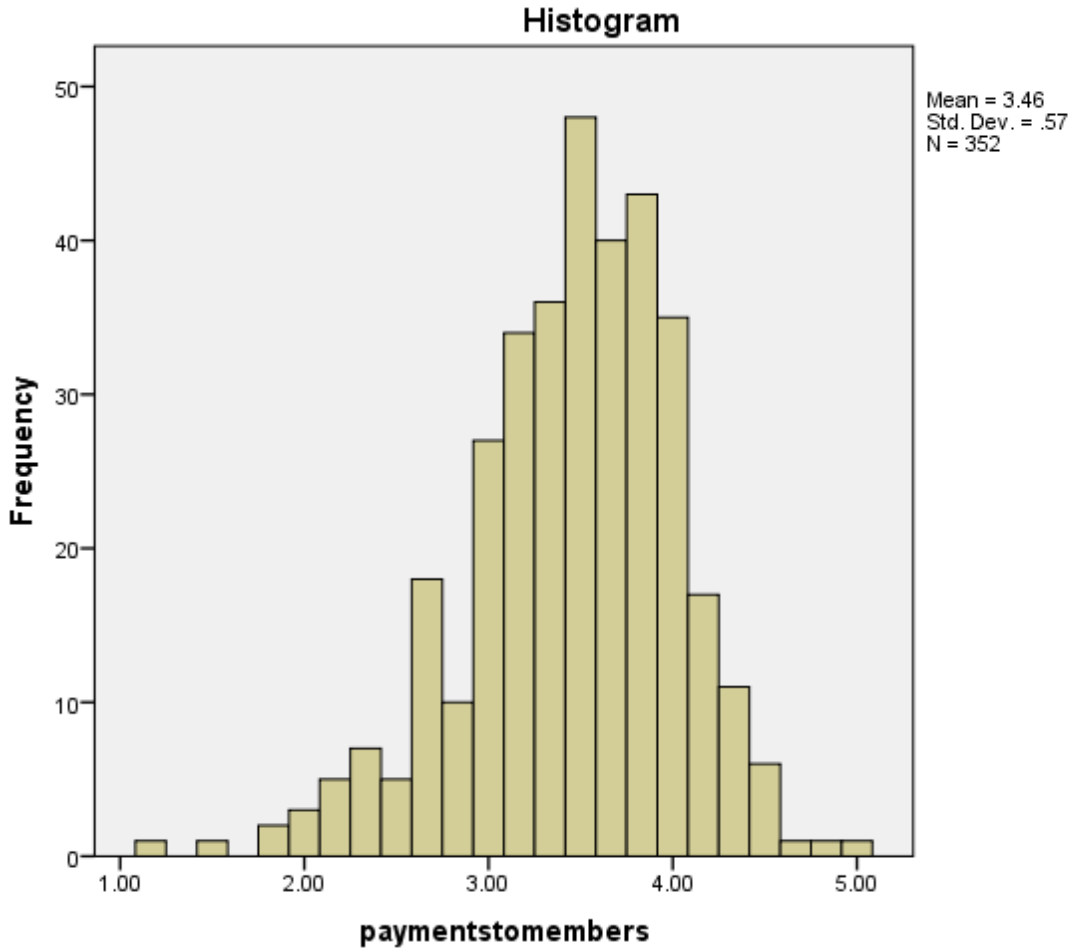
Appendix IV: Normality Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Payments to members	.107	352	.000	.971	352	.000
Production resources	.135	352	.000	.899	352	.000
Dairy production systems	.068	352	.001	.993	352	.090

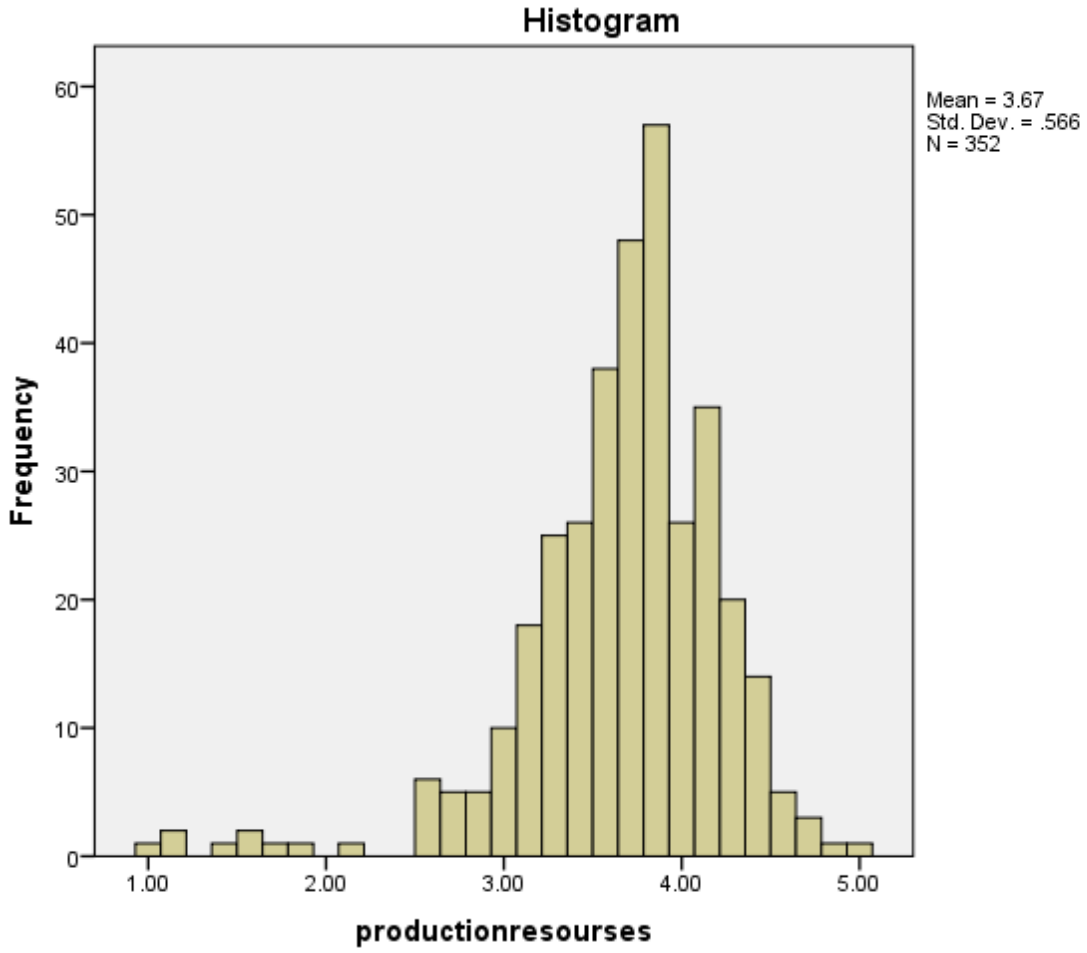
a. Lilliefors Significance Correction

Appendix V: Normality Test of payment to members



```
Payments to members Stem-and-Leaf Plot

 Frequency    Stem &  Leaf

     7.00 Extremes    (=<2.0)
     5.00        2 .  11111
     7.00        2 .  3333333
     5.00        2 .  55555
    18.00        2 .  666666666666666666
    10.00        2 .  8888888888
    61.00        3 .
0000000000000000000000000000011111111111111111111111111111111
    36.00        3 .  333333333333333333333333333333333333
    48.00        3 .  555555555555555555555555555555555555555555555555
    40.00        3 .  6666666666666666666666666666666666666666
    43.00        3 .  8888888888888888888888888888888888888888888888
    52.00        4 .  00000000000000000000000000000000000011111111111111111
    11.00        4 .  33333333333
     6.00        4 .  555555
     1.00        4 .  6
     1.00        4 .  8
     1.00 Extremes    (>=5.0)

 Stem width:      1.00
 Each leaf:       1 case(s
```

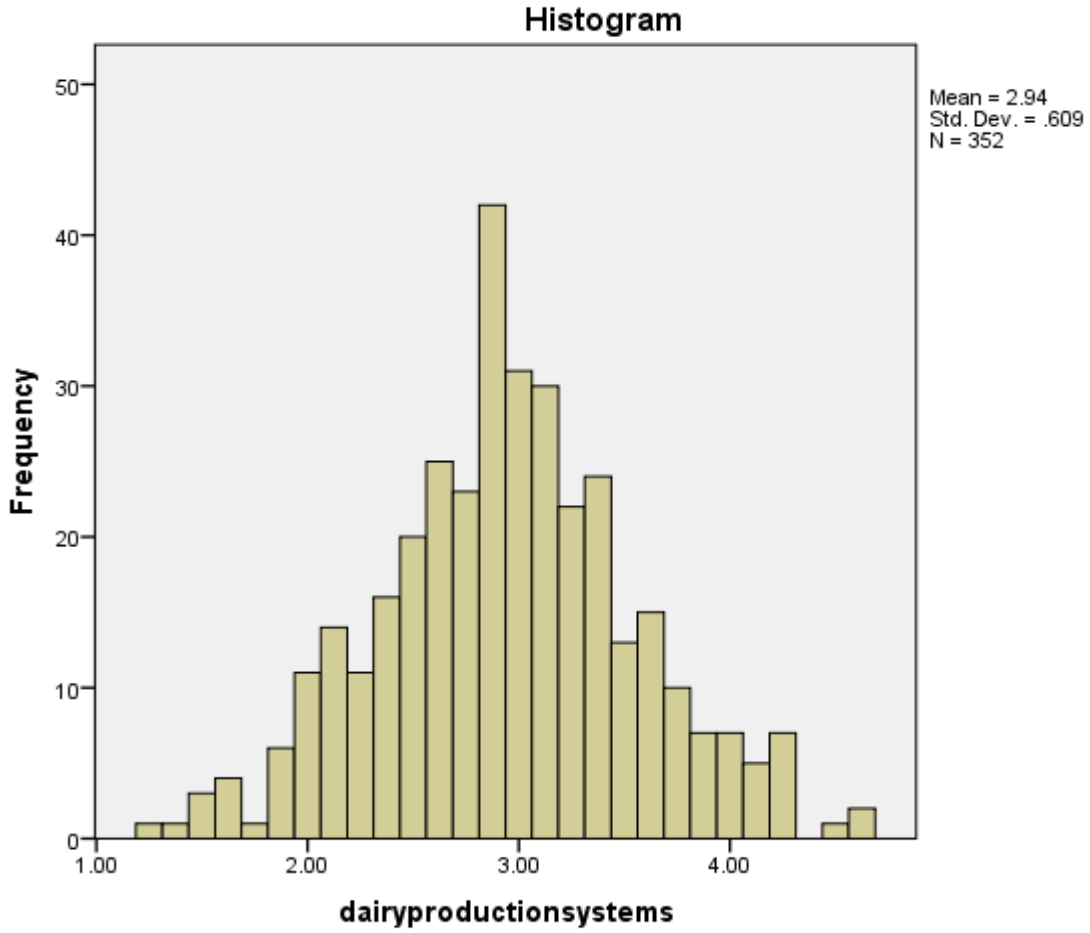
Appendix VI: Normality Test of production to resources




```
Production resources Stem-and-Leaf Plot

 Frequency    Stem &  Leaf

     9.00 Extremes    (=<2.1)
     6.00        2 .  555555
     5.00        2 .  77777
     5.00        2 .  88888
    28.00        3 .  0000000000111111111111111111
    25.00        3 .  2222222222222222222222222
    64.00        3 .
4444444444444444444444444455555555555555555555555555555555555555
    48.00        3 .  777777777777777777777777777777777777777777777
    57.00        3 .
888888888888888888888888888888888888888888888888888888
```

```
    61.00        4 .
00000000000000000000000000011111111111111111111111111111111
    20.00        4 .  22222222222222222
    19.00        4 .  4444444444444455555
     3.00        4 .  777
     1.00        4 .  8
     1.00 Extremes    (>=5.0)

 Stem width:      1.00
 Each leaf:       1 case(s)
```

Appendix VII: Normality Test of production system




```
Daily production systems Stem-and-Leaf Plot

 Frequency    Stem &  Leaf

     1.00 Extremes    (=<1.3)
     1.00        1 .  3
     3.00        1 .  555
     5.00        1 .  66667
     6.00        1 .  888888
    25.00        2 .  0000000000011111111111111
    27.00        2 .  222222222233333333333333
```

```
    20.00        2 .  55555555555555555
    48.00        2 .  666666666666666666666666777777777777777777777777
    42.00        2 .  888888888888888888888888888888888888888888
    61.00        3 .
00000000000000000000000000000000111111111111111111111111111111
    46.00        3 .  22222222222222222222233333333333333333333333333
    13.00        3 .  5555555555555
    25.00        3 .  666666666666667777777777
     7.00        3 .  8888888
    12.00        4 .  000000011111
     7.00        4 .  2222222
     1.00        4 .  5
     2.00 Extremes    (>=4.6)

 Stem width:      1.00
 Each leaf:       1 case(s)
```

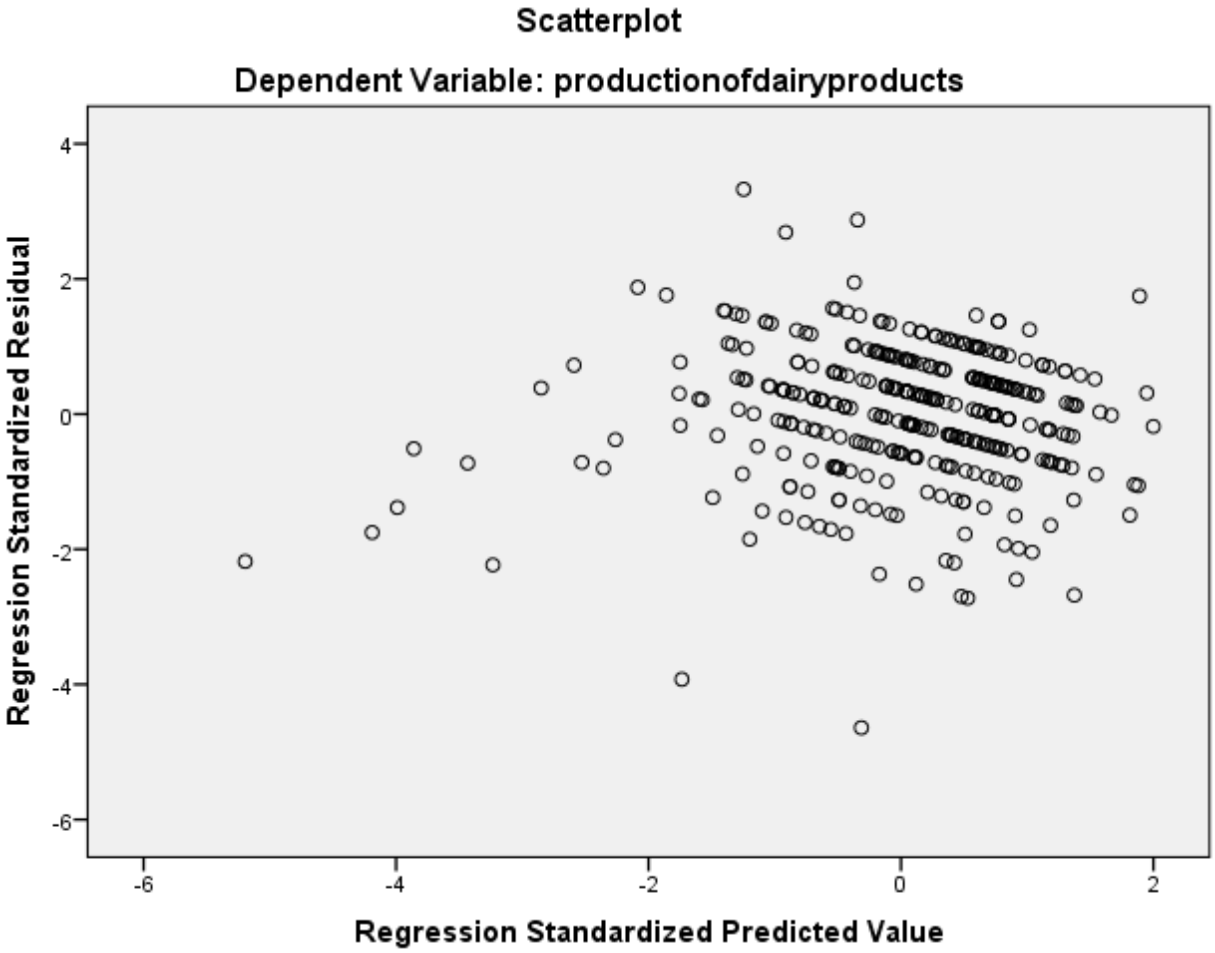
Appendix VIII: Correlations payments to members, production resources and dairy product system

Correlations

		Payments to members	Production resources'	Dairy production systems
Payments to members	Pearson Correlation	1	.405**	.275**
	Sig. (2-tailed)		.000	.000
	N	352	352	352
Production resources'	Pearson Correlation	.405**	1	.234**
	Sig. (2-tailed)	.000		.000
	N	352	352	352
Dairy production systems	Pearson Correlation	.275**	.234**	1
	Sig. (2-tailed)	.000	.000	
	N	352	352	352

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

Appendix IX


Scatterplot
Dependent Variable: productionofdairyproducts
Regression Standardized Residual
Regression Standardized Predicted Value
4
2
0
-2
-4
-6
-6
-4
-2
0
2

Appendix X

Coefficients

Model		Correlations			Collinearity Statistics	
		Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)					
	Payments to members	.379	.250	.231	.801	1.248
	Production resources	.349	.213	.195	.820	1.220
	Dairy production systems	.247	.133	.120	.906	1.103

a. Dependent Variable: production of dairy products

Appendix XI

Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	2.1637	4.0978	3.5604	.26880	352
Residual	-2.47598	1.77461	.00000	.53120	352
Std. Predicted Value	-5.196	1.999	.000	1.000	352
Std. Residual	-4.641	3.326	.000	.996	352

a. Dependent Variable: production of dairy products