

**FACTORS INFLUENCING UPTAKE OF EXOTIC DAIRY GOATS IN KITUI WEST
SUB COUNTY, KITUI COUNTY, KENYA**

BY

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DECLARATION

This project report is my original work and has not been submitted for the award of a degree in any other university.

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DEDICATION

I dedicate this research work to my loving wife Celestine Kemei and my children, Faith, Laura, Dennis, Felix and Audrey and my niece, Hellen for their moral support during the period of struggle for this post-graduate Degree. Their contribution towards my success is invaluable.

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ABBREVIATIONS AND ACRONYMS

ADP	Area Development Programme
CBO	Community Based Organization
CCPP	Contagious Caprine Pleuropneumonia
DFID	Department for International Development
FAOSTAT	Food and Agriculture Organization Corporate Statistics Data Base
GoK	Government of Kenya
HIV	Human Immune-Deficiency Virus
HPI	Heifer Project International
IFAD	International Fund for Agricultural Development
KDHS	Kenya Demographic and Health Survey
KWDGA	Kitui West dairy Goats Association
MoLD	Ministry of Livestock Development
MPRP	Mutonguni Poverty Reduction Project
NGO	Non-Governmental Organization
OVC	Orphans and Vulnerable Children
PLWHA	People Living with HIV and AIDS
PPP	Public Private Partnership
PPR	Peste des Petis
SADCC	Southern African Development Coordination Conference
SDG	Sustainable Development Goals
TFP	Total Factor Productivity
ToT	Trainer of Trainers

ABSTRACT

Dairy goat farming has gained admiration globally and Asia is the leading producer of goats while India leads in goat milk production in the world. The African continent is ranked second to Asia in goat population and efforts are made to improve dairy goat farming in Africa. Many smallholder farmers in Kenya have developed interest in exotic dairy goats farming. A study to investigate factors influencing uptake of exotic dairy goats was carried out in Kitui West Sub-County. The study was based on the following objectives which were to; assess socio-demographic factors influencing the uptake of exotic dairy goats, determine the influence of local community leadership, establish the influence of farmers' management practices on the uptake of dairy goats farming and finally to assess the influence of economic factors on the uptake of dairy goats farming in Kitui West Sub-County. The target population was smallholder farmers who kept exotic dairy goats in the four sub-clusters of Kitui West Sub-County. The sample size was 178 respondents who comprised 168 smallholder farmers and 10 Extension Officers. The researcher used descriptive research design in the study and applied random sampling technique to select the respondents. The researcher used questionnaire to collect quantitative and qualitative data from the smallholder exotic dairy goat farmers and an interview guide was used to engage Extension Officers in the Ministry of Agriculture, Livestock and Fisheries Development. Statistical package for social Sciences, version 21.0 was used to analyse data which was presented in percentages, frequencies and means using Tables. The findings showed that cultural background hindered the respondents from effectively engaging in exotic dairy goats farming. All the respondents were registered with respective Self Help Groups and some of them were registered with a Dairy Goats Association. Most of them reported practising dairy goat farming for 5 years. A good number of the respondents had received training on dairy goat husbandry. Majority of the farmers watered their dairy goats once a day with a few of them dipping and spraying them once in a month to control diseases and external parasites while some Farmers had access to Veterinary services. Farmers incurred higher costs on feeds at ksh.1396.00 and ksh.7052.00 monthly and annually respectively. Majority of the respondents received between 5 and 10 litres of milk per goat per lactation while some reported receiving market information from their fellow farmers and dairy goat farming was their highest income earner. From the Pearson moment correlation, there was a weak positive correlation between uptake of exotic dairy goats and social demographic factors with a correlation coefficient of 0.333 with a significant value of 0.001; which was less than 0.05. A correlation coefficient of 0.911 at 0.0003 level of confidence indicated a strong positive association between the uptake of exotic dairy goats farming and local community leadership. Also strongly positively correlated was the uptake of exotic dairy goats farming and farm management skills with a correlation coefficient of 0.872 at 0.002 level of confidence. There was strong negative correlation between uptake of exotic dairy goat farming and economic factors with a correlation coefficient of 0.044 at 0.000 level of confidence. It was concluded that socio-economic factors are significant in determining uptake of exotic dairy goats farming. The findings of this study are important because they will assist in improving breeding in goats which will improve farmers' income and livelihood. There is a need to strengthen awareness in order to change farmers' attitude in order to enhance the uptake of exotic dairy goats farming.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Global rearing of exotic dairy goats has been on an upward trend in terms of stock and production (Chetroju *et al.*, 2013). The trend of goat production systems has been directly proportional to the decreasing size of farms which haven't been able to accommodate high number of goats. There has been a decrease in pastoral practices especially in the production of milk as their numbers increase.

According to GrunerBericht (2012) and Monrad-Fehr et al (2007), rearing of goats has been the tradition in some European Countries like Italy, Greece and France where cheese and goat milk production takes lead. The same trend has been experienced in the European nations like Austria and Germany. Goat population globally is estimated to be over 924 million with growth rate being 13 percent (FAOSTAT, 2011, Ehim et al, 2003).

Substantial improvement in dairy goat industry has been reported by European countries with a focus on research (Dubeuf et al; 2004). According to Ehim et al (2003), goats contribute significantly to economic stability and food supply within the rural smallholder set-up. It was further reported that goats can contribute immensely to the economic issues and food supply among the rural small-holder farmers. However, the demand for the farm products has continued to exceed their availability.

Despite increased improvement in pastoral practices in milk production, stock of major milk producing breeds have significantly been on the rise (Chetroju *et al.*, 2013). Asia leads other continents globally in the rearing of goats, as Asia produces around 539 million (61.6%), with the African continent coming second with over 276 million goats; which contributes to 31.6% of the global livestock production. Goat population is highest globally in China with over 142 million heads. Pakistan is second with around 61.4 million goats, closely followed by Nigeria with a goat population of a around 57.3 million heads. India on the other hand takes lead in the production of goat's milk globally with 4594 metric tonnes, which translates to 28.98 percent of the global production ahead of Bangladesh at 2496 metric tonnes. In the African continent, Mali comparatively produces the highest amount of milk (703 metric tonnes and accounts for 4.3 percent of the global milk production (Chetroju *et al.*, 2013). In other studies, Lebbie (2004)

established that 26 percent of the small ruminant population comes from Africa and this constitutes 4.3 percent of the global milk production.

It is through research that the national and regional capacity can be strengthened to develop technology transfer to support small holders. This is according to the Southern African Development Coordination conference. Odunsi *et al* (2005) noted that goat has replaced a cow as a poor man's source of livelihood in terms of milk supply for family consumption. It has been proved through studies that goats adapt well in diverse environments to serve as socio-economic assets in fragile environments. Nutritionally goat's milk has been shown to be easily digestible with minimal allergy as compared to cow's milk. Studies by scholars have further revealed that goats are important assets used in ceremonies where feasting and payment of social dues is done (Okunlola, 2000). Goats sector serves as a source of income for small holder farmers with dismal capacity to maintain large herd of cattle (Degen *et al*; 2006). However, Nwafor (2004) and Degen (2006) has found that the former is true for vulnerable families in rural areas of Sub-Saharan Africa.

There is a ubiquitous concern among smallholder farmers in East Africa in embracing or adopting intensive exotic dairy goats based on cross breeding indigenous breeds with exotic breeds, with governments making inconsistent and fruitless endeavours at developing this new sector (Peacock, 2008). Goats form a fundamental part within livestock sector in Kenya where goat population is around 10.9 million across all the agro ecological zones (DFID, 2003). Goats are the most appropriate and popular stock among small holder peasant farmers since they are affordable as compared to cattle. They can do with little land as well as being prolific, feeding on a variety of forage. This has significantly made goats enterprise a more lucrative economic engagement among rural peasant farmers practising mixed farming which is a common system of production in Kenya.

Total red meat, milk, wool, skins and manure account 30 percent contributed by goats in Kenya where the population of dairy goats was estimated to be 90,826 by 2001 (Smith *et al.*, 2004). Exotic dairy goats have a great potential in the highlands of Kenya, where majority of the population live and pose substantial interest in the use of crossbred goats. Despite of a significant introduction of dairy goats in various parts of Kenya, most projects in the rural areas have not been sustained with realised benefits ending soon just after withdrawal or termination of donor funding or after realization of impacts. Farmer participation in the genetic improvement of

indigenous goat breeds has been dismal due to centralization of previous breeding programmes. Such programmes have ignored the smallholder farmers who would have benefited from such programmes thus culminating to delayed and poor adoption of new innovations. Continued increase in human population and land fragmentation in Kenya has compelled farmers to engage in dairy goat farming as compared to cattle that was formerly relied upon for milk and beef production (Kosgey *et al*, 2006). Kosgey *et al.*, (2006), notes that improved breeds of dairy goats is given preference to fast track improvement of small stock managed by smallholder farmers to improve their economic status and nutrition. However, dairy goats farming in Kenya is gaining incredible support from development organizations and policy both in private and public sectors for improved income and livelihoods.

Goats thrive well in different agro-ecological zones due to their widely adaptive nature and survival under diverse conditions that would subject them to stresses like diseases, parasites and high temperatures (Devendra, 2001 and Peacock, 2005). According to de Jong *et al*, (2000) and Braker *et al* (2002), interest of smallholder farmers in the adoption of dairy goat farming is also triggered by generational intervals that are relatively short, lower comparative investment, and higher roughage digestive efficiency, lower feed requirements as well as their multi-parity and multiple births.

World Vision Kenya, which is a Non-Governmental Organization, supported 300 vulnerable households with dairy goats with an aim to improve family food security and household income through sale of surplus goat's milk and male off-springs. The beneficiaries comprised widows, those living with HIV and AIDS (PLWHA) as well as the caregivers of the orphaned and vulnerable children (OVC).

According to Makodiah (2013), the dairy goats kept by smallholder farmers in Kitui West Sub-County were sourced from a reputable government dairy goats breeding institution, Kitui West Dairy Goats Association (KWDGA) with each family (household) receiving one Toggenburg Doe and two Galla Does and a shared Toggenburg buck. In the project area, the most preferred and reared small stock by farmers is the indigenous breeds of goats at 42.2 percent (Benslyn Consultants, 2011).

Farmers were trained on all aspects of dairy goats' husbandry practices with farmer Trainer of Trainers that was formed to complement extension services offered by the County government through the Ministry of Agriculture, Livestock and Fisheries development (Makodaih, 2013).

According to Mutonguni Poverty Reduction Project (MPRP) evaluation report, (2011), exotic dairy goat farmers received training on dairy goats' husbandry as well as milk marketing and record keeping.

Besides being dependent on livestock and peasant farming to derive livelihood, most vulnerable families in Kitui West Sub-County still depend on food aid from the government, NGOs and other well-wishers during drought period to augment income from dairy goats farming.

1.2 Statement of the Problem

Following a number of studies conducted in various parts of Kenya, adoption of dairy goats farming was reported with some progress (Mwaura, 2014). However, this has not been the case for Kitui West Sub-County where uptake of exotic dairy goats enterprise has been the concern for development organizations. The introduction of exotic dairy goats to small holder farmers in Kitui West Sub County was conceived to contribute to improved milk production, household income and nutrition. However, Kitui West Sub-County continued to report high number of malnourished children; with 117 cases reported in 2014 (Mutonguni ADP Annual report, 2014).

According to Kenya Demographic Household Survey (2014), Kitui is among the Counties in Kenya with the highest proportion (46 percent) of stunted children. Most families supported with the exotic dairy goats still were notable to sustain themselves economically several years after introduction with majority of them still relying heavily on food aid from the government and other well-wishers. Most of them have disposed or sold almost all the exotic stock of dairy goats and are fast turning into indigenous goats and poultry rearing. According to an evaluation report (MPRP evaluation, 2011), 31.4 percent of the dairy goat farmers had 16 goats each and 19.6 percent had 10 goats each. But from the subsequent projects monitoring reports, the uptake is slowly dwindling with most families having none of the introduced exotic breeds currently.

The planned milk value chain in the area could not pick up due to low goat milk production among the smallholder farmers in the Sub-County; a situation that has rendered idle some of the value chain components (equipment such as milk coolants and livestock feed mixers). Since the introduction of dairy goats to farmers in Kitui West Sub-County by World vision, no significant investigation had been conducted to establish factors that influence their uptake and sustainability though reasons for the same elsewhere have been documented.

Therefore, the study was intended to investigate the performance of the exotic dairy goat farming among the smallholder farmers and further establish factors influencing their uptake in Kitui West Sub-County and explore how socio-demographic factors, local community leadership, farming management practices and economic factors influence the uptake of dairy goats. The Sub-County is food deficit and both public and private sectors decided to introduce exotic dairy goats project in the area. Those farmers who offer milk for sale always ensure family demand is satisfied first. The findings of this study is crucial during planning as well as inform policy and decision making that will provide opportunities to farmers and extension agents to address the problem.

1.3 Purpose of the Study

The main goal of the study was to investigate factors influencing the uptake of exotic dairy goats among the small holder farmers in Kitui West Sub-County.

1.4 Objectives of the Study

The following objectives guided the study: -

- i. To assess socio-demographic factors influencing uptake of exotic dairy goats farming in Kitui West Sub-County.
- ii. To determine the influence of local community leadership on the uptake of exotic dairy goats farming in Kitui West Sub-County.
- iii. To establish the influence of farm management practices on the uptake of exotic dairy goats farming in Kitui West Sub-County.
- iv. To assess the influence of economic factors on the uptake of exotic dairy goats farming in Kitui West Sub-County.

1.5 Research Questions

The following research questions guided the study: -

- i. How do socio-demographic factors influence uptake of exotic dairy goats farming in Kitui West Sub-County?
- ii. How does local community leadership influence uptake of exotic dairy goats farming in Kitui West Sub-County?
- iii. How does farming management practices influence uptake of exotic dairy goats farming in Kitui West Sub-County?

- iv. To what extent do economic factors influence uptake of exotic dairy goats farming in Kitui West Sub-County?

1.6 Significance of the Study

The study was designed to look into the significance of socio-demographic factors, farmers' farm management skills, local community leadership and economic factors with regard to their influence on the uptake of exotic dairy goat farming by smallholder farmers within Kitui West Sub-County. The research findings are significantly crucial to policy makers in addressing impediments to adoption and sustainability of project within the area of study and beyond. The outcomes of the study will further go a long way in contributing towards exotic household food security and nutrition thus enhancing overall standard of living in the community. As we usher in the sustainable development goals (SDG), this study took place at the most appropriate time because of its immense contribution to the goals. The findings can assist trigger revitalization of the exotic dairy goat's milk value chain through Public Private Partnership (PPP) initiatives within the Sub-County given that some CBOs have value adding cottage industries (livestock feed processing plants and milk coolants) that operate below capacity.

1.7 Limitations of the Study

The research was conducted in an area inhabited by small holder farmers and therefore the findings may not be replicated adequately and effectively in arid rangeland condition where management of exotic dairy goats may be difficult. This could be as a result of low land carrying capacity and inadequate forage, coupled with other environmental and socio-cultural factors.

1.8 Delimitation of the Study

This study was confined to farmers keeping exotic dairy goats and lived in Kitui West Sub-County. However, another sample of smallholder exotic dairy goat farmers from the neighbouring Kitui east Sub-County participated in the pilot study.

1.9 Assumptions of the study

The researcher assumed that Toggenburg breeds of exotic dairy goats introduced to farmers in Kitui West Sub-County were the right breeds for the ecological zone and that the whole initiative was farmer or need driven. However other key assumptions include farmers and other stakeholders' willingness to participate in the study and , providing correct and reliable

information. The study also assumed that there would be very few intervening variables that superseded the researcher's control during the study.

1.10 Definition of significant terms used in the study

Exotic goat	This is a goat that is not native and was introduced to an area from abroad; and is an animal that originated in a particular region with superior characteristics or traits.
Innovation	This is a practice that is perceived as new and indented for adoption by farmers or considered as a unit of adoption.
Reliability	This refers to the level at which the findings of the study are consistent and accurate with regard to the subject of study among the exotic dairy goat farmers.
Smallholder	These are farmers who own 0.2 – 12 hectares of land and the definition was used throughout this study for consistency purpose.
Socio-demographic	These are groups of small holder farmers as defined by their Socio-cultural characteristics.
Uptake.	Acceptance of or receptivity to information or innovation without passing judgement on its indent validity, often without complete comprehension. It is the act of taking or receiving something.

1.11 Organization of the Study

The researcher structured the study into five chapters with chapter one describing introduction, background to the study, statement of the problem, purpose of the study that indicated the intended accomplishments of the study, the research objectives and questions and the significance of the study which justified the reason for conducting the study. This chapter also highlighted limitation, delimitation and the assumptions of the study.

Chapter two includes literature review and contains findings of previous researchers in the area of study. It also explained how various independent variables; socio-demographic factors, local leadership factors, farming management practices and economic factors influencing uptake of exotic dairy goats. It also covered theoretical and conceptual frameworks.

Chapter three covers research methodology and research design that explained the type of survey design adopted by the researcher and the rationale for choosing it. The target population was smallholder exotic dairy goat farmers living in Kitui West Sub-County and Extension Officers in the Sub-County. It also described the data collection methodologies, validity and reliability of the research instruments, data collection procedure, data analysis techniques, ethical considerations and lastly the operational definition of the variables.

Data analysis, presentation and interpretation are covered in chapter four while chapter five gives a summary of the research findings, discussion and conclusion. Recommendations are also given in the chapter.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter gives literature review on various factors which influence the uptake of dairy goats. The section further covers the theoretical framework and the conceptual framework of the study. It covers various independent variables; socio-demographic factors, local community leadership, farm management practices and economic factors which influence the uptake of exotic dairy goats from a global perspective, narrowing down to the local level.

2.2 Up-take of Exotic Dairy Goats

According to Rogers (2003), a process termed as the “Innovation-Decision Process” may give rise to adoption or rejection of a conceived innovation. The same decision, if adopted can as well be reversed at a later stage. Many other factors can also contribute to the adoption process. It has also been established that an adoption may not necessarily depend on the technological superiority of an innovation.

Dairy goats offer economic security since sale of a goat earns an income enough for grains to suffice a family of five for 2-3 months (Peacock, 2005). According to Fagerholm *et al.*, (2012) an increased human population and urbanization makes dairy goats an attractive and sustainable option for smallholder farmers in rural areas and semi-arid areas. Unlike a cow, a goat requires less feed, labour and small area to produce milk and meat and a farmer can also dispose it for immediate cash need.

Dairy goat milk production currently ranges at 1-3 litres per day with a daily potential of 3-4 litres. Achieving full potential of dairy goats requires an adequate knowledge on long term land use decisions by farmers. The knowledge is crucial in design, development and marketing of products and technologies (Mercer, 2004). Poverty alleviation and food insecurity are among the major socio-economic problems, which must be addressed due to their negative impact on people’s quality of life (Kiome, 2003). According to Ahuya *et al.*, (2009), Toggenburg breeds of dairy goats have shown good results under low-input farmer conditions in Kenya.

According to Ahuya *et al.*, (2004), the dairy goat industry among other industries have seen improvement and increased attention that results from their benefits of poverty reduction, (MoALFD, 2001). This has been attributed to the income generation from the sale of goats, milk,

skin, manure for crop propagation and meat hence acting as a financial intermediary to the resource constraint farmers (Dossa *et al.*, 2008; Gurmessa *et al.*, 2011). Braker *et al.*, 2002; Ahuya *et al.*, (2009) further points that engaging in this sector is not only beneficial in poverty alleviation through income generation but also in eradicating hunger through consumption of animal protein and hence improved nutritional status of rural communities.

Dairy goat technology is therefore more prevalent in the rural areas where land has been fragmented to accommodate high population. A good case scenario is Kiambu County where land has been fragmented resulting to increased land pressure (Kinyanjui *et al.*, 2008).

According to DFID (2006), an exotic dairy goat is associated with but not limited to high fertility, fast maturing and highly productive. Institutions such as Non-Governmental Organizations (NGO) and Faith Based Organizations (FBO), Universities and research institutions introduced European dairy goats in the rural areas of Kenya in the early 1980's (Kiamgo, 1996). During that particular time, Heifer Project International (HPI) in Tanzania, FARM AFRICA, Faith Based Organizations and Sokoine University of Agriculture played key roles in the introduction and distribution of dairy goats to smallholder farmers with an aim to address poverty through improved food security among the rural poor.

2.2.1 Enhanced goat management and production of exotic dairy goats

Programmes introduced exotic dairy goat breeds to smallholder farmers in rural areas with an aim to upgrade the indigenous breeds for improved growth rate and milk production. This would ultimately lead to an improvement in food security and household income (Peacock, 2008). Smallholder farmers' interest on dairy goats to wade off malnutrition and poverty improved; a strategy boosted by the government (Ogola *et al.*, 2010). Many farmers find quality dairy goat forages on easily accessible communal lands since goats are browsers and prefer to eat trees and shrubs as opposed to grass. Most of these trees and shrubs are drought tolerant and have potential to improve dairy goat health and milk production, especially during dry spells (Salem & Smith, 2008).

2.2.1 Increased Household income

Improved small scale farmers' income in Babati and Kongwa districts in Tanzania was attributed to improved production of dairy goats (Mary *et al.*, 2012). Dairy goat farming has attracted more peasant farmers as an income earner as well as source of milk and meat for the family (Shirima, 2005 and Tadele, 2007). Improved goats have continued to serve as a key measure in addressing

poor farmers' needs in the rural areas due to their affordable initial and maintenance costs. It is also imperative to note that goats can be taken care or looked after by any member of a family; unlike bigger stock like cattle.

2.3 Socio- demographic factors and uptake of exotic dairy goats

Socio-demographic factors found by scholars to have contributed to adoption or uptake of dairy goats farming cut across but is not limited to farmers' level of education, household or family size, gender roles and age of the household head. The livestock population standing in Kenya is 12.5 million cattle, 8 million sheep, 142,730 goats and 850,000 camels (Kamau *et al.*, 2008). Compared to cattle milk, goat's milk has been found to be allergy free and much enjoyed by people with allergy to cow's milk. On medical terms, goat milk is highly recommended to breastfeeding mothers. It has been established that the need for milk-based cheese and yoghurt is rising incessantly in the dairy market or industry. Small holder farmers enjoy the convenience of handling goats since they are easy to haul, besides being relatively cheap to buy, feed and house (Kamau *et al.*, 2008). Rearing of exotic dairy goats and feeding them on quality feeds has provided an opportunity for gainful and sustainable small scale dairy goat farming (Kamau *et al.*, 2008). Mixed farming in high potential areas or zones makes up the fundamental of the whole farming system with multiple biological (meat, milk, manure and skin) and non-biological (asset, security and socio-cultural) functions in the subsistence economy; and these functions are very important in providing stability to the whole farming system, (Davendra 1976; Fitzhugh 1982; Kotze and Schonfeldt, 1996).

2.3.1 Age of household heads

It has been established through research that, adoption and practice on new innovations have been traced more in farmers with more energy and active (Nanai, 1993). However, Singh (2011) on the other hand argues in his land based enterprise study that technology adoption was not significantly influenced by young people ranging from the age of 25 to 40 years. Amir and Pannel, (2004) pointed that more experience is rooted to relatively older farmers who are more endowed with resources and authority that provide a stronger platform to try new innovations. Through further studies, uptake of new ideas and age of the farmers are indirectly proportional where the aged are less receptive to innovations despite having the experience and resources (Dogbe, 2006). Due to the inconsistency of findings between age and adoption, Nkonya and Norman (2003) concluded that the effect of age on adoption tended to be location and

technology specific, and thus age can generate or erode confidence in new technology. Also, Bulale (2000) found age as inversely related to adoption of dairy technology.

2.3.2 Gender roles in exotic dairy goats farming

Women have been found through research to perform relatively more roles and functions in livestock production, especially in shoats (Reij and Waters-Bayer, 2001 and Moses, 2006). In Nigeria, women participate more in agricultural activities as compared to men and this is further confirmed whereby community projects addressing poverty and other socio economic impediments in Ghana and Nigeria have been successful because of women-led group work (Ogunlela and Mukhtar, 2009; IFAD,2010). According to Banda (2004), rural areas of Malawi are dominated by farming of shoats by smallholder peasant farmers. In other studies women have proved to be more enriched with innate scientific and practical knowledge of shoats husbandry (Moses, 2006).

Performance of women in rural development has drawn praise from many quarters though perceived as dismal in some areas especially in the livestock industry. This has been linked to predominant and deep-seated cultural factors (IFAD, 2010). Many scholars and development agencies have shifted and concentrated their focus on the perceived male dominated areas of the economy such as beef production and large-scale crop farming. This has put women on the periphery of development and decision making. However, a number of women have been seen engaged in milk production sector as well as rearing of small stock like poultry and shoats.

According to Haenlin (2004), goat milk is rich in proteins and a wide range of vitamins and minerals essential for human health. Dairy goats are smaller and easier to manage than cattle, making them more accessible to women (Milne-Price, 2011). Therefore, supporting dairy goat development can create jobs in other sectors like milk processing and distribution; and these jobs can be inclusive and engage women. However, dairy goat operations can have greater potential to support rural women and increase gender equality (Odero-Wanga *et al.*, 2009).

Patriarchal bias has partly contributed to gender-blindness; a scenario that has been exacerbated by women attitude as being associationalised by their cultures or traditional taboos. This has significantly undervalued the work women perform in the society (IFAD, 2010). This scenario has made it difficult for scholars to obtain vital information on the role of women in livestock production and so is the poor reflection of women work in national statistics. In other nations like Bolivia women are tasked with livestock duties while men engage in crop farming. Men's

engagement is not much differentiated from household chores in surveys; neither are women functions and roles economically considered important for the country (de Schulze and Sostres, 2000).

According to IFAD (2010), the productive labour for women is not distinguished from their reproductive roles in Latin America and the Caribbean societies. No value is attached to their functions and roles and hence loss of value of work performed which just diminishes to a mere activity. According to Ndagala (2000), it is worth noting that women work longer hours and live relatively more years as do men. This is confirmed and justified in a case study where Iparakuvu women in labour force lasts until age faces them out at the time when their corresponding men enter elder hood it at the age of 38 years with women hitting the same at the age of 60 years.

Traditional women's role in livestock production systems varies from one ethnic culture and agro-ecological zone to another. Access and control among women is a total odder among many rural communities where control is skewed to favour and benefit men more despite partial access and ownership by some women. This happens at the time when women provide labour in most systems but their role in decision making becomes totally obscured at the time of livestock disposal and products use. The same happens with production where women participate but will not own the same means of production, neither can they make decision over the use of the factors of production (IFAD, 2010).

According to Shumaker (2014), both men and women may determine the use of resources but skewed in terms of level of satisfaction from the use of the same resource(s). According to IFAD (2007) and Dahl (2001), men enjoy and override the *de jure* ownership rights regarding livestock and dominate decisions on property inheritance which is prejudiced against women who have limited access to means of production relative to their labour contributions.

2.3.3 Education level of dairy goat farmers

The level of participation of farmers in the market is determined by their level of education (Fuller *et al.*, 2004). For those who have the education, the number of years spend in an educational institution is also a major contributory factor as this directly affects the level of management and managerial competencies as well as the quality of implementing exotic dairy goat farming (Ndinomupya,2008). According to Marenya and Barret (2006), successful and efficient dairy goat farming is dependent on education as this would spur production, processing and marketing practices. Farmers have higher chances and capability of adopting agricultural

innovations and new marketing channels when they are exposed to more relevant knowledge. Vijay *et al* (2009), confirms that education is key and significant when choosing modern milk marketing channels such as cooperative and private dairy plants. According to Amir (2006), a farmer is ready to buy in and make use of an innovation when he or she has a stable education background.

The relationship between farmers' education and attitude towards exotic dairy goat husbandry is an empirical question as it provides the dairy farmer with necessary skills to enhance adoption of exotic dairy husbandry practices. Exotic dairy goat husbandry practices involve technical applicability and a dairy farmer with high level of education is better placed to access and utilise information concerning a prospective innovation and ensure coherent evaluation of the associated risks is made when adopting the exotic practice which comprehends to the taught aspects (Akinbile, 2003).

The outcome of the taught improved husbandry practices to a dairy farmer is viewed on its adoption and putting them into practice. Human capital can be compartmentalised into farmer or employee capacity and allocative ability (ability to adjust to change). A farmer with more education has the ability to adjust to change as compared to a farmer with little or no formal education (Crook, 2011). Such educated farmers are able to adjust and fit into new technologies and innovations under different prevailing conditions.

2.3.4 Household size

Household size is directly proportional to labour availability in any set up. A bigger household would generate more labour and hence affects adoption of an enterprise like dairy goat farming that is accompanied by new technologies a resource poor farmer may not afford (Kassie *et al.*, 2008). Higher production can be associated with availability of more labour at household level (Ndinomupya, 2010). It is further noted that a choice for a marketing channel is positively determined by the size of the household (Staal *et al.*, 2006).

2.4 Local community leadership and uptake of exotic dairy goats farming

According to Bono, Shen and Yoon, (2014) and Yukl, (2002), leadership may influence followers' attitudes, perceptions, behaviour or a combination of these outcomes. Three major outcomes of influence attempts are commitment, compliance and resistance (Feldman, 2000). However, effective leadership stimulates commitment and attracts membership by its appeal (Forsyth, 2011). Such an outcome depends on the manner in which a leader organises and directs

the group processes under various conditions, and determines group performance and effectiveness (Fleenor, 2011).

2.4.1 Farmer Groups Leadership and Management

According to Organic Farmer magazine (February, 2011) bulletin, groups of farmers engaged in livestock keeping may not have the legal structures as well as an obligatory description of their objectives and how to achieve them. The author further noted that farmers or individuals who are more vocal and successful can easily assume leadership positions shoved by their eloquence and financial capability. The dominance of such characters in a group may compromise the quality of group work due to their dominance in decision making; even their mistakes or performance in group leadership may not be questioned by resource poor farmers in the group. In such a scenario competencies of the committee members may not well be defined and most farmer groups may lack accountability mechanisms in place. Poor organizational and administrative structures elude fairness and transparency and lack of these may give rise to jealousy and selfishness. In such a case, shared resources among farmers or group members are mismanaged.

2.4.2 Farmers' Groups Registration Status

According to FARM AFRICA (2003), resource poor farmers can mobilise and make gainful use of resources in groups where participatory decision-making is embraced by all. High genetic material and affordable animal health services can easily be achieved through farmer group approaches, unlike when farmers are not in groups. Therefore, for this to take place farmers are required to register themselves into groups for ease of service access. According to dairy Goats Association of Kenya (DGAK), (2014), farmer groups registered with the association can easily access breeding stock or semen, buck rotation information, market for their milk and breeding goats through organized sales. They can also register their goats with Kenya Stud Book and Dairy recording service of Kenya. They can access extension services and be guided to develop breeding plans.

2.5 Farming Management Practices and uptake of exotic dairy goats

Kenya Agricultural Research Institute (KARI) has recognized the important role that dairy goats play and prioritised it as number three (3) in about fifty-nine (59) commodities and factor research programmes (Wandera *et al.*, 2000). However, despite the over twenty years, that have been spent on dairy goat research, adoption remains low for farmers to feel the impact of this

research effort (Wandera *et al.*, 2000). According to the Department for International Development (DFID), (2004), FARM -Africa and KARI carried out a research in central Kenya on community based goat productivity improvement. The results indicated that most of the breeding programmes initiated were done without involvement and input of the target beneficiaries. Low dairy goat technology uptake was suggested as an information gap in a research workshop in Machakos Kenya (Wandera, Okwach and Njarui, 2000). According to Stone *et al.* (2013), goat feeding system and milk production are correlated. Intensive and semi intensive management systems assist smallholder dairy goat farmers to be self-sufficient by using home grown feeds and labour (Peacock & Sherman, 2010). However dairy goats reared in intensive or semi intensive systems produce more milk compared to those raised in free grazing systems since many farmers using the latter system of feeding hardly supplement their goat's diet.

Keeping records could help farmers see the cost and benefits of improving their management practices. Helping them to justify making changes in management, such as buying supplemental feed because they see it improves their milk production. Promoting education on the importance of record keeping, and identifying easily understood and managed record keeping systems are essential. It is important to link these recording schemes to markets so farmers can see a tangible benefit for keeping records (Wurzinger, *et al.*, 2011).

2.5.1 Farmers Training on Exotic Dairy Goat Keeping

Adoption of agricultural innovations is determined by a number of reasons. Some farmers may choose to or choose not to adopt an innovation depending on how the innovation meets their needs (Degnet and Belay, 2001). A total effect of the socio-demographic and other factors may in one way or the other influence a trained farmer to adopt and continue practicing a new technology or innovation.

Effective dissemination of exotic dairy husbandry practices through training is an important strategy for increasing uptake; for it creates awareness and competence in the target audience about innovations (Thapa, 2003). Adoption of exotic dairy goat husbandry practices involves a process in which awareness is created, attitudes are changing and favourable conditions for actual use of recommended practices are provided to dairy farmers (Lemma and Trivedi, 2012).

Farmers with no skills and know-how about certain exotic husbandry practices have less probability of adopting new technologies that are introduced (Mugisha *et al.*, 2012). According

to Organic Farmer magazine bulletin (February 2011), poor management and negligence in providing the right feeds and good housing leads to inadequate milk yields from exotic dairy goats which require nutritious feeds, adequate clean water and spacious space for movement.

Innovator and early adopter farmers which represent 10 % of the potential farmer base in adoption curve dominate adoption and rearing of dairy goats (Maigua, 2005). A gap within the innovative approaches by dairy goat farmers and other related entrepreneurs has led to more risks and meagre income that hinder growth of the dairy goat farmers (GoK, 2008 and Prain, 2007). Urban dwellers find it difficult accessing adequate forage and other feed supplements and these compromises optimum production from dairy goats. This is contrary to farmers within peri-urban areas where there are alternative goat feeds that constitute crop residues that are collected to serve as goats' feeds

In most of the developing countries and mainly among pastoralists, goats have mainly been associated with those conceived to have access to limited resources, especially the nomads where goats are primarily owned for a living. Their paltry income is earned from goats. However, inconsistent feeding of dairy animals affects their productivity and performance (Thomton, 2010). Even as farmers continue to enhance their knowledge on livestock husbandry, nutritional limitation both in quantity and quality abound. The scenario is worse among the pastoral farmers in fragile ecosystems experiencing recurrent adverse weather (Bruinsma, 2003).

Applied modern agronomic and husbandry practices in tropical countries has not given the same level of productivity in farming as is the case for the temperate countries where selection of improved fodder and the right forage species has improved production significantly (Pagot, 2012). Farmers have realized increased yield of livestock products due to application of conventional breeding methods. The trend has been sustained in many parts over time (Leakey, 2009). For more improved livestock production in the developed nations, researchers have recommended broad selection inside a resultant population to enhance livestock production (Simm *et al.*, 2004).

Farming of goats has improved livelihoods among smallholder farmers. Goats in their nature are tolerant to inadequate food and water access. Besides this they are more resilient and can recover faster after being exposed to adverse weather conditions due to their fast reproduction cycle and their body size (Peacock, 2007).

Dairy goat farming is an insurance of an incessant flow of family income as compared to seasonal horticultural crops like vegetables. Goats rearing can be a good capital investment that can earn a farmer a micro loan to supplement other economic activities or other farm enterprises (Omore *et al.*, 2004). Dairy goat farmers incur more on livestock feeds for significant production of milk where processed feed supplements are needed to balance the natural pasture or forage. Other costly services include labour, transportation, disease and pest control (Kipserem, *et al.*, 2011).

2.5.2 Experience of goats breeding

Breeding programmes involving crossbreeding temperate breeds with indigenous breeds of goats has been triggered by inferior programmes involved in stock replacement and improvement in dairy goats for local breeds (Kosgey *et al.*, 2006). This has awakened programmes in the tropical countries to revert to local breeds as more such programmes emerge. This calls for dairy goat breeders and entrepreneurs to enhance stock quality with time.

Despite of the gains experienced in livestock breeding in developed countries significant prospects to initiate and promote the same in developing countries abound. Improved breeds can give rise in fast productivity improvement but this can only be achieved with environment appropriateness fitting within the production system that require limited resources and constraints (Simm *et al.*, 2004 and Thomson, 2010).

Views, knowledge and goals of peasant farmers (both crops and livestock farmers) regarding rearing of Toggenburg goat breeds were sought and included in the husbandry practices as encouraged and supported studies on livestock improvement in less developed nations (Kahi *et al.*, 2005; Kosgey and Okeyo, 2007).

To enable farmers achieve significant growth rates in weaning, their participation is crucial. Farmers can be able to maintain weights of weaned animals above 18kg after attaining the age of 120 days. However, goats form a fundamental part within livestock sector in Kenya where the estimated goat population is 10.7 million across all the agro-ecological zones (GOK, 2002). They are raised for their products such as milk, meat, hides and manure besides their convenience to feed (Nyendwa, 2002). The East African and the Galla goats are the two-main indigenous breeds in Kenya, kept mainly for meat production. According to Kinyanjui *et al.*, (2006), Dairy Goats Association of Kenya (DGAK) has strived to introduce artificial insemination service to improve genetic figure in dairy goats. 20 farmers were trained as community resource persons in central

province of Kenya to assist offer services to all the regions in the province as well as parts of western province.

A well-balanced diet in goats feeding is a prerequisite for self-maintenance and production of milk. High quality fodder is a necessity since dairy goats are quite selective in feeding. Farmers may realize wastage if the feeds given are of low quality (Kamau, 2011). According to Eik *et al.*, (2008), breed is a key factor that can bring about reproduction performance variation. Improved genotype of dairy goats can enhance production of milk due to high heritability found for milk yields traits. It is worth noting that breeding programmes take time and a number of generations of goats to realize impact (Oliver *et al.*, 2005). To establish milk production trend and status, buck's lineage, milk production of the buck's mother and sisters are essential (Ojango *et al.*, 2010).

2.5.3 Disease Control in dairy goats

According to Grimaud *et al.*, (2007), livestock farmers have continued to use recommended feed supplements as well as disease management to curb the high costs that are associated with feeds and Veterinary services. Some farmers haven't been able to afford the recommended dairy goat management practices. Some studies conducted have proven that cost of inputs such as feeds, labour, land, quality breeds, Veterinary services have been quite important, accounting for 94 percent variation in total output. For one to adequately address inadequate food in pastoral dry areas of Kenya, it is imperative to consider the above variables of inputs. Dairy farmers in different agro-ecological zones apply diversified dairy management practices or techniques in all systems of farming across the ecological zones.

2.6 Economic Factors and uptake of exotic dairy goats

Shoats have proven to be cost-effective and reliable enterprise in fragile environments of semi-arid areas as well as mountainous regions of the Sub-Saharan Africa where their products such as skins and hair provide (Panin, 1993). Their products such as hair and skin provide treasured products besides milk and meat. Goats contribute up to 20 % of the calories and 0.75 percent of meat in Kenya. It has also been established that small ruminants' milk is rich in nutrients (Nwafor, 2004).

2.6.1 Farm Size and labour

According to Armagan and Ozden (2007), total factor productivity (TFP) can be increased by demographic factors of farm size and labour. Thus, gross production value increase is directly proportional to increases in labour in small and large farms and variable inputs in large farms. Subsistence smallholder farmers produce in an extensive production system but with low investment costs that compromise the amount and quality of farm inputs thus making the system unattractive to markets. However, the meagre surplus of products accrued is casually sold in the local markets (Torero, 2011). However extensive production system by smallholder farmers carries the largest percentage of goat production globally (Escareno *et al.*, 2013).

In a wide-ranging goat rearing system some goats are attached to some social roles apart from their role of income generation and food (Debeuf, 2005). Increased human population has exerted pressure on land, forcing farmers to resort to tethering since land size can no longer accommodate free grazing or browsing of goats on communal pastures (Peacock, 2005). Therefore, limitation of land especially in high potential highlands has led to tethering of goats within the homesteads or not far from the homesteads. Small holder farmers are therefore encouraged to intensify dairy goat farming since they can be kept under confined conditions with good feeding and management (Fagerholm *et al.*, 2012). According to Armagan and Ozden (2007), farm size can increase the total factor productivity.

2.6.1 Market information of exotic dairy goats

According to Fuller *et al.*, (2004), farmers participate effectively in the market when adequately and widely exposed and access market information. Good and clear marketing channels and well-structured market as well as consistent and timely flow of market information espouse farmer participation. This will trigger an increase in volume of sales and improved and stable income base. From the studies of milk marketing channels, the source of market information determines the sale of milk by farmers (Awudu *et al.*, 2009). The information disseminated by the market triggers increased output sales of dairy goat farmers, making them more willing to participate actively in the marketing channels (Otieno *et al.*, 2009).

2.6.2 Market Prices of exotic dairy goats

The cost of a quality dairy goat in Kenya is around ksh10, 000 to ksh 15,000 depending on the age and breed. However, prices for a near lactating Kenya Alpine dairy Doe goes up to ksh

20,000 (DGAK, 2016). According to Geisler (2015), dairy goat farmers depend upon direct market sales for both milk and cheese. Other market outlets include the retailers as well as the internet sales which too offer the market outlets. Some individual farmers sell directly to local market markets within their localities while some sell a herd of stock to distant organized markets in big towns and cities.

2.6.3 Volume of goat's milk produced and value addition

Consumers akin with products produced under safe environments have continued to advocate and promote local value chain development especially in Europe and United State. They attach such products with better quality and able to develop local markets.

More smallholder farmers have resorted to selling their milk and products to the growing number of local consumers in the local markets thus promoting local value chains (Verhaegen and Van Huylenbroek, 2002). According to Herr (2007), prospective local value chain of goat's milk has been identified and developed in the less developed countries. Detailed inquiry of workable smallholder innovations or initiatives in local value chain based on local resources and context have been established.

Interest in goat milk and other products like cheese has been in an upward trend in European countries. A number of reasons which are still elusive have triggered the interest with some of them who develop allergies from using a cow's milk consider goats milk as an alternative. Goat's milk products like cheese have become increasingly popular due to its appealing taste (Haenlein, 2004). However, a number of studies have scientifically compared goat's milk to cow's milk and proven some level of superiority in terms of quality which may be limited in the cow's milk. The investigation during the studies was more focused on the essential amino acids in goat's milk (Haenlein, 2010, Silanikove *et al.*, 2010; Ravnal-Ljutovac *et al.*, 2007 and Haenlein, 2004). Organic agriculture has immensely grown and organic farming has also been gaining popularity (Lu *et al.*, 2010) and this plays an integral role within the sector of ruminants (EC, 2010, 1-2 and 45-47). Research on organic goat milk and cheese and their quality is taking route and calls for the focus of scholars. Ruminants have the ability to enrich our diets with fibre which is vital for human health and nutrition (Hofmann, 2013

Besides supplying proteins, goat milk is a source of income for many rural farmers as is witnessed in the US, Britain and France where goats contribute significantly to the national economy and cheap proteins (Imasuen and Otoikhian, 2004). The same potential should be

tapped in the developing countries to reduce vulnerabilities among smallholder farmers thus addressing the impending nutritional deficiency. According to Wang *et al* (2012), the yield of milk is affected by many factors but the major ones are genetic and environment. The genetic affecting yield of milk is accounted by 30-35 percent and the other of 65-70 percent is affected by management and environment.

The world's 2 percent of the milk by livestock is from goats and this constitutes 15.2 million metric tonnes of milk. However much of this milk produced by goats is locally consumed at household level though it can still be processed into other consumable and market products such as cheese (FAOSTAT, 2008). Large quantities of milk are more preferred by both private dairy industries and traditional marketing channels (Vijay *et al.*, 2009).

The selection of milk market networks was certainly influenced by the bulk of milk produced daily (Tsougiannis *et al.*, 2008). This is as a result of low production costs by the processors. Much milk is produced by farmers with access to improved Veterinary services, whereas a small holder farmer may not afford (Vijay *et al.*, 2009).

In his study in Kitui West Sub-County, Makodiah (2013) noted that the few farmers (4 percent) who had not been able to milk their goats lost the original stock to diseases and had to look for replacement on their own. Almost half of the farmers (42 percent) in Kitui West Sub-County use milk from their dairy goats for home consumption to improve family nutrition.

Dairy goats produce more milk than the indigenous goats and therefore are gaining more popularity by farmers as a more convenient investment. Smallholder dairy goat farmers engaged in small-scale dairy production have attributed their main source of income to the enterprise which is commonly practised in the highlands of eastern Africa (Omore *et al.*, 2004). 70 percent of milk production in Tanzania comes from smallholder dairy farmers in the rural areas; a production equivalent to 1.6 million tonnes. Goats make up the highest percentage of small stock kept by smallholder farmers in Tanzania where dairy goats are gaining popularity and more milk production from the stock realized among those endowed with limited resources and income (Njombe and Msanga, 2009). Milk is considered as a child food in Tanzania and this is the main reason as to why we have few consumers as compared to other east African countries. It is however critical to point out that demand for milk by urban dwellers has never been met with studies by scholars indicating that processing capacity of milk in Tanzania only suffices the needs of around 33 percent of the overall milk demand (RLDC,2010). Too often the deficit, the

government of Tanzania resorted to importing milk. In the rural areas, there is more demand for milk and this has continued to grow immensely thus generating more opportunities for new products and hence improved and diversified value chain. The need for more milk and associated products is tremendously growing in the rural areas thus creating more opportunities that will see new value chains established to bridge the local supply and the growing demand. Development funders have found goats to be more ideal and economical for resource poor smallholder farmers engaged in mixed small scale farming systems in high and middle potential areas (Peacock, 2005). Goats rearing have been known to offer a quick means of wealth creation besides supplying high quality protein - rich milk among smallholder farmers in the rural areas (Muellhoff *et al.*, 2013).

Cattle milk is less recommended as compared to goat's milk since the former has smaller fat globules that make goats milk easily digestible. Goat milk is also preferred to cow's milk due to its richness in the minerals that is easily digestible (Peacock, 2005). According to Escareno *et al* (2013), goat milk can be available in all times as compared to cattle milk since they are fast breeders with lower nutritional requirements, unlike cattle. Therefore, for this case, most community projects in the rural areas have integrated goats farming as a rather effective enterprise.

To promote livelihood, goat's milk value addition is key since this will enable farmers fetch more income from the sale of milk products such as cheese which can be sold at a much convenient time. This is possible since the shelf life of such products is longer compared to that of fresh milk which cannot store longer. It has been established and documented that goat's milk is mainly produced by smallholder farmers to supplement and blend cow's milk. On the other hand, it is argued that goat's milk has a typical flavour that renders it unpopular to some individuals and this notion affects market development for goat's milk (Peacock, 2008; Amati and Parkins, 2011). It is worth noting that value addition can improve the net income from goat milk thus earning farmers good income that can directly enhance their livelihood (Lokhande *et al.*, 2011).

It has proved hard for smallholder farmers in developing countries to sustainably enter into value chain due to limited demand or need for entrepreneurship, business skills as well as low capital. This is more complicated by emerging competing needs and interests. It is common that entrepreneurial skills are hardly provided by schools in the rural areas. Illiteracy exacerbates the

situation where smallholder farmers find it hard initiating value chain or value addition at farm level (Verneulen and Cotula, 2010; Vorley, Lundy, and MacGregor, 2009; World Bank, 2007).

Improved children's health has been traced to the use of goat milk which is rich in nutrients. In 1990s, studies conducted proved that dairy goat projects were successful since they met the goals of the exotic nutritional needs as well as food security and improved income for smallholder farmers in the rural areas of Mgeta in Tanzania where interest for dairy goats by farmers grew immensely (Eik *et al.*, 2008).

Sokoine University of Agriculture (SUA) supported farmers endeavour in the promotion of goat's milk value chain and even initiating a milk collection centre in 2007 around Mgeta in Tanzania. This was as a result of a perception that milk supply was glut that called a collective effort to stimulate marketing and this was as a result of a feasibility study done by the University Researchers Agricultural and natural resource Transformation for Exotic Livestock baseline survey programme (Krogh, 2007). It was conceived that the collection and production centre would enhance milk production and further support in its marketing (Kifaro *et al.*, 2007).

2.6.4 Number of exotic dairy goats kept

The size of the herd is important in determining the market channels participation in the contemporary market channels. Any impact on the market contributed by the herd size is linked to organized private market channels. It has been established that farmers tend to shift suppliers to systematized private dairy channels due to high price incentives associated with such organized channels (Vijay *et al.*, 2009) and Tsougiannis *et al.* (2008). Number of goats kept by a farmer determines the total cost of production as well as the working capital required to spur production at farm level. According to Vijay *et al.*, (2009), a cooperative channel choice determines the size of the herd and this can pose a negative impact since large herd will trigger further transition of farmers from the cooperative to other lucrative channels.

2.6.5 Farmers' Alternative Income Source

From studies conducted, small scale farmers' embracing of certain marketing channels as well as their choice of cooperative channels was as a result of the earned income by farmers which accrued from the sale of other farm enterprises other than dairying (Mburu *et al.*, 2007). It was further noted that such income from other farm enterprises enable farmers procure other inputs of necessity and which can meet channel requirements by producing good quality and large volumes of marketable products (Marenya *et al.*, 2006).

2.6.6 Maintenance Cost of exotic dairy goats

Despite of the fact that dairy goats give more milk per lactation as compared to indigenous breeds, cost of production among the improved breeds is significantly high due to need and demand for high quality inputs. Equally the cost of Veterinary services exceeds the capacity financial capacity of smallholder marginal farmers (Ogola *et al.*, 2010).

More production costs in dairy goat enterprise are incurred in feeds which comprise concentrates which expose smallholder dairy goat farmers to more risks and hence making them reluctant to use the inputs or resort to sparing use. Therefore, there is a reduction in the potential to fully exploit the potential of dairy goats farming thus leading to low returns that make the whole lucrative enterprise a liability (Ogola *et al.*, 2010).

2.7 Theoretical Framework

The study is based on the Diffusion of Innovations Theory which explains the “how, why, and at what rate” new innovations and ideas diffuse different cultures, and relying on the human capital (Rogers, 2003). From the studies conducted, an innovation is said to be sustainable when it is adopted by a sizable number of farmers. However, within an adoption process is the critical mass which determines the level at which an adoption of new idea becomes self-sustaining and hence further growth is realised.

A number of social factors suffice and affect to an extent the adoption process. According to Rogers (2003), communication channels through which an innovation diffused affects the level and rate of adoption. The same is determined by existing social system as well as the efforts of the change agents involved in the diffusion process. As studied, any such diffusion-decision process may determine either adoption or outright rebuff of an innovation despite of a possibility of reversal at some point in time (Rogers, 1995).

Uptake of dairy goat farming is influenced by many factors, both institutional and farm-based. There has been a trend where needs are ascribed by institutions for farmers in the rural areas to adopt; a scenario termed- “top-down” approach with innovations or perception based technologies initiated to trigger adoption and diffusion at the lower level (Eneh,2010).

According to Rogers (2013), a structure of a social system may also contribute to an individual’s innovativeness as characterised by an adoption curve where adopters are classified; and in this regard an individual farmer may choose to adopt a technology or reject an innovation outright.

Rogers refers “adoption” as full use of an innovation to action a course and “Rejection” as declining to adopt the innovation. The same innovation may be adopted while in its partial trial stage (Rogers, 2003).

Farmers may try the innovation, first as it befits their own situation before making a final decision to adopt it. It is further noted that such an indirect trial can expedite the innovation process. Rejection of an innovation may occur in any stage of an innovation –decision process. According to Rogers, rejection can present itself both as an active rejection and as a passive rejection, where in the former a farmer or individual tries an innovation and considers adopting it; while in the latter, a farmer or an individual decides not to adopt the innovation. However, a decision to discontinue adoption-decision may also be an active form of rejection.

The reverse is opposite whereby an individual farmer maintains a passive position and decides not to adopt an innovation (Rogers, 2003). The change agents have a role of assisting farmers manage the adoption process which is associated with either the “knowledge-persuasion-decision” and or the “knowledge-decision-persuasion” processes. These processes cause uncertainty among dairy goat farmers who may end up not acknowledging new innovations meant to boost their livelihoods and income. In this case, any new innovation loses its lustre and hence the loss of distinctiveness of any new idea (Rogers, 2003)

2.8 Conceptual Framework

This is an imagined model that identifies the concepts under the study as well as their relationship (Mugenda and Mugenda, 2003). It’s a diagrammatic presentation showing the connection concerning the independent and dependent variables. It aims at explaining relationship between variables and it synthesizes the idea in a systematic way to provide direction. The conceptual framework is given in Figure 1.

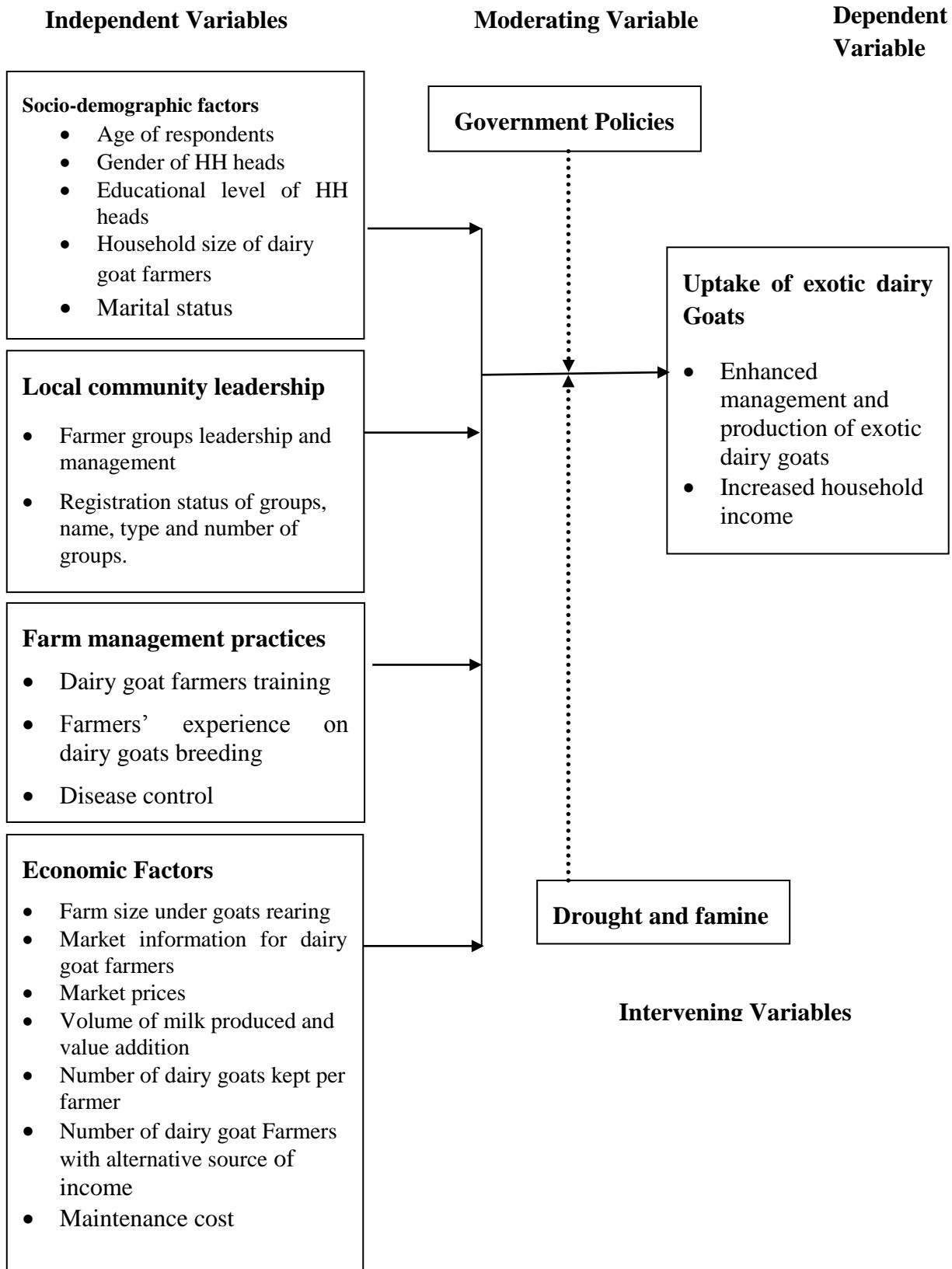


Figure 1. Conceptual Framework of the study

2.8.1 Explanation of relationships of variables in the Conceptual Framework

The conceptual Framework has identified independent, dependent, intervening and moderating variables. The relationship is as shown in Figure 1 above. The independent variables include Socio- demographic factors such as education level, Household size, Gender roles in dairy goats farming, age and farm size and labour. Other independent variables include local community leadership, farming management practices and economic factors (Figure 1).

The conceptual framework also identifies the moderating variables such as government policies. The dependent variable depends on the independent variables, the moderating variables and the intervening variables. That is, if the independent variables are managed, then the uptake of exotic dairy goats farming can be reversed; a trend that can be determined by number of stock and milk production per household and farmer as well as the income level per household.

2.9 Summary of Literature Review

This chapter contains literature review on socio-demographic factors, local community leadership, farming practices and economic factors influencing uptake of dairy goats. The chapter further gives an overview of studies done by different scholars and how uptake of exotic dairy goats has been achieved globally, regionally and in Kenya. The chapter also gives theoretical Framework and conceptual Framework.

2.10 Research Gap

According to Krogh (2007), the idea to introduce dairy goats in Mgeta triggered interest from farmers to expand the project that would see value addition and improved household income achieved but this idea was only triggered by the researcher's perception that there would be surplus milk that never was. Young and energetic farmers are competent enough to adopt new innovations; a perception disagreed by Singh (2011) who believed in his land based enterprise study that technology adoption was not significantly influenced by young ranging from 25 to 40 years. On the other hand, Amir and Pannel (2012) in their study further contradicted that older farmers were more experienced and had more resources and authority that would put them in a better decision to adopt and try new innovations. This can only be proven by conducting a research in order to establish the factors which influence uptake of dairy goats. This would further determine if indeed age, resource endowment and experience of farmers can contribute to the uptake of dairy goat enterprise.

The above findings apply to the researcher's area and location of study but the introduction of exotic breeds of dairy goats has not borne fruits several years after the inception. According to Makodiah (2013), the dairy goats introduced to farmers in Kitui West Sub-County were sourced from a reputable government dairy goats breeding institution, Kitui West Dairy Goats Association (KWDGA) and therefore the quality of breed was well taken care and could not be the reason for low uptake after introduction to farmers. This study therefore sought to uncover the underlying reasons to this and provide recommendations and options. Most of these studies have been done in far off countries and regions and within Kenya. Through this study the researcher sought to fill a research study gap on factors that influence low uptake of exotic goats farming despite having full knowledge of its advantages.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives research methodology which was used in the study, the sampling procedure and methods of data collection. It further explains the reliability and the validity of the instruments used in data collection, operationalization of variables of the study and methods of data analysis and ethical considerations of the study.

3.2 Research Design

The study used a descriptive survey research design which assessed factors influencing uptake of exotic dairy goats among smallholder farmers in Kitui West Sub-County. The survey research design used assisted the researcher to gather both qualitative and quantitative data on how the study variables such as; socio demographic factors, local leadership dynamics, management practices and economic factors influence uptake of exotic dairy goats. Through this design, the study established the link between study variables and the problem of the study. This is because survey research design enabled the researcher to ask the respondent farmers and Extension Officers about their perception and knowledge regarding the research topic.

3.3 Target Population

The target population of the study comprised 300 smallholder farmers who kept exotic dairy goats and were selected randomly from the four locations of Kitui West Sub-County. The four locations included Musengo, Kauwi, Mutonguni and Kakiani. A list of all dairy goat farmers making up the population was provided by the Ministry of Agriculture, Livestock and Fisheries Development and World Vision and they were clustered according to their localities in the Sub - County.

3.4 The Sample Size and Sampling Procedure

This section of the report describes the determination of the sample size and the sampling procedure applied to select the subjects for the study. A sample of 178 was used in the study and this comprised 168 dairy goat farmers and 10 Extension Officers (Table 3.1).

Table 3.1 Sampling Frame

Respondents	Target Population	Sample Size
Dairy goat farmers	300	168
Extension officers	10	10
Total	310	178

Source. Kitui West Sub-County livestock office and World Vision, Mutonguni ADP, (2015).

3.4.1 Sample Size

It is suggested that, a desired sample size should be determined when a population exceeds 10,000 individuals (Mugenda and Mugenda, 2003). Equal clusters were constituted out of the locations and a sample size was calculated using a recommended formula. Mugenda and Mugenda (2003) recommend the use of the following formula in order to determine the sample size.

$$nf = \frac{n}{1 + \frac{n}{N}}$$

From the formula given above: -

nf = Desired sample size when the population is less than 10,000.

n = Desired sample size when the population is more than 10,000.

N = Estimate of the population size.

Applying the formula, the sample size for the exotic dairy goats was given as: -

$$nf = \frac{384}{1 + \frac{384}{300}} = 168.4$$

The adjusted sample size of 168 farmers was used during the distribution in the locations in order to collect heterogeneous data. The variables that were investigated include; socio-demographic factors, local community leadership factors, farming management practices and economic factors influencing uptake of exotic dairy goats.

3.4.2 Sampling Procedure

Purposive sampling was used during the identification of key informants and focus group discussants of the study. This is a technique which allows a researcher to use cases that have the requisite information as guided by the objectives of the study.

The subjects were hand-picked since they possessed the requisite characteristics as noted by Gay and Airasian, (2006). Purposive sampling therefore helped get small samples but with detailed interviews or interactions.

The smallholder farmers who participated in the study were provided by the staff of World Vision Area Development Programme and the Ministry of Agriculture, Livestock and Fisheries Development in Kitui west Sub-County. The list of farmers was subjected to thorough scrutiny to ascertain the existence of the farmers in the area. After authentication, the names were compiled by the clusters to form sample frame. Sampling was thereafter done in two stages; first proportional sampling according to the number of farmers in a given cluster and random sampling within a cluster. In proportional sampling, each cluster or administrative unit was allocated a number according to the existing dairy goat farmers and each cluster was covered by one enumerator who interviewed 42 farmers.

In random sampling a list of dairy goat farmers from each of the four clusters was provided in order to form a sample frame whereby enumerators picked one name of a farmer printed on a tag. This was done in turns in the respective clusters until all the names of the required respondents were picked in all the clusters. All the names picked by the enumerators constituted a survey sample of 168 exotic dairy goat farmers for the study.

3.5 Methods of Data Collection

Data was collected using questionnaires, Key Informant Interviews and observations. Questionnaires are used to acquire crucial information on the population. In this case, each item in the questionnaire addressed a respective research objective or question of the study.

The researcher analyzed information which was obtained from the questionnaires. Both open and close-ended questionnaires were subdivided into the following sections, socio-demographic information, local community leadership, management practices and economic factors influencing uptake of dairy goats. This was meant to collect data that addressed both the

independent and the dependent variables besides answering the given research questions. The questionnaire was administered to household heads of households keeping exotic dairy goats.

Data collection was undertaken systematically and the enumerators were recruited and trained before reviewing the instruments. The enumerators were recruited from the local community. Pre-testing of the instruments was done after the training in order to test their appropriateness and the document subjected to revision based on the findings to remove any ambiguities noted during pre-testing. This was done from a different community with similar characteristics. The final research instruments were printed and photocopied to ensure all the required instruments were available. Data collection was done in the identified clusters or locations with each enumerator allocated one location or cluster. A filled questionnaire was cross checked every day for approval by the researcher to ensure the required standards were met.

Before the data collection exercise the County Government was notified of the intention to conduct the research for their approval and support. The local leadership was mobilized and requested to support the enumerators during the data collection exercise. Filled questionnaires were kept by the researcher in a safe place to ensure their safety. Safe data coding and entry commenced immediately from the first day of data collection.

3.6 Validity of the research Instruments

The validity of the research instruments was established by conducting a pilot study that pre-tested the instruments which were used to give qualitative and quantitative data.

3.6.1 Pilot Study

A pilot study was conducted in the neighboring Kitui East Sub-County which has similar conditions. The pilot study utilized 10 percent of the sample size and comprised 16 exotic dairy goat farmers who were selected randomly. According to Kimberlin and Winterstein (2008), a pilot study allows for the identification of sources of errors; and defines validity as extent to which an instrument measures what it intends to measure. It is further stated that a scale has a face validity if it 'looks' it will measure what is supposed to be measured (Ahmad and Schroeder, 2003).

This was meant to elicit some of the misconceptions surrounding exotic dairy goats farming in the area. The study also compared farmer management practices adopted and served as a pre-test

of the selected research instruments such as the questionnaire and the interview schedule. This served to increase the likelihood of research success.

3.6.2 Validity of the research instruments

The validity of the instruments demonstrates the accuracy of the data obtained in the study with respect to the variables of the same study. It is about the level of correctness and the significance of the inferences or interpretations that are based on the research findings. It gives the degree to which findings obtained from the analyses of the data represents the problem being investigated (Mugenda and Mugenda, 2003).

Kimberlin, and Winterstein (2008) refers to validity as the level at which an instrument measures what it intends to measure. Reliable instruments are needed for an accurate level of validity. According to Mugenda and Mugenda (2003), a researcher should develop instruments that are accurate and be able to standardize data collection procedures. Training of the survey participants was done before the actual data collection commenced.

According to Kimberlin and Winterstein (2008), content validity is usually dependent on the expert judgement in the absence of the statistical test which determines if a measure adequately represents a construct. In this case, the researcher applied the expert judgement to assess the content validity of the instruments by liaising and discussing the instruments and the results with the supervisors and other technical experts in the field.

Pre-testing of the research instruments such as the questionnaire, focus group discussion and the key informant interview guides was done in order to meet the standards and remove any ambiguity. Biasness in the questionnaire and random sampling technique was employed in data collection in order to enhance validity.

3.7 Reliability of the Instruments

This is where the instruments yield consistent research findings or results or data after a number of trials (Mugenda and Mugenda, 2003). The authors explained that reliability in research is influenced by random error. Kimberlin, and Winterstein (2008) further argued that sources of errors in research can only be identified through a pre-test or a pilot study, involving subjects with the same characteristics but outside the study area.

In the study, pre-testing of the instrument was done before application. During the pilot study, split-half method was used and involved administration of questionnaires where closed –ended items were subjected to the pilot study using 10 % (16) households.

The collected data values were operationalized. The numerical scores were split into odd numbers and even number items; a process that got two sets of values that were correlated using Pearson product moment Correlation Coefficient.

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{\{n \sum x^2 - (\sum x)^2\} \{n \sum y^2 - (\sum y)^2\}}}$$

The above correlation coefficient gave 0.91 which is a value above 0.80. This implies the degree of reliability of the data was high (Mugenda and Mugenda, 2003).

3.8 Data Analysis Techniques

Coding, entry and analysis of data was done using Statistical Package for Social Sciences. The same data was analyzed using statistical techniques and results were presented using Tables, percentages and frequencies. Qualitative data was analyzed systematically in order to obtain useful conclusions and inferences. Patterns, trends and relationships were established from the qualitative data while the quantitative data was analysed using descriptive statistics. A Pearson Moment Correlation was conducted in order to determine the strengths of the association or correlation.

3.9 Ethical consideration

To safeguard the confidentiality and privacy of the respondents, the provided information was kept confidential. The researcher sought the consent of the respondents before administering the questionnaire and clearly explained to them the benefits and objectives of the study. The study was approved by the supervisor and University staff before it was conducted. The researcher planned well in order to ensure that the study doesn't give misleading findings, and put measures in place in order to resolve consultatively any precipitating ethical ideas which may be resolved through peer review with the guidance of the supervisor. The researcher took precautions that safeguarded the dignity and welfare of all the respondents or study participants as well as those who may be affected by the findings of the study in one way or another. The researcher upheld

professional ethics by avoiding presenting the work of other scholars as his own and giving appropriate credit for the work of other authors which was cited.

3.10 Operational Definition of Variables

The operational definition of variables is given in Table 3.2.

Table 3.2 Operationalization of variables

Objectives	Independent Variables	Indicators	Measurement Scale	Tools of Analysis	Data Analysis
To assess socio-demographic factors influencing uptake of dairy goats farming in Kitui West Sub-County.	Socio-demographic factors	Age Gender Education level Marital status Household size	Nominal	Percentages Mean	Descriptive
To determine the influence of local community leadership on uptake of dairy goats farming in Kitui West Sub-County.	Local community leadership	Number of farmer groups Leadership and management. Farmer group types and number of groups. Registration status.	Nominal Interval	Percentages Means	Descriptive
To establish the influence of farm management practices on uptake of dairy goats farming in Kitui West Sub-County.	Farmers management practices	Farmers training Experience of goats breeding. Disease control	Nominal Ratio	Percentages Means	Descriptive
To assess the influence of economic factors on the uptake of dairy goats farming in Kitui West Sub-County	Economic factors	Farm size Market information Market prizes. Volume of milk produced and value addition. Number of dairy goats kept. Number of farmers with alternative source of income. Maintenance cost	Interval Nominal	Percentages Means	Descriptive
	Dependent variable Uptake of exotic dairy goats	Enhanced goat management and production. Increased household income	Ratio Interval	Percentage Mean	Descriptive

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents the data analysis, presentation and interpretation of the study findings. The other areas covered in the chapter include the background information of the respondents and findings of the study following objectives.

4.2.1 Response rate

The study used a sample size of 178 respondents out of which 156 of them filled the questionnaires and returned them. This gave a response rate of 87.6 %, and was quite satisfactory for making conclusions for the study as it was adequately representative (Table 4.1). A response rate of 50 % is considered adequate for analysis and reporting while 60% response rate is considered good and over 70 % response rate is considered excellent (Mugenda and Mugenda, 2003).

Table 4.1. Response Rate

Questionnaires Issued	Questionnaires Returned	Percentage
178	156	87.6

4.2 Socio-Demographic Factors

This section gives socio-demographic factors such as age, gender, education level, marital status and household size and their contribution to the uptake of exotic dairy goats.

4.2.1 Distribution of respondents by age

Various age groups were requested to indicate their age category. This was made on the understanding that different age sets hold various opinions relating to the subject of study. The results are presented in Table 4.2.

Table 4.2. Distribution of respondents by Age

Age (Years)	Frequency	Percentage
20-29	44	28.2
30-39	50	32.1
40-49	49	31.4
50 and above	13	8.3
Total	156	100.0

Table 4.2 shows that 32.1% of the respondents were spread between ages of 30 to 39 years while 31.4% of respondents fell between 40 to 49 years of age. 8.3 % of the respondents were aged 50 years and above. This indicates that farmers of all age categories participated in the study and had some knowledge of rearing exotic dairy goats.

4.2.2 Distribution of respondents by Gender

Respondents were requested to indicate their gender. This was made in order to ensure equity and fairness during involvement of farmers in gender study. The results are shown in Table 4.3

Table 4.3 Distribution of Respondents by gender

Gender	Frequency	Percentage
Female	94	60.3
Male	62	39.7
Total	156	100.0

The study results obtained show that majority (60.3%) of the farmers involved were females whereas 39.7% were males. This implies that exotic dairy goats farming in Kitui West Sub County is commonly dominated by female farmers.

4.2.3 Level of Education

The household heads were asked to give their level of education and this was sought to gauge their level of understanding on research subject and their easiness and comfortability in responding to research questions. The findings were given in Table 4.4.

Table 4.4. Level of education

Description	Frequency	Percentage
Certificate	95	60.9
Diploma	58	37.2
Degree	3	1.9
Total	156	100.0

Results obtained show that majority (60.9 %) of the farmers involved were holders of a certificate course. 37.2% of the respondents indicated they had diploma certificates, while 1.9% of the respondents indicated they were degree graduates. This shows that majority of exotic dairy goat famers had received education and were able to clearly comprehend the research questions posed and responded accordingly.

4.2.4 Marital status

The background of family to some extent was perceived to influence farmer's choices in agricultural activities, especially the uptake of the exotic dairy goats. As guided by this hypothesis, the household heads (respondents) were requested to indicate their marital status and results are given in Table 4.5.

Table 4.5. Marital status

Description	Frequency	Percentage
Married	92	59.0
Single	47	30.1
Widowand Widower	17	10.9
Total	156	100.0

The study results obtained show that majority (59.0%) of the exotic dairy goat farmers were married, 30.1% of the farmers were single while 10.9% of the farmers were either widowed or separated.

4.2.5 Household size

Farmers were requested to indicate their family size as this was perceived to influence their choice of engagement in dairy goats farming. The results are shown in Table 4.6.

Table 4.6. Household size

Household Size	Frequency	Percentage
Less than three	45	28.8
3 to 7 family members	86	55.1
8 to 10 family members	25	16.0
Total	156	100.0

Investigations on family size showed that 55.1% of the families involved had between 3 to 7 family members, 28.8% of the respondents indicated less than three while 16.0% of the respondents indicated 8 to 10 family members. This shows that majority (55.1%) of exotic dairy goat farmers came from families with between 3 to 7 family members.

4.2.6 Influence of cultural background on engagement in dairy goats farming

The study sought to determine whether cultural background hinder farmers from effectively engaging in exotic dairy goats farming in Kitui West sub-County. The findings are given in Table 4.7.

Table 4. 7. Effect of cultural background on engagement in dairy goats farming

Opinion	Frequency	Percentage
Yes	117	75.0
No	39	25.0
Total	156	100.0

From Table 4.7, majority (75.0%) of the respondents agreed that cultural background hindered them from effectively engaging in dairy goats farming, whereas 25.0% indicated otherwise. This implies that cultural background hindered farmers in Kitui West from effectively engaging in dairy goats farming. Respondents further repowered the common believe that exotic goats could not do well or survive in semi-arid areas delimited the adoption of exotic goats in Kitui West - Sub county.

4.3 Local Community Leadership

4.3.1 Membership of local community group

The study sought to determine whether the farmer was a member of an organized group. The results are given in Table 4.8

Table 4.8. Membership of local community group

Opinion	Frequency	Percentage
Yes	156	100.0
Total	156	100.0

From the study findings, all the household heads (100%) were members to an organized group as given in Table 4.8. Among the groups include, Kithio Nzau Self Help Group. Gwata Self Help Group, Mwagya community group, Kutha community group, Mithini community group, Kwagutu Self Help Group, Nzinia community group, Kwabelu community group, Muthale women group, Syathani community group, Muthamo community group, Mutuli women Self Help Group, Musengo community group and Focal community group, among others

4.3.2 Registration with dairy goat's association or group

The study sought to determine the respondents had registered with any dairy goat's association or group. The results are shown in Table 4.9

Table 4.9. Registration with dairy goats association or group

Opinion	Frequency	Percentage
Yes	118	75.6
No	38	24.4
Total	156	100.0

From the study, majority (75.6%) of the respondents were registered with a Dairy Goats Association or group whereas 24.4% indicated that they were not registered. This implies that majority of the exotic dairy goat's famers in Kitui West Sub -County were registered with dairy goat's association or group.

4.3.3 Role of local community leadership

The study sought to establish how farmers benefited from local community leadership in the area. The findings are given in Table 4.10

Table 4. 10. Role of local community leadership

Role	Percentage
Information sharing	72.4
Meetings of extension officers organized	50.0
Linkage to partners	64.1
Total	100

Majority (72. 4%) of the respondents agreed that community leadership promoted information sharing. Community leadership promoted linkage to partners as shown by 64.1% and that respondents also agreed that community leadership organized meetings with extension officers for the benefit of the farmers as indicated by 50% of the respondents.

4.4 Farm Management Practices

The study examined a number management practices exotic dairy goat farmers ought to uphold in order to realize improved goats productivity and household income.

4.4.1 Duration of rearing exotic dairy goats

Respondents were requested to indicate the period which they had been practising exotic dairy goats farming in their farm. The findings are given in Table 4.11.

Table 4.11. Duration of rearing exotic dairy goats

Description	Frequency	Percentage
Less than a year	30	19.2
2 to 4 years	36	23.1
More than 5 years	90	57.7
Total	156	100.0

Most (57.7%) smallholder farmers kept exotic dairy goats in their farms and have been practising dairy goat farming for more than 5 years, 23.1% of the farmers have been rearing the improved breeds of goats for a period of 2 to 4 years whereas 19.2% of them had only kept exotic dairy goats for less than a year. This implies that exotic dairy goats were introduced long time to most farmers and the innovation wasn't new to majority of them. This confirms that the information farmers shared during the study was credibly correct and this calls for redress in order to sustain the uptake and production of dairy goats.

4.4.2 Training on dairy goat's husbandry or management

The study sought to establish whether the respondent had received training on dairy goat's husbandry or management. The findings are given in Table 4.12.

Table 4. 12. Training on dairy goats husbandry or management

Opinion	Frequency	Percentage
Yes	124	79.5
No	32	20.5
Total	156	100.0

Most (79.5%) respondents had received training on dairy goat husbandry while only 20.5% indicated they had not received any form of training. This implies that majority of the dairy goat farmers in Kitui west Sub-County had received training on dairy goat. Farmers received training on breeding management, feeding management and production management and therefore dairy goat farmers seemed to have received requisite skills and knowledge on rearing of exotic dairy goats during the introduction of the breeds to them.

4.4.3 Method of rearing adopted by the farmer

Respondents were requested to indicate the mode of grazing they had adopted in rearing of dairy goats. The results are given in Table 4.13.

Table 4. 13. Method of rearing adopted by the farmer

Description	Frequency	Percentage
Zero grazing	21	13.5
Tethered	78	50.0
Free grazing	57	36.5
Total	156	100.0

The study shows that 50.0% of the farmers indicated that they used tethering method, 36.5% of the farmers indicated that they used free grazing while 13.5% of the farmers indicated that they used zero grazing. These grazing or feeding methods have some significance in the performance and productivity of exotic dairy goats in the area.

4.4.4 Supplementary feeding of exotic dairy goats

The study sought to establish whether farmers used any supplements. For this case, the findings are presented in Table 4.14.

Table 4. 14. Use of animal’s supplement on exotic dairy goats

Opinion	Frequency	Percentage
yes	156	100.0
Total	156	100.0

All the respondents (100%) confirmed having used supplementary feeds for their exotic goats (Table 4.14).

4.4.5 Type of feed supplements used by goat farmers

Respondents were requested to indicate the dairy type of animal supplements they used. The results are given in Table 4.15.

Table 4.15. Types of feed supplements used by dairy goat farmers

Animal supplements	Frequency
Sunflower Seed Cake and Maize Bran	71.8
Maize Bran	61.5
Maize Bran Alone	83.3
Crop Residue	82.7
Green Fodder	67.3
Hay	55.1
Cotton seed cake and maize bran	42.3

Most (83.3 %) respondents used maize bran alone to feed their goats, 82.7% used crop residues while 71.8% of the respondents indicated that they used sunflower seed cake mixed with maize bran, 67.3% of the respondents used green fodder, 61.5% of the respondents indicated that they used maize bran, 55.1% of the respondents indicated that they used hay, while 42.3 % of the respondents indicated that they used cotton seed cake mixed with maize bran. This implies that among the types of animal supplements used by exotic dairy farmers in Kitui west Sub-County include the combination of Sunflower seed cake and maize bran, maize bran alone, crop residues, green fodder, hay, combination of Cotton seed cake and maize bran.

4.4.6 Provision of drinking water to exotic goats

Farmers engaged were requested to indicate the number of times the exotic goats were provided with drinking water.

Table 4. 16. Frequency of provision of drinking water to exotic dairy goats.

Description	Frequency	Percentage
Once a day	82	52.6
Twice a day	56	35.9
Once after two days	18	11.5
Total	156	100.0

Most (52.6 %) farmers watered their exotic dairy goats once a day and 35.9% of the farmers watered their goats twice a day while 11.5 % of them watered theirs once after two; implying that they provided water to their goats once a day.

4.4.7 Control of external parasites

Farmers engaged were requested to indicate they controlled on external parasites. The findings are given in Table 4.17

Table 4. 17. Control of external parasites

Opinion	Frequency	Percentage
Yes	156	100
Total	156	100

Most (100%) farmers controlled external parasites from attacking their goats.

4.4.8 Spraying during the Wet seasons

The study sought to establish the number of times of exotic dairy goat farmers carried out spraying during the wet seasons as shown in Table 4.18.

Table 4. 18. Spraying during the Wet seasons

Description	Frequency	Percentage
Once a week	21	16.7
Once in two weeks	34	27.0
Once a month	71	56.3
Total	126	100

Results obtained from the analysis show that most (56.3 %) of the farmers sprayed their goats once in a month, 27.0% indicated that they carried out spraying exercise once in every two weeks while 16.7% of them sprayed once per week. This implies that most farmers of exotic dairy goats in Kitui West Sub-County sprayed their goats once a month during wet seasons.

4.4.9 Spraying during dry seasons

The study sought to establish the number of times exotic dairy goat farmers sprayed their goats during dry season. The results are given in Table 4.19.

Table 4.19. Spraying during the dry seasons

Description	Frequency	Percentage
Once a week	23	18.3
Once in two weeks	90	71.4
Once a month	13	10.3
Total	126	100

Results obtained from the analysis show that majority (71.4 %) of the farmers carried out spraying once in every two weeks; 18.3 % of them carried out spraying exercise once in a week and 10.3% of the farmers sprayed only once in a month. This implies that most farmers in the study area sprayed their goats once in two weeks during dry seasons.

4.4.10 Dipping during the wet seasons

The study established how often dairy goat farmers in Kitui West Sub-County dipped their animals during wet seasons. The results are given in Table 4.20.

Table 4. 20. Dipping during wet seasons

Description	Frequency	Percentage
Once in two weeks	1	3.3
Once a month	29	96.7
Total	30	100

Results obtained from the analysis show that most (96.7 %) farmers carried out dipping exercise once in every month while 3.3% only carryout dipping once in every two weeks. This implies that majority of the dairy goat in Kitui West Sub-County dipped their goats once in a month during wet seasons.

4.4.11 Dipping of goats during dry seasons

The study sought to establish the number of times farmers dipped their goats during dry seasons. The results are shown in Table 4.21.

Table 4. 21. Dipping during the dry seasons

Description	Frequency	Percentage
Once in two weeks	30	100
Total	30	100

All farmers (100%) carried out dipping exercise once after two weeks; implying that most of them carried out dipping during dry season only once in two weeks.

4.4.12 Access to a Veterinarian

The study established whether the exotic dairy goat farmers in Kitui west Sub-County had access to a Veterinarian or animal health extension technicians. The results are given in Table 4.22.

Table 4. 22. Access to a Veterinarian

Opinion	Frequency	Percentage
Yes	100	64.1
No	56	35.9
Total	156	100.0

Results obtained from the analysis show that majority (64.1 %) of the farmers had immediate access to Veterinary services whereas 35.9% indicated to have access to Veterinary services. This implies that considerable number of exotic dairy goat farmers in Kitui west Sub-County received prompt Veterinary services at the time of need. Though the others received the services, they accessed when it is already late.

4.4.13 Type of Veterinary Services available to the dairy goat farmers

The study sought to precisely establish whether the farmers had access to Veterinary services and Health Advisors. The results are given in Table 4.23.

Table 4. 23. Type of Veterinary services available to respondents

Services	Frequency	Percentage
Veterinary	74	74
Health Advisors	26	23
Total	100	100

It is clear from the study that, 74 % of the respondents indicated that they have access to Veterinary services while 23% of the respondents indicated that they have access to health advisor's services. This implies that only a small percentage of farmers have access to Veterinary services or health advisor's services.

4.4.14 Control of internal parasites

The research sought to establish whether farmers in Kitui west Sub County controlled internal parasites affecting their livestock. The findings are shown in Table 4.24.

Table 4. 24. Control of internal parasites

Opinion	Frequency	Percentage
Yes	156	100.0
Total	156	100.0

The study findings indicate that respondents control internal parasites which affect their livestock. This implies that a large number of dairy goat farmers in Kitui west Sub -County control internal parasites which affect their livestock.

4.4.15 Injection and drenching of drugs in wet seasons

The study established how dairy goat farmers carried out injection and drenching of drugs in animals during wet seasons. The results are given in Table 4.25.

Table 4. 25. Injection and drenching of drugs in wet seasons

Description	Frequency	Percentage
Once in three months	106	67.9
Once in six months	50	32.1
Total	156	100.0

Results obtained from the analysis show that most (67.9%) farmers as shown by carried out injection and drenching exercise once per three months while 32.1% carried out the exercise once in six months. This implies that most dairy goat farmers in Kitui West Sub-County carried out injection and drenching of drugs of their goats once per three months during wet seasons.

4.4.16 Injection and drenching in Dry seasons

The study established the number of times dairy goat farmers in the study area carried out injection or drenching during dry seasons. The results are given in Table 4.26.

Table 4. 26. Injection and drenching of drugs in Dry seasons

Description	Frequency	Percentage
Once in three months	32	20.5
Once in six months	95	60.9
Once per year	29	18.6
Total	156	100.0

Results obtained from the analysis show that majority (60.9%) of the farmers indicated that they carried out injection and drenching of drugs for worms once in six months, 20.5% of the respondents indicated that they carried out injection and drenching of drugs once in three months while 18.6% of the respondents indicated that they carried-out injection once in six months during the dry seasons

4.4.17 Vaccination of Goats

The research sought to establish whether farmers in Kitui West Sub-County carried out vaccination exercise on their goats. The results are shown in Table 4.27.

Table 4.27. Vaccination of Goats

Description	Frequency	Percentage
Yes	88	56.4
No	68	43.6
Total	156	100.0

Most (56.4 %) farmers carried out vaccination exercise while 43.6% of the farmers did not. This implies that most of the farmers of exotic dairy goats in Kitui West Sub-County carried out vaccination of goats

4.4.18 Diseases prevented through Vaccination

Exotic dairy goat farmers in Kitui West were requested to indicate the diseases they vaccinated their goats against. The findings are given Table 4.28.

Table 4.28. Diseases prevented through Vaccination

Disease	Percentage
CCPP	35.3
Foot and Mouth Disease	49.4
Goat plague (PPR)	42.3
Not known	32.7
Total	100

Most (49 %) exotic dairy goat farmers in Kitui West Sub-County carried out vaccination to prevent Foot and mouth disease. 42.3 % of the farmers indicated that they carried out vaccination in order to prevent goat plague, Peste des Petits Ruminants (PPR), 35.3% of the farmers indicated that they carried out vaccination to prevent Contagious Caprine Pleuropneumonia (CCPP) while 32.7% of the farmers indicated that they carried out vaccination to prevent diseases unknown to them. This implies that farmers carried out vaccination to prevent CCPP, Foot and Mouth Disease, goat plague (PPR) and other diseases.

4.4.19 Number of times which farmers of exotic dairy goats carried out vaccination exercise

The study was conducted to establish how often dairy goat farmers in the study areas carried out vaccination exercise each year. The results are shown in Table 4.29.

Table 4.29. Number of times farmers of exotic dairy goats carried out vaccination exercise

Description	Frequency	Percentage
Twice	12	14.0
Not regular	74	86.0
Total	86	100

From the research findings, 86.0% of the respondents indicated that they did not regularly vaccinate while 14% of the respondents indicated that they vaccinate twice in a year. This implies that most exotic dairy goat farmers do not conduct vaccination exercise in the year.

4.4.20 Common Prevailing diseases affecting farmers' livestock

The study sought to determine the common prevailing diseases affecting farmers' livestock. The results are shown in Table 4.30.

Table 4. 30. Common Prevailing diseases affecting farmers' livestock

Description	Percentage
Foot and Mouth Disease	73.1
Pneumonia	70.5
CCPP	48.1
Helminth	51.9

From the research findings, majority (73.1%) of the respondents indicated Foot and Mouth Disease, 70.5% of the respondents indicated Contagious Caprine Pleuropneumonia(CCPP), 51.9% of the respondents indicated Helminth while 48.1 % of the respondents indicated CCPP are the most commonly encountered livestock diseases affecting dairy goats in the area. This indicates that most common prevailing diseases and parasites affecting dairy goats include; Foot and Mouth Diseases, Pneumonia, Helminths and CCPP.

4.4.21 Record keeping

The research sought to determine whether exotic dairy goat's farmers in Kitui West Sub- County maintained farm records. The results are given in Table 4.31.

Table 4. 31. Record keeping

Description	Frequency	Percentage
Yes	136	87.2
No	20	12.8
Total	156	100.0

Most (87.2%) farmers indicated that they maintained farm records, while only 12.8% who indicated that they did not maintain livestock records. This implies that a large number of exotic dairy goat's farmers in Kitui West Sub-County keep livestock farm records.

4.4.22 Type of records maintained by the farmer

The study sought to find out the types of records maintained by exotic dairy goat farmers in Kitui West Sub-County. The results are indicated in Table 4.32.

Table 4. 32. Type of records maintained by the farmer

Records	Percentage
Production records	64.1
reproductive records	62.2
Treatment records	49.4
Purchase and sales records	53.2
Feeds records	67.3
Total	100

Most (67.3%) respondents indicated that they keep feed records, 64.1% of the farmers indicated that they keep production records, 62.2% of the farmers indicated that they keep reproductive records, 53.2% of the farmers indicated that they keep purchase and sales records and 49.4% of the farmers indicated that they keep treatment records. This implies that most dairy goat farmers keep production records, reproductive records, treatment records, purchase and sales records and feeds records.

4.4.23 Reasons why farmers never kept records

On reasons as to why farmers never kept records, the study established that some of the respondents lacked or had inadequate record keeping skills while others had the skills and knowledge but ignored to keep records with a strong presumption that they were progressing well with the dairy goat enterprise.

4.4.24 Period of rearing exotic dairy goats farming in your farm

Investigation on period which farmers have been practising exotic dairy goats farming in their farms showed that most of the farmers had been in the practice for not less than 5 years.

4.4.25 Training on dairy goats breeding Management

From the study, the researcher was able to establish the trainings farmers had received on dairy goats breeding, management as indicated in Table 4.33.

Table 4. 33. Training on dairy goats breeding management

Opinion	Frequency	Percentage
Yes	112	71.8
No	44	28.2
Total	156	100

Majority (71. 8%) of the dairy goat farmers had received training on dairy goats breeding management. While only 28.2% indicated to have not received training on dairy goats breeding management. This implies that a considerable number of dairy goat farmers in Kitui West Sub-County had not received training on dairy goats breeding management.

4.4.26 Means of getting the breeding bucks for mating

The study sought to establish the means through which farmers acquired the breeding bucks for mating. The results are shown in Table 4.34.

Table 4. 34. Means of getting the breeding bucks for mating

	Frequency	Percentage
Hired	21	13.5
Own	90	57.7
Dairy goat project	45	28.8
Total	156	100

Majority (57.7%) of the respondents indicated that they used their own breeding bucks for mating 28.8% of the respondents indicated that they used dairy goat project breeding bucks for mating, while 13.5% of the respondents indicated that they used hired breeding bucks for mating, this implies that most of the farmers either acquired the breeding bucks for mating through hiring, or from dairy goat project or from their own farm

4.4.27 Types of dairy goat breeds kept by the farmer

The study sought to establish the types of dairy goat breeds kept by farmers in the study area. The results are shown in Table 4.35.

Table 4. 32. Types of dairy goat breeds kept by the farmer

Breeds	Percentage
Indigenous	73.1
Toggenburg	72.4
Saanen	42.3
Kenya alpine	60.9

Investigations on types of dairy goat breeds kept by the farmer showed that 73.1 % of the farmers kept indigenous breeds, 72.4% of them kept Toggenburg breeds, 60.9% of them raised Kenya Alpine breed while 42.3% kept Saanen breed. This implied that majority of the farmers in Kitui West Sub- County kept various goat breeds including indigenous goats, Toggenburg, Saanen and Kenya Alpine.

4.4.28 Number of Breeding Bucks

The research sought to determine the number of breeding bucks kept by dairy goat farmers. The results are given in Table 4.36.

Table 4. 36. Number of Breeding Bucks

Number	Frequency	Percentage
One	104	66.7
Two	52	33.3
Total	156	100.0

Most (66.7%) respondents indicated that they kept one breeding bucks while 33.3% indicated that they kept two breeding bucks. This shows that majority of the farmers kept either one or two breeding bucks

4.4.29 Number of Does kept by dairy goat farmers

The research sought to determine number of Does kept by a dairy goat farmer. The results are shown in Table 4.37.

Table 4. 37. Number of Does kept by the farmer

Number	Frequency	Percentage
Less than 3	25	16.0
3 to 6	63	40.4
7 to 9	68	43.6
Total	156	100.0

The study indicated that, 43.6% of farmers interviewed kept between 7 and 9 Does, 40.4% of the respondents indicated that they kept 3 to 6 Does, while 16.0% of them indicated that they kept less than 3 Does. This implies that most farmers kept between 7 and 9 weaned Does.

4.4.30 Number of Weaned Males kept by the farmer

The research sought to determine number of weaned males kept by a farmer. The results are shown in Table 4.38.

Table 4.38. Number of Weaned Males kept by the farmer

Number	Frequency	Percentage
Less than 3	72	46.2
3 to 6	84	53.8
Total	156	100.0

Most (53.8%) respondents indicated that they keep between 3 and 6 weaned males, while 46.2% of them keep less than 3 weaned males. This implies that most dairy goat farmers keep 3 and 6 weaned males.

4.4.31 Number of Weaned females kept by the farmer

The research sought to determine the number of weaned females kept farmers. The results are shown in Table 4.39.

Table 4. 39 Number of Weaned females kept by the farmer

Number of weaned females	Frequency	Percentage
Less than 3	47	30.1
3 to 6	27	17.3
7 to 9	82	52.6
Total	156	100.0

Most(52.6%) respondents indicated that they keep between 7 and 9 weaned females, 30.1% of the respondents indicated that they keep less than 3 weaned females while 17.3% of them keep 3 to 6 weaned females. This implies that most of the respondents keep 7 to 9 weaned females.

4.4.32 Number of kids kept by the farmer

The research sought to determines the number of kids kept by the farmer. The results are shown in Table 4.40.

Table 4. 40. Number of kids kept by the farmer

Number	Frequency	Percentage
Less than 3	95	60.9
3 to 6	61	39.1
Total	156	100.0

Most (60.9%) respondents keep less than 3 kids while 39.1% of the respondents indicated that they keep 3 to 6 kids. This implies that most of the respondents keep less than 3 kids. The results are provided in Table 4.40.

4.4.33 Tasks of taking care of the goats

The study sought to establish who in the household or family spent much of his or her time looking after the goats. The results are given in Table 4.41

Table 4. 41 Tasks of taking care of the goats

Description	Frequency	Percentage
Children	83	53.2
Wife	27	17.3
Husband	30	19.2
House helpers	16	10.3
Total	156	100.0

The results show that in most families the responsibility of taking care of goats is as follows, 53.2% of respondents indicated that the task was done by children, 19.2% of the respondents indicated the responsibility of taking care of goats was done by the husband, 17.3% of the respondents indicated the wife while 10.3 % of respondents indicated house helpers. This finding is a clear pointer that responsibility of taking care of goats was commonly tasked to children in most families or households. There is therefore need to further establish if indeed this affects and infringes on the rights of children in the study area.

4.4.34. Reasons influencing expansion of exotic dairy goats farming

It is clear from the study findings that some farmers were not willing to increase their dairy herd because the local butchers were unwilling to purchase exotic dairy goats but instead preferred the indigenous breeds of goats. Other farmers indicated that exotic goats were costly to maintain than local breeds. The other contributory factors included inadequate funds, unstable livestock market for milk and limited land for grazing. These factors were the major constraints which limited the practice. From the qualitative analysis, rearing dairy goat for meat was not popular in the majority of the residents in Kitui West Sub-County because the meat had some unpalatable smell and not as delicious as the one from the indigenous reared breeds of goats.

4.5 Economic Factors

4.5.1 Farm size in acres

Farmers were requested to indicate the size of their farms. The results are shown in Table 4.42.

Table 4. 42. Farm size in acres

Farm Size in acres	Frequency	Percentage
0-1	21	13.5
2-5	38	24.4
6-9	65	41.7
10 and above	32	20.5
Total	156	100.0

Most (41.7%) farmers owned between 6 and 9 acres of land, 24.4% of them owned between 2 and 5 acres, 20.5% of them owned 10 acres and above while 13.5% of the farmers owned between 0 and 1 acre of land. This implies that majority of the dairy goat famers owned between 6 and 9 acres of land.

4.5.2 Quantity of milk in liters received per goat per lactation

The study investigated the amount of milk received from goats per lactation and the findings are given in Table 4.43

Table 4. 43. Quantity of milk in litres received per goat per lactation

Description	Frequency	Percentage
5-10 litres	103	66.0
15-20 litres	53	34.0
Total	156	100.0

Most (66.0%) respondents indicated that they received between 5 and 10 litres of milk while 34.0% of them received 15 to 20 litres of milk This implies that most of the farmers received between 5 and 10 litres of milk per goat per lactation.

4.5.3 Cost incurred on raising dairy goats

Table 4.44 shows the cost incurred on raising dairy goats in Kitui West-Sub County.

Table 4. 44 Cost incurred on raising dairy goats

Item	Average Price per month in shillings	Average Price per year in shillings
Drugs	356	1053
Dipping and spraying	199	1176
Labour cost	3513	13311
Feed costs (concentrate)	1396	7052
Mineral block	171	140
Hiring breeding male	198	679
Construction cost	1953	787
Goat house repair cost	924	364
Veterinary extension services	441	1999

According to research findings, the average cost incurred by farmers on purchase of drugs was ksh 356 per month and ksh 1053 per year. Dipping and spraying cost was ksh 199 per month and ksh 1176 per year while labour cost was ksh 3513 per month and ksh 13311 per year. The cost of feeds (concentrates) was ksh 1396 per month and ksh 7052 per year. The cost of mineral block was ksh 171 per month and an average of ksh 140 per year while breeding male was hired at a cost of ksh 198 per month and an average of 679 per year. Construction cost was ksh 1953 per month and an average of ksh 787 per year. Farmers spent ksh 924 per month and an average of ksh 364 per year to repair goats' house and finally the Veterinary extension services cost was ksh 441 per month and an average of ksh 1999 per year.

4.5.4 Income obtained from sales of goats per year

The results given in Table 4.45 outline the number of goats sold by farmers in a given year.

Table 4. 45. Income obtained from sale of goats per year

Description	Male		Female	
	Number	Price(Ksh)	Number	Price Price(Ksh)
Kids	2	1545	2	1764
Growers	2	5294	2	10800
Adults	2	8509	2	8383

The study revealed that most farmers sold an average of 2 male Kids at an average cost of Ksh. 1545 and 2 female Kids costing 1764 in the last one year. Most farmers sold an average of 2 male growers at an average price of Ksh. 5294 and an average of 2 female growers at an average cost of ksh. 10800 in the last one year. Most of them sold an average of 2 male adults at an average price of Ksh. 8509 and an average of 2 female adults at an average price of ksh. 8383 in the last one year.

4.5.5 Number of does, milk produced price per litre quantity of milk sold daily monthly and yearly

Table 4.46 shows the average number of does, milk produced, price per litre, quantity of milk sold daily, monthly and yearly.

Table 4.46 Number of does, milk produced price per litre quantity of milk sold daily monthly and yearly

Number of Does milked (aggregate value)	Price per litre of milk in ksh (aggregated value)	Sales per (aggregated value)	Total sales per month (aggregated value) in ksh	Total sales per year (aggregated value) in ksh
2	56	44	2470	29637

The findings show that on average, farmers milked 2 Does daily. The average price of milk per liter was ksh 56, and on average farmers sold 44 liters of milk each month. The average milk sold monthly and annually was ksh 2470 and ksh 29637 respectively.

4.5.6 Milk consumed by the household

Table 4.47 shows the average quantity of milk consumed by household's daily, monthly and annual basis.

Table 4. 47. Milk consumed by the household

Description	Litres per day	Litres per month	Litres per year
Average number	1	33	401

The findings show that, on average most of the households' milk consumption was 33 liters per month.

4.5.7 Source of market information for the farmers

Respondents were requested to indicate how they accessed market information. The results are given in Table 4.48.

Table 4. 48. Source of market information for the farmers

Description	Percentage
Radio	71.8
Extension agents	73.7
Fellow farmers	74.4
Local leaders	66.0
Total	100

Most (74.4%) exotic dairy goat farmers received market information from fellow farmers, 73.7% of them relied on extension agents for market information, and 71.8% relied on radio for market information, while 66.0% relied on local leaders for market information. This implies that most farmers relied on radio, extension agents, fellow farmers, and local leaders as sources of market information.

4.5.8 Alternative sources of income

Farmers were requested to indicate the alternative source(s) of income apart from dairy farming. The results are given in Table 4.49.

Table 4. 49. Alternative sources of income

Description	Percentage
Crop farming	91.7
Business	62.8
casual labour	74.4
Total	100

Most (91.7%) respondents indicated crop farming, 74.4% indicated casual labour while 62.8 % of the respondents indicated business activities as an alternative source of income. This implies that, apart from dairy goat farming, farmers relied on crop farming, business and casual labour as an alternative source(s) of income. Table 4.50 gives results of the highest source of income.

Table 4. 50. Highest source of income

Description	Frequency	Percentage
Dairy goat farming	84	53.8
Crop farming	19	12.2
Business	53	34.0
Total	156	100.0

Most (53.8%) farmers indicated dairy goat farming as the highest source of income, 34.0% of the respondents indicated business, 12.2% of the respondents indicated crop farming. This implies that crop farming presented the highest source of income to most farmers.

4.5.9 Milking period

The research sought to establish the number of months which farmers milked their Doe's after kidding. The results are given in Table 4.51.

Table 4. 51. Milking period

Months	Frequency	Percentage
3	30	19.2
4	58	37.2
5	38	24.4
6	30	19.2
Total	156	100.0

Most (37.2%) farmers milked their dairy goats for a period of 4 months, 24.4% of them milked for a period of 5 months while 19.2% of the respondents indicated that they milked their goats for either 3 or 6 months. This implies that majority of the farmers milked their does for a period of 4 months after kidding.

4.6. Correlation Table

Pearson Correlation analysis was conducted after the descriptive analysis and indicated a linear or true association or correlation between the explanatory variables and the predicted variables or among the latter. This was crucial in this study as it helped to determine the strengths of the association or correlation in the model. The findings are given in Table 4.52.

Table 4.52. Correlation Results

		Adoption of exotic Dairy goat farming	Social demographic factors	Local community leadership	Farm management skills	Economic factors
Adoption of exotic dairy goat farming	Correlation Coefficient	1.000				
	Sig. (1-tailed)	–				
Social demographic factors	Correlation Coefficient	0.333	1.000			
	Sig. (1-tailed)	0.001	–			
Local community leadership	Correlation Coefficient	0.911	0.112	1.000		
	Sig. (1-tailed)	0.003	0.001	–		
Farm management skills	Correlation Coefficient	0.872	0.027	0.046	1.000	
	Sig. (1-tailed)	0.002	0.000	0.001	–	
Economic factors	Correlation Coefficient	0.044	0.001	0.008	0.124	1.000
	Sig. (1-tailed)	0.000	0.003	0.001	0.000	–

A Pearson moment Correlation was conducted by the researcher and the findings indicate that:

There was a weak positive correlation between adoption or uptake of exotic dairy goats farming and socio-demographic factors with a correlation coefficient of 0.333. This relationship is statistically significant with a value of 0.001 that is exceeded by 0.05. With regard to this

association, socio-demographic factors had some significance in the uptake of the dairy goats though with some households.

There was a strong positive correlation between adoption or uptake of exotic dairy goats farming by farmers and the local community leadership with a correlation coefficient of 0.911 at 0.003 level of confidence or statistical significance below 0.05. Local leaders and group management is paramount for the uptake and good management of the improved dairy goats in Kitui West Sub-County. In some instances leaders are relied upon for information relating management of dairy goats

The study also established a strong positive correlation between adoption or uptake of exotic dairy goat farming and farm management skills with a correlation coefficient of 0.872 at 0.002 level of confidence or statistical significance. Therefore for this case farmers with limited dairy goat husbandry skills may not be able to gain optimum gains from exotic dairy goat enterprise since poor management would lead to low productivity and inadequate income to sustain household socio-economic needs. Farmers with adequate formal education have a higher ability to adopt and practice new innovations for economic gain.

There was a strong negative correlation between the adoption or uptake of exotic dairy goats farming and economic factors with a correlation coefficient of 0.04 at 0.000 level of confidence. With weak financial capacity, farmers may not be able to offer quality management of dairy goats and this may result in poor performance and yields

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter gives a summary of the study findings, discussion of the findings, conclusions and recommendations of the study on factors influencing the uptake of exotic dairy goats farming among small holder farmers in Kitui West Sub- County. The research was guided by four objectives of the study..

5.2 Summary of the Findings

A summary of the study findings are given below.

5.2.1 Effects of socio-demographic factors influencing the uptake of Exotic dairy goats

Most (32.1 %) exotic dairy goat farmers aged between 30 to 39 years with 31.4 % were aged between 40 to 49 years old, while majority (60.9%) of the farmers were females. A good number (60.9%) of farmers had acquired at least a certificate in their training. The study established that most (75.0%) farmers concurred that cultural background hindered them from effectively engaging in exotic dairy goats farming in Kitui west Sub-County. However, 25 % of the farmers never held the same opinion. It emerged from the study that exotic dairy goats cannot do well in arid conditions and this notion is delimiting adoption or uptake of the exotic breeds in the Sub-County.

5.2.2. The role of local community leadership on uptake of dairy goats

According to the study, most respondents were members of local community groups as shown by a response rate of 87.6%. This implies that most respondents were members of community organized groups.

It clearly emerged from the research that majority (76.6%) of the farmers belonged to a legally registered group like the dairy goat's association or group whereas 24.4% had not registered with any group. This implies that majority of the exotic dairy goat's famers in Kitui West Sub - County were registered with dairy goat's association or group.

The study noted that community leadership enhanced information sharing as shown by 72.4%. Community leadership promoted linkage to partners as shown by 64.1% and that respondents

also agreed that community leadership organized meetings with extension officers for the benefit of the farmers as indicated by 50% of the respondents. This finding confirms Forsyth (2011) argument that effective leadership stimulates commitment and attracts membership by its appeal besides organizing and directing group processes under various conditions.

5.2.3. The influence of farm Management Practices on the uptake of exotic dairy goats farming

Most (57.7 %) farmers in Kitui West Sub-County have been practising exotic dairy goats farming for more than 5 years, while 23.1% of the farmers have been keeping the breeds of goats for the last 2 to 4 years and only 19.2% have kept dairy goats for less than a year.

The study further showed that majority (79.5 %) of the respondents had received training on dairy goat's husbandry while only 20.5% indicated to have not received any form of training. This implies that majority of the dairy goat farmers in Kitui west sub- county had received training on dairy goat's husbandry. Key areas covered in the training include breeding management, feeding and feed management and production.

Tethering method of rearing dairy goats is most common method used in the Sub-County (50.0%). From the research findings, 50.0% of the farmers indicated that they used tethering method and 36.5% of the farmers indicated that they used free grazing while 13.5% of the farmers indicated that they used zero grazing. This therefore signify that dairy goat farmers in Kitui West Sub-County had adopted zero grazing, tethering method and free grazing of exotic dairy goats

Majority (83.3%) of the respondents used maize bran alone, while 82.7% of them used crop residue and 71.8% of the respondents indicated that they used sunflower seed cake and maize bran. Those using green fodder were 67.3% of the respondents in Kitui west-Sub county included the combination of sunflower seed cake and maize bran, maize bran alone, crop residue, green fodder, hay, combination of cotton seed cake and maize bran.

Results obtained from the analysis show that most (52.6 %) farmers watered their exotic dairy goats once a day and 35.9% of the farmers watered their goats twice a day while 11.5 % of the farmers watered theirs once in the afternoons implying that they provided water to their goats once per day. Control of external parasites is practised by all farmers (100%) in the Sub County.

Disease control against Foot and Mouth Disease (42.3 %), PPR (35.3%) through vaccination is practised by exotic dairy goat farmers.

5.2.4. Economic Factors influencing uptake of exotic dairy goats

A total of 41.7% of the farmers owned between 6 to 9 acres of land, 24.4% owned between 2 to 5 acres of land, 20.5% of them owned 10 acres and above while 13.5% of the farmers owned between 0 to 1 acre of land. This implies that most (41.7 %) of exotic dairy goat farmers owned between 6 to 9 acres of land and hence had adequate land which is an important factor of productivity. This is confirmed by Ozden (2007) whose study established that the size of the farm and labour directly increases the total factor productivity (TFP).

Most (66.0%) farmers interviewed confirmed receiving 5 to 10 litres while 34.0% of them indicated they received between 15 to 20litres. A number of farmers sold an average of 2 kids in a year as revealed by the study.

Majority (74.4%) of the farmers received market information from fellow farmers while 73.7% of them relied on extension officers for market information, and 71.8% relied on radio for market information, whereas 66.0% relied on local leaders for market information. This implies that most farmers relied on radio, extension officers, fellow farmers, and local leaders as sources of market information. From the study, the highest alternative source of income is crop farming (91.7%) while the highest source of income is dairy goats (53.8 %).

5.3 Discussions

A discussion of findings of the study is given below and is guided by the research objectives.

5.3.1 Socio-demographic factors influencing uptake of dairy goats

The study revealed that community organizational culture, farmers' individual level of education, role of women and men in the society, quantity of land owned, climatic factors and belief system all influenced the uptake of dairy goats in Kitui West Sub-County. The study noted that most women in Kitui West Sub-County were occupied by other household chores which could not allow them to attend training on dairy goats farming which limited adoption of the practices. These findings are also supported by a study by Bulale (2000) who established that age is inversely proportional to adoption of dairy farming.

From the study, the level of willingness by farmers to take up and sustain dairy goats farming in Kitui West Sub-County was determined by the level of education acquired by the respective

farmers. However it emerged from the focus group discussions and the key informant interviews that, the level of acceptability by older farmers with little education was relatively low despite having received adequate education on dairy goat farming. Farmers with formal education were more receptive though would still be affected by socio-cultural issues that dominate the area concerning the rearing of dairy goats. This is supported by Degnet and Belay (2001) who argued that socio-cultural factors may in a way influence a farmer who has acquired education from either adopting or not adopting a new technology.

Educated household heads, both males and females have high capability of investing in dairy goat farming with both parties having equal access and control of livestock resources. However, families with adequate education found it sensible to increase consumption of dairy goat products at the same time investing heavily on the enterprise.

However, it is worth noting that, most households in the study area have skewed access and control of livestock and land resources but in favour of men. According to Shumaker (2014), husbands and wives have a say over the use of resources but inequality will always be there in terms of level of needs satisfaction achieved by both. From the study males were found to control resources in the households and influence farming decision-making due to the view that they had more access to information, extension and credit services than females.

5.3.2 Role of local community leadership on uptake of dairy goats

The study established that local community leadership influenced the uptake of dairy goats farming in Kitui West Sub-County. Local leadership influenced farmers' attitudes, perceptions, and behaviour, effective leadership stimulates commitment and attracted membership on community development groups. Strong local community leadership was important in linking farmers to social economic stimulants, overseeing smooth implementation of every social economic practice that promoted the welfare of community serves as one of the channels and sources of information for the dairy goat farmers. According to Davis (2004), local community barazas (22%) are sources of market information for dairy goat farmers.

5.3.3 Influence of management practices on uptake of dairy goats farming

The study revealed that majority of dairy goat farmers in Kitui West Sub County had received training on dairy goats' husbandry and or management. Among the topics covered includes breeding management, feeding management and production management. Dairy goat farmers in Kitui west Sub County had adopted zero grazing, tethering method or free grazing method in

rearing of exotic dairy goats. Among the types of animal supplements used by exotic dairy farmers' in Kitui West sub county included the combination of sunflower seed cake and maize bran, maize bran alone, crop residue, green fodder, hay, combination of Cotton seed cake and maize bran, farmers watered their goats once after two this implies that provided water to their goats' once per day

Regular dipping or spraying of dairy goats against diseases is a good means of diseases control. Most exotic dairy goats farmers in Kitui west Sub County sprayed their goats once per month during the rainy seasons and once per two weeks during dry spell, most of the farmers of exotic dairy goats in Kitui west Sub County dipped their goats once in a month during the wet seasons and once after two weeks during the dry seasons. A considerable number of exotic dairy goats in Kitui west Sub-County have no immediate access to Veterinary services save for a small percentage of farmers with access to Veterinary services or health advisor's services. A considerable number of dairy goat's farmers in Kitui west Sub County controlled internal parasites affecting their livestock. Most farmers of exotic dairy goats in Kitui west Sub County carried out injection and drenching of drugs on their goats once every three months during the wet seasons

Most exotic dairy goat farmers in Kitui west Sub County carried out injection and drenching of drugs on their goats once per six months during the dry seasons, farmers carried out vaccination to prevent CCPP, Foot and Mouth Disease, goat plague (PPR) and other diseases unknown to them. Common diseases that affect dairy goats include Foot and Mouth Disease, Pneumonia, Helminth and CCPP. Most farmers kept production records, reproductive records, treatment records, purchase and sales records and feed records. The study established that some of the respondents lacked record keeping skills, others were presumed to know the progress of their goats effectively. A considerable number of dairy goat farmers in Kitui west Sub-County had not received training on dairy goats breeding management, farmers either acquired the breeding bucks for mating through hiring, or from dairy goat project or from their own farms.

The study established that farmers' in Kitui West Sub County kept various goat breeds including indigenous goats, Toggenburg, Saanen and Kenya Alpine, majority of the farmers kept either one or two breeding bucks, 7 to 9 weaned does, 3 to 6 weaned males 7 to 9 weaned females, and Less than 3 kids, in most families. The responsibility of taking care of goats was commonly tasked to children. Farmers indicated that they were unwilling to expand dairy goat farming, for reasons

that local butchers were unwilling to purchase exotic goats but instead preferring the local breeds, others indicated that exotic goats were costly to maintain than local breeds, lack of funds, lack of sufficient milk for the market and lack of land for grazing, were also indicated as a major constrain that limited the practice.

However, some of the farmers were willing to expand their farms, indicating that the practice was highly profitable compared to other forms of agricultural practices in the area and offers employment to many local women in the society, both socially and economically. The study also noted that the practice highly contributed positively towards food security in Mutonguni location in Kitui West Sub County. The results agree with Progressive Agribusiness Magazine Edition 005 of May and June, 2011, which pointed out that the introduction of dairy goats in Mutonguni location of Kitui West Sub County has served as a poverty reduction strategy and this strategy should be promoted in other areas as it is one of the best practice.

5.3.4 Economic Factors Influencing the Uptake of Dairy Goats Farming

The research revealed that most exotic dairy goat farmers owned between 6 to 9 acres of land. Most of them received between 5 and 10 litres of milk per goat per lactation. On average, the cost incurred by the farmers on drugs was ksh 356 per month and ksh 1053 per year. Dipping and spraying cost was ksh 199 per month and ksh 1176 per year while labour cost was ksh 3513 per month and ksh 13311 per year. Feed (concentrate) cost ksh 1396 per month and ksh 7052 per year. Mineral block cost was ksh 171 per month and an average of ksh 140 per year while cost of hiring breeding male was ksh 198 per month and an average of ksh 679 per year. Construction cost was ksh 1953 per month and an average of ksh 787 per year. Goat house repair cost was ksh 924 per month and an average of ksh 364 per year and finally the cost of Veterinary extension services was ksh 441 per month and an average of ksh 1999 per year.

The study also revealed that most of the farmers sold an average 2 male Kids at a cost of Ksh 1545 and average 2 female Kids costing 1764 in the last one year. Most of the farmers sold an average of 2 male growers at an average price of Ksh 5294 and an average of 2 female growers costing an average of Ksh 10800 in the last one year. Most farmers sold an average of 2 male adults costing an average price of Ksh 8509 and an average 2 female adults costing an average price of ksh 8383 in the last one year.

The study revealed that on average farmers milked 2 does daily, with the average price of milk per liter being ksh 56. On average, farmers sold 44 liters of milk each month, earning ksh 2470 and the average milk sold annually was ksh 29637. On average most of the households consumed 33 liters of milk on monthly basis.

Farmers relied on radio, extension agents, fellow farmers and local leaders as sources of market information. Apart from dairy farming farmers relied on crop farming, business and casual labour as alternative source(s) of income. Crop farming presented the highest source of income to most of the farmers who engage in mixed subsistence farming; and that majority of the farmers milked their does for a period of 4 months after kidding. These findings are in agreement with Nolte (2016) report which notes that goats' milk begins to level after two months milking and up to 4 months in lactation.

5.4 Conclusion

It was concluded that socio-demographic factors influenced the uptake of dairy goats farming in Kitui West Sub-County. Cultural myths which surround the improved dairy goats in the region were found to be some of the setbacks in the adoption or uptake of exotic dairy farming in Kitui West Sub-County.

Age factor has been found to play a key role in terms of acceptability and application of sound management practices when handling dairy goat enterprise with the old being slow to adopt improved breeds of goats. This exacerbated the uptake since most development organizations, both public and private in Kitui West Sub-County targeted the most vulnerable who comprises the old or the aged where many resources were invested on them but with very minimal impact in terms of transformational development.

Older farmers in Kitui west Sub County were less willing to change farm management practices, to young and middle level farmers who have acquired education and adequate agricultural extension services.

Local community leadership was shown to influence the uptake of dairy goats farming in Kitui West Sub-County. Local leadership influenced farmers' attitudes, perceptions, and behaviour. Effective leadership stimulates commitment and attracted membership on community development groups. Strong local community leadership was important in linking farmers to

social economic stimulants, overseeing smooth implementation of every social economic development that promote the welfare of community members in general.

Farmers' management practices also influenced the uptake of dairy goats farming in Kitui west Sub-County. Inadequate knowledge and skills in record keeping, lack of modern farming skills especially in dairy farming delimited uptake of dairy goats farming in Kitui West Sub-County. The study also concluded that lack of access to livestock extension services negatively influenced the adoption of dairy goats farming in Kitui West Sub-County.

Economic factors were also shown to influence the uptake of exotic dairy goats farming in Kitui West Sub County. Market outlet, lack of funds, inadequate milk for marketing and inadequate land for grazing, have had negative influence on farmers' decision to adopt dairy goats farming in Kitui West Sub-County. Strong civilization on negative attitudes and believes towards dairy farming is important as this will significantly encourage farmers and promote uptake of the dairy enterprise in the area.

From the Pearson moment correlation, there was a weak positive correlation between the uptake of dairy goats farming and socio-demographic factors with a correlation coefficient of 0.333. This strong relationship is statistically significant with a value of 0.001 that is exceeded by 0.05. Therefore, socio-cultural factors play a fairly significant role in influencing the uptake of the livestock enterprise in the area as is the case with managerial skills among the dairy goat farmers who may require more training.

This study contributes significantly to the solutions on the problems of adoption of exotic dairy goat farming among smallholder farmers in Kitui West Sub-County. The findings of the study are useful in planning for enhanced milk production and household income and thus improve the standard of living among the smallholder farmer households. The study concluded that economic factors influenced the uptake of dairy goats farming in Kitui West Sub-County. However, market outlet, lack of funds, lack of sufficient market for milk and inadequate land for grazing, had a negative influence on farmers' decision to adopt dairy goats farming in the sub-County. The study suggested that all the NGOs pushing the change need to enhance measures that promote awareness on the relevance of the improved dairy goats farming.

5.5 Recommendations

The following recommendations were made from the study:

1. The study suggests that all the NGOs pushing for the change need to enhance measures that promote awareness on relevance of dairy goats farming in order to promote the adoption of dairy goat farming in Kitui County.
2. The study advocates for strong community leadership policies. Strong leadership will create a smooth path for implementation of change initiatives that endeavour to uplift the social economic welfare of the community.
3. The study also advocates for comprehensive training on dairy goat farming practices as most farmers were found to be non-conversant with the internal goat farming practices. Training on record keeping and agribusiness management skills is an important primary measure towards adoption of dairy goats
4. The County Government should work closely with community groups in order to foster a relation that promotes motivation and encourage participation in social economic activities. Such measures may include setting up of business incubators, sources of markets for farm produce, and favourable trade policies.
5. There is a need to address socio-cultural myths of the community concerning exotic dairy goats in order to encourage farmers to improve dairy goat uptake and improve farmers' income and livelihoods.
6. The Ministry of Agriculture, Livestock and Fisheries Development should deploy more Agricultural Extension Officers in Kitui West Sub-County as there are few officers who are faced with heavy workload and there are many farmers who would like to adopt dairy goat farming practice.
7. Organizational capacity assessment of dairy goat farmers groups should be conducted in order to establish capacity gaps and training of farmers.
8. The Kitui County government should work closely with community groups in order to foster relationships which promote motivation and encourage social economic activities.

5.6 Suggestions for further Study

The following areas should be studied in order to address some of the impediments affecting the uptake of exotic dairy goats farming among smallholder rural farmers.

1. An in-depth analysis of socio-cultural factors limiting exotic dairy goats farming and marketing in Kitui West Sub-County should be conducted.
2. A study should be conducted on issues affecting performance of dairy goat farmers groups in Kitui West Sub-County since the the study revealed that most (86.7%) of the respondents are registered with Self-help Groups.
3. A study should be done in order to investigate the impact of dairy goats farming on the young children engaged in taking care of the goats as findings show children are tasked with care of goats at household level.

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APPENDICES

APPENDIX 1. LETTER OF TRANSMITTAL

Bwanawoy Philemon

P. O. Box 710-30100

Eldoret

To.....

Dear Sir and Madam

I am a student at the University of Nairobi and I am carrying out a research study as requirement for the award of Master of Arts Degree in Project planning and Management.

I am conducting a survey with the purpose of gathering information on “The factors influencing the uptake of exotic dairy goats in Kitui West Sub-County, Kitui County”.

You have been selected to assist in providing the required information as your views and ideas are considered important in this study.

I am kindly requesting you to fill this questionnaire. The information and data required is needed solely for academic purposes and will be treated with confidentiality.

Your cooperation and participation was highly appreciated

Thank you.

Yours faithfully

Bwanawoy K. Philemon

Reg. L50/70168/2013

APPENDIX 2. QUESTIONNAIRE FOR EXOTIC DAIRY GOAT FARMERS

Instructions

Fill the questionnaire by putting a tick \sqrt in the appropriate box or by writing your response in the spaces provided.

Part A. Socio-Demographic Factors

1. Please indicate your age in years.
a. 20-29 b. 30-39 c. 40-49 d. 50 and above
2. Kindly indicate your Gender.
a. Male b. Female
3. What is your highest level of education?
a. Certificate b. Diploma c. Degree
d. Masters and above e. Not schooled
4. What is your marital status?
a. Married b. Single c. Widow d. Widower
e. Any other, specify _____
5. What is your household size? _____
6. Does your cultural background hinder from engaging effectively in dairy goats farming?
a. Yes b. No

Briefly explain _____

Part B. Local Community Leadership

7. Are you a member of an organized group? a. Yes b. No
8. Is your group registered with any dairy goats association?
a. Yes b. No
9. What benefits do you receive from the association stated above?

10. How do you benefit from the local community leadership in your area?
a. Information sharing b. Meetings of extension officers organized
c. Linkage to partners d. None

Part C. Farm Management Practices

11. For how long have you been practising dairy goats farming in your farm? Please write down in the space provided_____

12. Have you received any training on dairy goats husbandry or management?

- a. Yes b. No

Give two topics on dairy goats farming your extension officer has trained you or shared with you_____

13. How do you feed your dairy goats? (Tick appropriately)

- a. Zero grazing b. Tethering c. Free grazing

d. Others, specify _____

14. Do you supplement your animal feeds? a. Yes b. No

Which of the following feeds or supplements do you feed your goats?

- a. Sunflower seed cake b. Maize bran c. Crop residue d. Green fodder e. Hay g. Maize bran Others specify

15. How often do your goats drink water? (tick appropriately)

a. Once per day

b. once in every two days

c. Twice a day

d. Once in two days

e. Ad- libitum

f. Others specify _____

16. Do you control external parasites in your goats? If yes which method do you use?

(Tick appropriately). a. Yes b. No

Which of the following control methods do you apply in wet season and dry season and how often do you do it?

Spraying:

Wet season

Once per week b. Once in two weeks c. Once per month

Dry season

a. Once per week b. Once in two weeks c. Once per month

Dipping []

Wet season []

a. Once a week [] b. Once in two weeks [] c. Once per month []

Dry season.

a. Once per week [] b. Once in two weeks [] c. Once per month []

Traditional medicine. a. Yes [] b. None []

17. Do you have access to a Veterinarian or other dairy goat health advisors?

a. Yes [] b. No []

18. Do you control external parasites affecting your goats? a. Yes [] b. None []

If yes above, specify: a. Veterinarian [] b. Health Advisors c. None []

19. Do you control internal parasites? a. Yes [] b. None []

Injection and drenching of drugs during wet and dry season.

Wet season

a. Once in three months [] b. Once every six months [] c. Once a year []

Dry season

a. Once in three months [] b. Once every six months [] c. Once per year []

Do you use traditional medicine to control parasites? a. Yes [] b. No []

20. Do you vaccinate your goats? a. Yes [] b. No []

i. Against which disease(s) do you vaccinate your goats?

a. CCPP [] b. Foot and Mouth Disease []

c. Goat plague (PPR) [] d. Not known []

ii. How many times per year do you vaccinate your goats? a. Once [] b.

Twice []

21. What other diseases prevail on your flock?(tick appropriately)

a. Foot and mouth Disease [] b. Pneumonia [] c. CCPP []

d. Helminths [] e. Others, specify [] _____

22. What kind of records do you keep in your farm?

- a. Production records b. Reproduction records Treatment records
- d. Purchase and Sales records e. Feed records f. Others specify
23. How long have you been practising exotic dairy goats farming in your farm?
- a. 1 year b. 1-2 years c. 3 – 5 years d. 6-8 years e. Above 8 years
24. Have you received any training on dairy goats breeding management?
- a. Yes dairy goats husbandry b. No
25. Where do you get breeding bucks for mating in your farm? (Tick appropriately).
- a. Hired b. Own c. Dairy goat project d. Other, specify _
26. i.) Which dairy goat breeds do you keep? (Tick appropriately).
- a. Indigenous b. Toggenburg c. Saanen
- d. Kenya alpine e. Not known f. Others specify _____
- ii.) Number of goats kept.
- a. Breeding Bucks _____
- b. Does _____
- c. Weaned Males _____
- d. Weaned Females _____
- e. Kids _____
27. How do the members of your family split the tasks of taking care of the goats? _____
28. Which member of the family spends most time taking care of goats?
- a. Husband b. Wife c. Children d. Others, specify,
29. Do you hope to expand and keep more dairy goats? a. Yes b. No
- If you do not intend to keep more dairy goats, state reasons _____

Part D. Economic Factors

30. How big is your farm in acres?
- a. 0-1 b. 2-5 c. 6-9 d. 10 and above
31. How much milk in litres do you receive per goat per lactation?
- a. 5-10 b. 15-20 c. 20-25 d. I don't know

32 State the cost in Kenya shillings incurred on raising dairy goats

Item	Price in ksh per month	Price in ksh per Year
Drugs		
Dipping and spraying		
Labour cost		
Feed costs (concentrate)		
Mineral block		
Hiring breeding male		
Construction cost		
Goat house repair cost		
Veterinary extension services		
Total costs		

33 i.) Income in Kenya shillings obtained from sale of goats per year _____

ii.) How many goats did you sell in the last 12 months? (Indicate in the Table below).

	Male		Female	
	Number	Price in Ksh	Number	Price in Ksh
Kids				
Growers				
Adults				

34 Income in shillings from milk and manure

	Units	Price Per Litre Ksh	Sales Per Month	Total Sales Per Year
Number of Does milked				
Milk per Doe per day				
Amount sold				
Household milk consumed				
Manure				

35 How do you access market information?

- a. Radio b. Extension agents
c. Fellow farmers d. Local leaders

36 What are some of your alternative source of income apart from dairy goats farming?

- a. Crop farming b. Business
c. Casual labour d. Others, state _____

37 Which of the following is your highest source of income?

- a. Dairy goat farming b. Crop farming
c. Casual labour d. Business

38 For how many months do you milk your does after kidding? (Tick one)

- a. 3 months b. 4 months
c. 5 months d. 6 months others, specify


APPENDIX 3: INTERVIEW GUIDE FOR KEY INFORMANTS

Kindly provide the feedback on the following questions based on the objectives of the study.

1. Kindly tell me about yourself, and what you do.
2. What is the average household size among dairy goat farmers?
3. What is common age and gender for the majority dairy goat farmers you serve?
4. What level of education have majority of the farmers attained?
5. Who are the common household heads among dairy goat farmers?
6. Tell us more about their cultural orientation in dairy goats rearing
7. What are some of the key contributions from the local leaders in dairy goats keeping?
8. Farmers organizations, if any and benefits derived from such institutions
9. In your own view, how would the leaderships contribute towards enhancing dairy goat farming, if this has not been achieved? And how do they support you in extension service linkages?
10. According to you, what are some of the problems faced by dairy goat farmers are associated with the local leadership? In what way could the local leadership contribute to dairy goat farming in the area?
11. Do farmers keep exotic dairy goats in Kitui West Sub-County?
12. What could be some of the factors that affect dairy goats farming in the Sub-County?
13. Do dairy goat farmers undergo training and what are some of the areas the trainings constitute?
14. What are some of the frequently reported cases do you receive from dairy goat farmers, and how often do they report?
15. What are the common breeds of dairy goats has your ministry or NGO supported farmers with in the area; and how effective is the breeding among the farmers?
16. What are some of the common diseases and parasites affecting goats in the area; and how effective are the control measures?
17. How do farmers access market information and what key roles do they play in the market?
18. How do you support farmers to maintain the genetic figure or control breeding of the stock, given that some of them keep indigenous breeds?
19. What is the main reason farmers give for not enhancing dairy goat farming?

20. Briefly explain the average farm size and common farm-based agro-enterprises
21. What is the average milk production per Doe per lactation among the small holder farmers in your area of operation?
22. Give milk sales and income based on periodic reports from the field.
23. How much does an average farmer incur in raising a dairy goat in the area?
24. Give market information access by farmers; and means of accessing information
25. What would you say are the goat products sold and how much is the income per farmer from the records kept?
26. What general perception do the farmers and the community at large hold concerning rearing of exotic dairy goats in the sub-County? What has been or is being done to demystify any negative misgivings on dairy goats rearing?
27. Kindly give your recommendations and way forward on exotic dairy goats farming in Kitui West Sub-County.

APPENDIX 4: PLAGIARISM REPORT

 Turnitin Originality Report

FACTORS INFLUENCING UPTAKE OF EXOTIC DAIRY GOATS IN KITUI WEST SUB COUNTY, KITUI COUNTY, KENYA by Phillemon K. Bwanawoy

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7

APPENDIX 5: ACCEPTANCE LETTER OF PAPER NUMBER 2021072 FROM SCIENCE PUBLISHING GROUP

Acceptance Letter of Paper [2021072] from SciencePG - phillemon...

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Acceptance Letter of Paper [2021072] from SciencePG

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Jul 20 (9 days ago)

to me, kebwa2005

Dear Phillemon Bwanawoy,

Your paper:

Paper Number: 2021072

Paper Title: Factors Influencing Uptake of Exotic Dairy Goats in Kitui West Sub County, Kenya

Abstract: This study investigated factors influencing uptake of exotic dairy goat West Sub County of Kitui County, Kenya. Dairy goat farming has gained admirati Asia is the leading producer of goats while ...

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Factors Influencing Uptake of Exotic Dairy Goats in Kitui West Sub-County, Kitui County, Kenya

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Abstract. This study investigated factors influencing uptake of exotic dairy goat farming in Kitui West Sub County, Kenya. Goat farming has gained popularity globally especially among small holder farmers and many countries are making tremendous efforts to support farmers improve their quality, an productivity. Many smallholder farmers in Kenya have developed interest in exotic dairy goats farming and factors which enhance uptake were investigated. The study assessed and investigated socio-demographic, local community leadership, management practices and economic factors influencing uptake of dairy goats which should be addressed in the sub-County. The paper recommends interventions which can address impediments to uptake of dairy, goats. The data was analyzed using descriptive statistics and was presented using percentages, frequencies, means and Tables. The findings showed that cultural background hindered respondents from effectively engaging in exotic dairy goats farming. From the Pearson moment correlation, there was a weak positive correlation between uptake of exotic dairy goats and social demographic factors with a correlation coefficient of 0.333 with a significant value of 0.001; which was less than 0.05. A correlation coefficient of 0.911 at 0.0003 level of confidence indicated a strong positive correlation between the uptake of exotic dairy goats farming and local community. Also strongly positively correlated was the uptake of exotic dairy goats farming and farm management skills with a correlation coefficient of 0.872 at 0.002 level of confidence. There was strong negative correlation between uptake of exotic dairy goat farming and economic factors with a correlation coefficient of 0.044 at 0.000 level of confidence. It was concluded that socio-economic factors are significant in determining uptake of exotic dairy goats farming. The study findings are important because they will assist in improving goat breeding and improve farmers' income and livelihood. There is a need to strengthen awareness in order to change farmers' attitude and enhance uptake of exotic dairy goats farming.

Keywords: Factors; Dairy Goats; Uptake ; Small holder farmers, Kitui County; Kenya

1. Introduction

Global rearing of exotic dairy goats has been on an upward trend in terms of stock and production [8]. The trend of goat production systems has been directly proportional to the decreasing size of farms which haven't been able to accommodate high number of goats. There has been a decrease in pastoral practices especially in the production.

According to [26, 39], rearing of goats has been the tradition in some European Countries like Italy, Greece and France where cheese and goat

milk production takes lead. The same trend has been experienced in the European nations like Austria and Germany. Goat population globally is estimated to be over 924 million with growth rate standing of 13 percent [19, 17].

Substantial improvement in goat industry has been reported by European countries with a focus on research [16]. Goats contribute significantly to economic stability and food supply within the rural smallholder set-up[17]. It was further reported that goats can contribute

immensely to the economic issues and food supply among the rural small-holder farmers. However, the demand for the farmers' products has continued to exceed their availability.

Despite increased improvement in pastoral practices in milk production, stock of major milk producing breeds have significantly been on the rise [8]. Asia leads globally in the rearing of goats, as Asia produces 539 million (61.6 percent) goats, with Africa coming second with over 276 million goats; which contributes 31.6 percent of the global livestock production. Goat population is highest globally in China with over 142 million heads with Pakistan being second with around 61.4 million goats, closely followed by Nigeria with a goat population of around 57.3 million heads. India leads in the production of goat's milk globally with 4594 metric tonnes, which translates to 28.98 percent of the global production ahead of Bangladesh at 2496 metric tonnes. In the African continent, Mali comparatively produces the highest amount of milk (703 metric tonnes and accounts for 4.3 percent of the global milk production [8]. Other studies, [35] established that 26 percent of the small ruminant population comes from Africa and this constitutes 4.3 percent of the global milk production. .

It has been proved through studies that goats adapt well in a diverse environment and they serve as a socio-economic asset in a fragile environment. Nutritionally goat's milk has been shown to be easily digestible with minimal allergy as compared to cow's milk. Studies by scholars have further revealed that goats are important assets used in ceremonies where feasting and payment of social dues is done [51]. Goats sector serves as a source of income for small holder farmers with dismal capacity to maintain large herd of cattle [13]. However, [13, 47]. It has been reported that the former is true for vulnerable families in rural areas of Sub-Saharan Africa.

There is a concern among smallholder farmers in East Africa in adopting intensive exotic dairy goats based on cross breeding indigenous breeds with exotic breeds, with governments making inconsistent and fruitless endeavours to develop this new sector [57]. Goats form a fundamental part livestock sector in Kenya where goat population is around 10.9 million across the agro ecological zones [1]. Goats are the most appropriate and popular stock among small holder peasant farmers since they are affordable as compared to cattle. They can be reared in small sizes of land as well as being prolific, feeding on a variety of forage. This has significantly made goats enterprise a more lucrative economic engagement among rural peasant farmers practicing mixed farming which is a common system of production in Kenya.

Despite significant introduction of dairy goats in various parts of Kenya, most projects in the rural areas have not been sustained with realized benefits ending soon just after withdrawal or termination of donor funding or after realization of impacts. Farmer participation in the genetic improvement of indigenous goat breeds has been dismal due to centralization of previous breeding programmes. Such programmes have ignored the smallholders who would have benefited from such programmes thus culminating in delayed and poor adoption of new innovations. Continued increase in human population and land fragmentation in Kenya has compelled farmers to engage in dairy goat farming as compared to cattle grazed for milk and beef production [33]. The authors noted that improved breeds of dairy goats along with accompanying technologies is given preference in order to fast track improvement of small stock managed by smallholder farmers in order to improve their economic status and nutrition. However, dairy goats farming in Kenya is gaining incredible support from development organizations and policy for private and public sectors have led to improved income and livelihoods.

World Vision supported 300 vulnerable households in Kitui West Sub County with exotic dairy goats in order to improve household food security and income through sale of surplus goat's milk and male off-springs. The beneficiaries comprised widows, those living with HIV and AIDS (PLWHA) and caregivers of orphaned and vulnerable children (OVC).

The dairy goats kept by smallholder farmers in Kitui West Sub-County were sourced from a reputable government dairy goats breeding institution, Kitui West Dairy Goats Association (KWDGA) with each family (household) receiving one Toggenburg Doe and two Galla Does and a shared Toggenburg

buck[36]. In the project area, the most preferred and reared small stock by farmers is the indigenous breeds of goats with 42.2 percent (Benslyn Consultants, 2011).

Farmers were trained on all aspects of dairy goats' husbandry practices with farmer Trainer of Trainers that was formed to complement extension services offered by the County government through the Ministry of Agriculture, Livestock and Fisheries development (Makodaih, 2013). According to Mutonguni Poverty Reduction Project (MPRP) evaluation report, (2011), exotic dairy goat farmers received training on dairy goats' husbandry as well as milk marketing and record keeping.

Besides being dependent on livestock and peasant farming in order to derive livelihood, most vulnerable families in Kitui West Sub-County still depend on food aid from the Government, NGOs and other well-wishers during drought period in order to augment income from dairy goats farming.

1.2 Statement of the Problem

Following a number of studies conducted in various parts of Kenya, adoption of dairy goats farming was reported with some progress [42]. However, this has not been the case for Kitui West Sub-County where uptake of the dairy goats' enterprise has been of concern to many development organizations. The introduction of exotic dairy goats to small holder farmers in Kitui West Sub County was conceived in order to contribute to improved milk production, household income and nutrition. However, Kitui West Sub-County continued to report high number of malnourished children; with 117 cases reported in 2014 (Mutonguni ADP Annual report, 2014).

According to Kenya Demographic Household Survey (2014), Kitui County is among the Counties in Kenya with the highest proportion (46 percent) of stunted children. Most families supported with the dairy goats still cannot sustain themselves economically with majority of them relying heavily on food aid from the Government and well-wishers. The planned goats' milk value chain in the area could not pick up due to low goat milk production among the smallholder farmers in the Sub-County; a situation that has rendered idle some of the value chain components (equipment such as milk coolants and livestock feed mixers). Therefore, the study was conducted in order to investigate the performance of the exotic dairy goat farming among the smallholder farmers and further establish factors which influence their uptake in Kitui West Sub-County and explore how socio-demographic factors, local community leadership, farming management practices and economic factors influence the uptake of exotic dairy goats.

2. Literature Review

2.1. Up-take of Exotic Dairy Goats

According to [58], a process termed as the "Innovation-Decision Process" may give rise to adoption or rejection of a conceived innovation. The same decision, if adopted can be reversed at a later stage. Many other factors can also contribute to the adoption process.

According to [2], the dairy goat industry has seen improvement and increased attention resulting from their benefits of poverty reduction. (MoALFD, 2001) This has been attributed to the income generation from the sale of goats' milk, skin, manure for crop propagation and meat hence acting as a financial intermediary to the resource constraint farmers [15]. [1, 6] further points that engaging in this sector is not only beneficial in poverty alleviation through income generation but also in eradicating hunger through consumption of the animal protein and hence improved nutritional status of rural communities.

2.1.1 Increased Household income

Improved small scale farmers' income in Bahati and Kongwa districts in Tanzania was attributed to improved production of dairy goats [38]. Dairy goat farming has attracted more peasant farmers as an income earner as well as source of milk and meat for the family [60]. Improved goats have continued to serve as a key measure in addressing poor farmers' needs in the rural areas due to their affordable initial and maintenance costs.

2.1.2 Enhanced production and management of exotic dairy goats

Programmes introduced exotic dairy goat breeds to smallholder farmers in rural areas with an aim to upgrade the indigenous breeds for improved growth rate and milk production. This would ultimately lead to an improvement in food security and household income [57]. Smallholder farmers' interest on dairy goats to wade off malnutrition and poverty improved; a strategy boosted by the government [49]. Many farmers find quality dairy goat forages on easily accessible communal lands since goats are browsers and prefer to eat trees and shrubs as opposed to grass. Most of these trees and shrubs are drought tolerant and have potential to improve dairy goat health and milk production, especially during dry spells [59].

2.2 Socio-demographic factors and uptake of exotic dairy goats

Socio-demographic factors have been found to contribute to uptake of dairy goats farming irrespective of farmers' level of education, household or family size, gender roles and age of the household head. The livestock population standing in Kenya is 12.5 million cattle, 8 million sheep, 142,730 goats and 850,000 camels [29]. Compared to cattle milk, goat's milk is allergy free and much enjoyed by people with allergy to cow's milk.

2.2.1 Age of household head

Technology adoption and practice of new innovations have been traced to energetic and active [43]. [62] argues in his land based enterprise study that technology adoption was not influenced significantly by young people ranging from 25 to 40 years. Following [4] study, more experience is rooted to relatively older farmers who are more endowed with resources and authority that provide a stronger platform to try new innovations. From other studies, uptake of new ideas and age of the farmers are indirectly proportional where the aged are less receptive to innovations despite having the experience and resources [14]. Due to the inconsistency of findings between age and adoption, [45] concluded that the effect of age on adoption tended to be location and technology specific. Age can generate or erode confidence in new technology. [7] found age as inversely related to adoption of dairy technology.

2.2.2 Gender roles in exotic dairy goats farming

Women perform relatively more roles and functions in rearing of shoats [40]. In Nigeria, women participate more in agricultural activities as compared to men and this is further confirmed whereby community projects addressing poverty and other socio economic impediments in Ghana and Nigeria have been successful due to women-led group work [28].

According to [55], rural areas of Malawi are dominated by farming of shoats by smallholder peasant farmers and women have proved to be more naturally enriched with scientific and practical knowledge of shoats' husbandry [40].

Performance of women in rural development has drawn praise from many quarters though perceived as dismal in some areas especially in the livestock industry. This has been linked to predominant and deep-seated cultural factors [28].

Patriarchal bias has partly contributed to gender-blindness; and this has been exacerbated by women's attitude as being associationalised by their traditional taboos, thus significantly undervaluing the work women perform in the society [28]. In Bolivia women are tasked with livestock duties while men engage in crops farming but men's engagement is not much differentiated from household chores in surveys; neither are women functions and roles economically considered important for the country [12].

According to [28], both men and women may determine the use of resources but skewed in terms of level of satisfaction from the use of the same resource(s). According to [10, 28] men enjoy and override the *de jure* ownership rights regarding livestock and dominate decisions on property inheritance which is biased against women who have limited access to means of production relative to their labour contributions.

2.2.3 Education level of dairy goat farmers

The level of participation of farmers in the market is determined by their level of education [21]. For those who have education, the number of years spent in an educational institution is also a major contributory factor as it affects directly the level of management and managerial competencies as well as the quality of implementing exotic dairy goat farming [44]. According to [37], successful and efficient dairy goat farming is dependent on education as this would spur production, processing and marketing practices. Farmers have higher chances and capability of adopting agricultural innovations and new marketing channels when they are exposed to more relevant knowledge. [65], confirms that education is key and significant when choosing modern milk marketing channels such as cooperative and private dairy plants. According to [4], a farmer is ready to buy in and make use of an innovation when he or she has a stable education background.

The relationship between farmers' education and attitude towards exotic dairy goat husbandry is an empirical question as it provides the dairy farmer with necessary skills to enhance adoption of exotic dairy husbandry practices. Exotic dairy goat husbandry practices involve technical applicability and a dairy farmer with high level of education is better placed to access and utilize information concerning a prospective innovation and ensure coherent evaluation of the associated risks is made when adopting the exotic practice which comprehends to the taught aspects [3].

The outcome of the taught improved husbandry practices to a dairy farmer is viewed on its adoption and putting them into practice. A farmer with more education has the ability to adjust to change as compared to a farmer with little or no formal education [9]. Such educated farmers are able to adjust and fit into new technologies and innovations under different prevailing conditions.

2.2.4 Household size

Household size is directly proportional to labour availability in any set up. A bigger household would generate more labour and hence affects adoption of an enterprise like dairy goat farming that is accompanied by new technologies a resource poor farmer may not afford [30]. Higher production can be associated to availability more labour at household level [44]. It is further noted that a choice for a marketing channel is positively determined by the size of the household [53].

According to [20], resource poor farmers can mobilize and make gainful use of resources in groups where participatory decision-making is embraced by all. High According to dairy Goats Association of Kenya ([11], farmer groups registered with the association can easily access breeding stock or semen, buck rotation information, market for their milk and breeding goats through organized sales. They can also register their goats with Kenya Stud Book and Dairy recording service of Kenya. They can access extension services and be guided to develop breeding plans.

2.3 Farm Management Practices and uptake of exotic dairy goats

Kenya Agricultural Research Institute (KARI) has recognized the important role the dairy goats play and prioritized it as number three (3) in about fifty-nine (59) commodities and factor research programmes [66].

According to the Department for International Development [1, 20] and KARI carried out a research in central Kenya on community based goat productivity improvement. The results indicated that most of the breeding programmes initiated were done without involvement and input of the target beneficiaries. Low dairy goat technology uptake was suggested as an information gap in a research workshop in Machakos Kenya [66].

According to [63], goat feeding system and milk production are correlated. Intensive and semi intensive management systems assist smallholder dairy goat farmers to be self-sufficient by using home grown feed and labour [56]. However, dairy goats reared in intensive or semi intensive systems produce more milk compared to those raised in free grazing systems since many farmers using the latter system of grazing hardly supplement their goat's diet.

Keeping records can help farmers realize cost and benefits of improving their management practices. The records can help make changes in management, such as buying supplemental feed because they see it improves their milk production.

2.3.1 Disease Control in dairy goats

According to [25], livestock farmers have continued to use recommended feed supplements as well as disease management to curb the high costs that are associated with feeds and veterinary services. Some farmers haven't been able to afford the recommended dairy goat management practices. Some studies conducted have proven that cost of inputs such as feeds, labour, land, quality breeds, veterinary services have been quite impotent, accounting for 94 percent variation in total output.

2.3.2 Experience of goats breeding

Programmes involving crossbreeding temperate breeds with indigenous breeds of goats has been triggered by inferior programmes involved in stock replacement and improvement in dairy goats for local breeds [33]. This has initiated programmes in the tropical countries to improve local breeds as more such programmes emerge. This has led to dairy goatbreeders and entrepreneurs to enhance stock quality with time.

Despite gains experienced in livestock breeding in developed countries significant prospects to initiate and promote the same in developing countries has been slow. Improved goats breeds can give rise to fast productivity improvement but this can only be achieved with environment appropriateness fitting within the production system that require limited resources and constraints [61].

To enable farmers achieve significant growth rates in weaning, their participation in breeding is crucial to maintain weights of weaned animals above 18kg after attaining the age of 120 days. Goats form a fundamental part within livestock sector with an estimated goat population of 10.7 million across all the agro-ecological zones [24]. Goats are raised for their products such as milk, meat, hides and manure besides their convenience to feed [48]. The East African and the Galla goats are the two-main indigenous breeds in Kenya, kept mainly for meat production. According to [32], Dairy Goats Association of Kenya (DGAK) has strived to introduce artificial insemination service to improve genetic figure in dairy goats. 20 farmers were trained as community resource persons in central province of Kenya to assist offer services to all the regions in the province as well as parts of western province.

A well-balanced diet for feeding goats is a prerequisite for self-maintenance and production of milk. High quality fodder is a necessity since dairy goats are quite selective in feeding. Farmers may realize wastage if the feeds given are of low quality [29]. According to [19], breed is a key factor which can bring about reproduction performance variation. Improved genotype of dairy goats can enhance production of milk due to high heritability found for milk yields traits. It is worth noting that breeding programmes take time and a number of generations of goats to realize impact [52]. To establish milk production trend and status, buck's lineage, milk production of the buck's mother and sisters are essential [50].

2.4 Economic Factors and uptake of exotic dairy goats

Goats have proven to be cost-effective and reliable enterprise in fragile environments of semi-arid areas as well as mountainous regions of the Sub-Saharan Africa where their products such as skins and hair provide [55]. Their products such as hair and skin provide treasured products besides milk and meat. Goats contribute up to 20 % of the calories and 0.75 % of meat in Kenya. It has been established that small ruminants' milk is rich in nutrients [47].

2.4.1 Market information

According to [21], farmers participate effectively in the market when adequately and widely exposed and access market information. Good and clear marketing channels and well-structured market as well as consistent and timely flow of market information espouse farmer participation. This will trigger an increase in volume of sales and improved and stable income base. From the studies of milk marketing channels, the source of market information determines the sale of milk by farmers [5]. The information

disseminated by the market trigger increased output sales of dairy goat farmers, making them more willing to participate actively in the marketing channels [54].

2.4.2 Market Prices of exotic dairy goats

The cost of a quality dairy goat in Kenya is around ksh10, 000 to ksh 15,000 depending on the age and breed. However, prices for a near lactating Kenya Alpine dairy Doe goes up to ksh 20,000 [11]. According to [23], dairy goat farmers depend upon direct market sales for both milk and cheese. Other market outlets include the retailers as well as the internet sales which too offer the market outlets. Some individual farmers sell directly to local market markets within their localities while some sell a herd of stock to distant organized markets in big towns and cities.

2.4.3 Volume of goat's milk produced and value addition

Consumers are familiar with products produced under safe environments have continued to promote local value chain development especially in Europe and United States. They attach such products with better quality and able to develop local markets.

According to [27], prospective local value chain of goat's milk has been identified and developed in the less developed countries. Detailed inquiry of workable smallholder innovations or initiatives in local value chain based on local resources and context have been established.

The selection of milk market networks was certainly influenced by the bulk of milk produced daily [64]. This is as a result of low production costs by the processors. More milk is produced by farmers with access to improved Veterinary services, whereas a small holder farmer may not afford [65]. Sokoine University of Agriculture (SUA) supported farmers endeavour and promote goat's milk value chain and even initiating a milk collection centre in 2007 around Mgeta in Tanzania. This was as a result of a perception that milk supply was glut that called a collective effort to stimulate marketing and this was as a result of a feasibility study done by the University Researchers Agricultural and natural resource Transformation for Exotic Livestock s baseline survey programme [34].

2.5 Theoretical Framework

This study was based on the Diffusion of Innovations Theory which explains the “how, why, and at what rate” new innovations diffuse from one culture to another, relying on the human capital [58]. A number of social factors suffice and affect to an extent an adoption process. According to [58], communication channels through which an innovation diffused affects the level and rate of adoption. The same is determined by existing social system as well as the efforts of the change agents involved in the diffusion process. As studied, any such diffusion-decision process may determine either adoption or outright rebuff of an innovation despite of a possibility of reversal at some point in time [58].

Uptake or adoption of dairy goat farming is influenced by factors, both institutional and farm-based. According to [58], a structure of a social system may also contribute to an individual's innovativeness as characterized by an adoption curve where adopters are classified; and in this regard an individual farmer may choose to adopt a technology or reject an innovation outright. Farmers may try the innovation, first as it befits their own situation before making a final decision to adopt it. It is further noted that such an indirect trial can expedite the innovation process. Rejection of an innovation may occur in any stage of an innovation –decision process.

2.6 Conceptual Framework

This is an imagined model that identifies the concepts under the study as well as their relationship [41]. It's a diagrammatic presentation showing the connection concerning the independent and dependent variables. It aims at explaining relationship between variables and it synthesizes the idea in a systematic way in order to provide direction. The conceptual Framework is given in Figure 1.

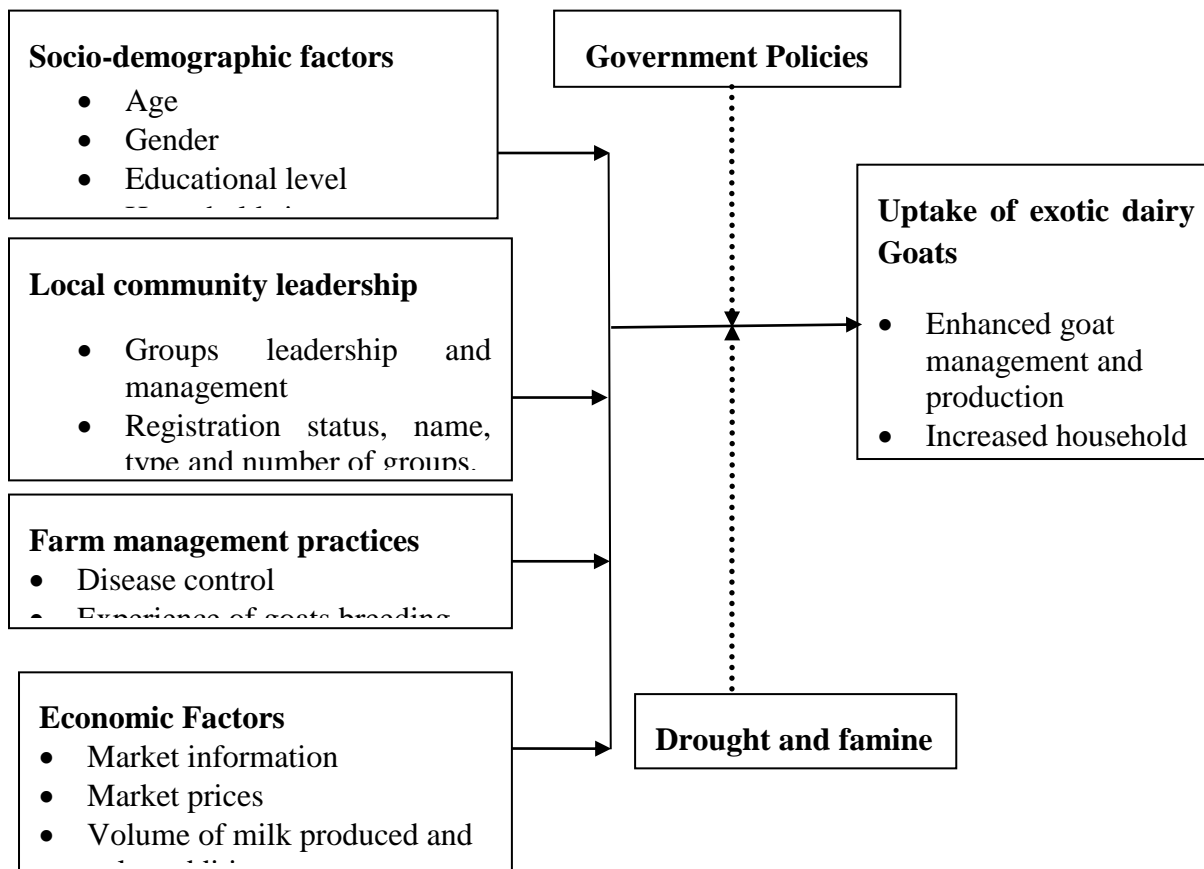


Figure 1. Conceptual Framework of the study

3. Research Methodology

The study used a descriptive survey research design which assessed factors that influencing uptake of exotic dairy goats among smallholder farmers in Kitui West Sub-County. The survey research design used assisted the researcher to gather qualitative and quantitative data on the study variables. The target population of the study comprised 300 smallholder farmers who kept exotic dairy goats and were selected randomly from the four locations of Kitui West Sub-County.

A sample of 178 was used in the study and included 168 dairy goat farmers and 10 Extension Officers. A desired sample size should be determined when a population exceeds 10,000 individuals [41]. Equal clusters were constituted out of the locations and a sample size was calculated using a recommended formula. [41] recommend use of the following formula.

$$nf = \frac{n}{1 + \frac{n}{N}}$$

From the formula given above: -

nf = Desired sample size when the population is less than 10,000.

n = Desired sample size when the population is more than 10,000.

N = Estimate of the population size.

Applying the formula, the sample size for the exotic dairy goats was given as: -

$$nf = \frac{384}{1 + \frac{384}{300}} = 168.4$$

The adjusted sample size of 168 farmers was used during the distribution in the locations in order to collect heterogeneous data.

3.3.2 Sampling Procedure

Purposive sampling was used during the identification of key informants and focus group discussants of the study. This is a technique which allows a researcher to use cases which have the requisite information as guided by the objectives of the study. The subjects were hand-picked since they possessed the requisite characteristics as noted by [22].

In proportional sampling, each cluster or administrative unit was allocated a number according to the existing dairy goat farmers and each cluster was covered by one enumerator who interviewed 42 farmers.

A list of dairy goat farmers from each of the four clusters was provided to form a sample frame whereby enumerators picked one name of a farmer printed on a tag. This was done in turns in the respective clusters until all the names of the required respondents were picked in all the clusters. All the names picked by the enumerators constituted a survey sample of 168 exotic dairy goat farmers for the study.

3.4 Methods of data Collection

Data was collected using questionnaires, Key Informant Interviews and observation. Questionnaire was used to acquire crucial information on the population. In this case, each item in the questionnaire addressed a respective research objective. Both open and closed ended questionnaire was subdivided into sections based on the objectives of the study. The questionnaire was administered to household heads of households keeping exotic dairy goats.

Pre-testing of the instruments was conducted in order to test their appropriateness and the document was reviewed based on the findings to remove any ambiguities noted during pre-testing. This was done from a different community with similar characteristics.

3.5 Validity and reliability of the Research Instruments

The validity of the research instruments was established by conducting a pilot study that pre-tested the instruments which were used to give qualitative and quantitative data. The study utilized 10 percent of the sample size, which comprised 16 exotic dairy goat farmers which were selected randomly. According to [31], a pilot study allows for the identification of sources of errors; and defines validity as extent to which an instrument measures what it intends to measure. The validity of the instruments demonstrates the accuracy of the data obtained in the study with respect to the variables of the same study and gives the degree to which findings obtained from the analyses of the data represents the problem being investigated [41]

Reliability is where the research instruments give consistent research findings following several trials [41], and it is influenced by random error. [31] further argued that sources of errors in research can only be identified through a pre-test or a pilot study, involving subjects with the same characteristics but outside the study area. For this case, therefore pre-testing of the instrument was done before application. The numerical scores were split into odd numbers and even number items; a process that got two sets of values that were correlated using Pearson product moment Correlation Coefficient.

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{\{n \sum x^2 - (\sum x)^2\}\{n \sum y^2 - (\sum y)^2\}}}$$

The above correlation coefficient gave a value of 0.907 that is above 0.80; implying the degree of data reliability was high [41].

3.6 Data analysis Techniques

Coding, entry and analysis of data was done using Statistical Packages for Social sciences. The analyzed data was presented using percentages and frequencies. Qualitative data was analyzed systematically to obtain useful conclusions and inferences. A Pearson Moment Correlation was conducted in order to determine the strengths of their association.

4.0 Results

This section presents the data analysis, presentation and interpretation of the study findings. Other areas covered in the chapter include the background information of the respondents and the findings of the study following the objectives.

4.1 Socio-Demographic Factors

This section discusses socio-demographic factors and their contribution towards uptake of exotic dairy goats.

4.1.1 Distribution of respondents by age

Various age groups were requested to indicate their age category. This was made on the understanding that different age sets hold various opinions relating to the subject of study. The results are presented in Table 1.

Table 1. Distribution of respondents by Age

Age	Frequency	Percentage
20-29 Years	44	28.2
30-39 Years	50	32.1
40-49 Years	49	31.4
50 Years s and above	13	8.3
Total	156	100.0

Table 4.2 shows that, 32.1% of the respondents were spread between ages of 30 and 39 years while 31.4% of respondents fell between 40 and 49 years of age. 8.3 % of the respondents were aged 50 years and above. This indicates that farmers of all age categories participated in the study and had some knowledge of rearing exotic dairy goats.

Respondents were requested to indicate their gender. This was made in order to ensure equity and fairness during involvement of farmers in gender study. The results are shown in Table 4.3

Table 2. Distribution of Respondents by gender

Gender	Frequency	Percentage
Female	94	60.3
Male	62	39.7
Total	156	100.0

The study results obtained showed that majority (60.3%) of the farmers involved were females whereas 39.7% were males. This implies that exotic dairy goats farming in Kitui West Sub County is commonly dominated by female farmers.

4.1.2. Level of Education

The household heads were asked to give their level of education and this was sought to gauge their level of understanding on research subject and their easiness / comfortability in responding to research questions. The household heads were asked to give their level of education and this was sought to gauge their level of understanding on research subject and their easiness / comfortability in responding to research questions. The findings were given in Table.3.

Table 3. Level of education

Description	Frequency	Percentage
Certificate	95	60.9
Diploma	58	37.2
Degree	3	1.9
Total	156	100.0

Results obtained show that majority (60.9 %) of farmers were holders of a certificate course. 37.2% of the respondents had diploma certificates, while 1.9% of them were degree graduates. This shows that majority of exotic dairy goat famers had requisite education and were able to comprehend the research questions posed and responded accordingly.

4.2.3. Household Size

Farmers were requested to indicate their family size as this was perceived to influence their choice of engagement in dairy goats farming. The results are shown in Table 4.

Table 4. Household size

Household Size	Frequency	Percentage
Less than three	45	28.8
3 to 7 family members	86	55.1
8 to 10 family members	25	16.0

Total	156	100.0
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Investigations on family size showed that 55.1% of the families involved had between 3 to 7 family members, 28.8% of the respondents indicated less than three while 16.0% of the respondents indicated 8 to 10 family members. This shows that majority (55.1%) of exotic dairy goat famers came from familiars with between 3 and 7 family members.

4.2.4: Effect of cultural background on engagement in dairy goats farming

The study sought to determine whether cultural background hinder farmers from effectively engaging in dairy goats farming. The findings are given in Table 5.

Table 5. Effect of cultural background on engagement in dairy goats farming

Opinion	Frequency	Percentage
Yes	117	75.0
No	39	25.0
Total	156	100.0

From Table 5, majority (75.0%) of the respondents agreed that cultural background hindered them from effectively engaging in dairy goats farming, whereas 25.0% indicate otherwise. This implies that cultural background hindered farmers in Kitui west from effectively engaging in dairy goats farming. Respondents further repowered the common believe that exotic goats could not do well or survive in semi-arid areas delimited the adoption of exotic goats in Kitui West -Sub county

4.2. Farm Management Practices

The study examined a number management practices exotic dairy goat farmers ought to uphold in order to realize improved goats productivity and household income.

4.2.1 Control of external parasites

Farmers engaged were requested to indicate how they controlled external parasites. The findings are given in Table 6.

Table 6. Control of external parasites

Opinion	Frequency	Percentage
Yes	156	100
Total	156	100

Results obtained from the analysis indicate that 100% of farmers controlled external parasites from attacking their goats.

4.2.2 Spraying during the Wet seasons

The study sought to establish the number of times exotic dairy goat farmers carried out spraying during the wet seasons as shown in Table 7.

Table 7. Spraying during Wet seasons

Description	Frequency	Percentage
Once per week	21	16.7
Once in two weeks	34	27.0
Once per month	71	56.3
Total	126	100

Results obtained from the analysis show that most (56.3 %) of the farmers carried out spraying exercise once in a month, 27.0% indicated that they carried out spraying exercise once /two weeks while 16.7% of the respondents indicated that carried out spraying exercise once/week. This implies that most of the farmers of exotic dairy goats in Kitui West Sub-County sprayed their goats once per month during the wet seasons. The study established the number of times farmers of exotic dairy goats carried out spraying during the dry seasons. The results are given in Table 8.

4.2.3 Spraying during dry seasons

The study sought to establish the number of times exotic dairy goat farmers sprayed their goats during dry season. The results are given in Table 8.

Table 8. Spraying during the dry seasons

Description	Frequency	Percentage
Once per week	23	18.3
Once in two weeks	90	71.4
Once per month	13	10.3
Total	126	100

Results obtained from the analysis show that most (71.4 %) of the farmers carried out spraying exercise once in two weeks, 18.3 % of the respondents carried out spraying exercise while 10.3% of the respondents carried out spraying exercise once per month. This implies that most of the farmers of exotic dairy goats in Kitui West Sub-County sprayed their goats once per two weeks during the dry seasons.

4.2.4 Dipping during the wet seasons

The study established how often dairy goat farmers in Kitui West Sub-County dipped their animals during wet seasons .The results are given in Table 9.

Table 9. Dipping during Wet seasons

Description	Frequency	Percentage
Once in two weeks	1	3.3
Once per month	29	96.7
Total	30	100

Results obtained from the analysis show that most (96.7 %) of the farmers carried out dipping exercise once in every month while 3.3% only carryout dipping once in every two weeks. This implies that majority of the dairy goat in Kitui West Sub-County dipped their goats once in a month during wet seasons.

4.2.4 Dipping of goats during dry seasons

The study sought to establish the number of times farmers dipped their goats during dry seasons.The results are shown in Table 10.

Table 10. Dipping during the dry seasons

Description	Frequency	Percentage
Once per two weeks	30	100
Total	30	100

Results obtained from the analysis show that all farmers (100%) carried out dipping exercise once after two weeks; implying that most of them carried out dipping during dry season only once in two weeks.

The study sought to determine whether the exotic dairy goats in Kitui west had access to veterinarian or other dairy goat health advisors. The results are given in Table 11.

Table 11. Access to a Veterinarian

Opinion	Frequency	Percentage
Yes	100	64.1
No	56	35.9
Total	156	100.0

Results obtained from the analysis show that majority (64.1 %) of the farmers had immediate access to veterinary services whereas 35.9% indicated to have access to veterinary services. This implies that considerable number of exotic dairy goats in Kitui west have no immediate access to Veterinary services.

4.2.5 Type of Veterinary Services available to the dairy goat farmers

The study sought to precisely establish whether the farmers had access to veterinary services or Health Advisors. The results are given in Table 12.

Table 12. Types of Veterinary services available to farmers

Services	Frequency	Percentage
Veterinary	74	74
Health Advisors	26	23
Total	100	100

It is clear from the study that, 74 % of the respondents indicated having access to veterinary services while 23% of the respondents indicated to have access to health advisor's services. This implies that only small percentage of the farmers who had access to veterinary services or health advisor's services.

4.2.6 Control of internal parasites

The research sought to establish whether farmers in Kitui west Sub County controlled internal parasites affecting their livestock. The findings are indicated in Table 13.

Table 13. Control of internal parasites

Opinion	Frequency	Percentage
Yes	156	100.0
Total	156	100.0

From the study findings, all the respondents indicated they controlled internal parasites affecting their livestock, this implies that of the considerable number of dairy goat's farmers in Kitui west Sub -County controlled internal parasites affecting their livestock.

4.3. Economic Factors

The study investigated the amount of milk received from goats per lactation and the findings are given in Table 14.

Table 14. Quantity of milk in litres received per goat per lactation

Description	Frequency	Percentage
5-10 litres	103	66.0
15-20 litres	53	34.0
Total	156	100.0

The research findings show that 66.0% of the respondents indicated that they received between 5-10 litres, 34.0 while 34.0% of the farmers shared that they got between 15 and 20litres. This implies that most of the farmers received between 5 and 10 litres per goat per lactation.

Source of market information for the farmers

Respondents were requested to indicate how they accessed market information. The results are given in Table 15.

Table 15. Source of market information for the farmers

Description	Percentage
Radio	71.8
Extension agents	73.7
Fellow farmers	74.4
Local leaders	66.0
Total	100

The findings show that 74.4% of exotic dairy goat farmers received market information from fellow farmers, 73.7% of them relied on extension agents for market information, and 71.8% relied on radio for market information, whereas 66.0% relied on local leaders for market information. This implies that most of the farmers relied on radio, extension agents, fellow farmers, and local leaders as sources of market information.

4.5 Correlation Coefficient

The study conducted Pearson correlation analysis in order to indicate a linear association between the predicted and explanatory variables or among the latter, It, thus, helped in determining the strengths of association in the model (Table 16).

Table 16. Correlation Results

		Adoption of exotic Dairy goat farming	Social demographic factors	Local community leadership	Farm management skills	Economic factors
Adoption of exotic dairy goat farming	Correlation Coefficient	1.000				
	Sig. (1-tailed)					
Social factors	Correlation Coefficient	0.333	1.000			
	Sig. (1-tailed)	0.001	.			
Local leadership	Correlation Coefficient	0.911	0.112	1.000		
	Sig. (1-tailed)	0.003	0.001	.		
Farm management skills	Correlation Coefficient	0.872	0.027	0.046	1.000	
	Sig. (1-tailed)	0.002	0.000	0.001	.	
Economic factors	Correlation Coefficient	0.044	0.001	0.008	0.124	1.000
	Sig. (1-tailed)	0.000	0.003	0.001	0.000	.

There was a weak positive correlation between adoption or uptake of exotic dairy goats farming and socio-demographic factors with a correlation coefficient of 0.333. This relationship is statistically significant with a value of 0.001 that is exceeded by 0.05. With regard to this association, socio-demographic factors had some significance in the uptake of the dairy goats though with some households.

There was a strong positive correlation between adoption or uptake of exotic dairy goats farming by farmers and the local community leadership with a correlation coefficient of 0.911 at 0.003 level of confidence or statistical significance below 0.05. Local leaders and group management is paramount to the uptake and good management of the improved dairy goats in Kitui West Sub-County. In some instances leaders are relied upon for information relating management of dairy goats

The study also established a strong positive correlation between adoption or uptake of exotic dairy goat farming and farm management skills with a correlation coefficient of 0.872 at 0.002 level of confidence or statistical significance. Therefore for this case farmers with limited dairy goat husbandry skills may not be able to gain optimum gains from exotic dairy goat enterprise since poor management would lead to low productivity and inadequate income to sustain household socio-economic needs. Farmers with adequate formal education have a higher ability to adopt and practice new innovations for economic gain.

There was a strong negative correlation between the adoption or uptake of exotic dairy goats farming and economic factors with a correlation coefficient of 0.04 at 0.000 level of confidence. With weak financial capacity, farmers may not be able to offer quality management of dairy goats and this may result in poor performance and yields.

5.0 Discussion

Socio-demographic factors, farmers' level of farm management and economic factors have been found to influence the uptake of exotic dairy goats among rural farmers in Kitui West Sub County. The study further noted that most women in Kitui West Sub County were occupied by other household chores which could not allow them to attend training on dairy goats farming which delimited the adoption of the enterprise.

Older farmers were reluctant and unwilling to change farm management practices as compared to younger educated farmers. Those who have received more education on dairy goats tend to be more willing to adopt new technologies and join dairy farming practices. The findings are in line with the research by [65] who indicated that farmer's extensive grassland farms are more likely to participate in schemes than intensive livestock and arable farms.

Households with higher education had the likelihood of increasing the dairy product consumption. Males were likely to control resources in the households and influence farming decisions-making due to the view that they have more access to information, extension and credit services than females.

Regular dipping of dairy goats diseases is a sure measure of disease control. Most farmers practiced this once in a month during wet season and twice in a month during dry season. Considerable number of exotic dairy goats in Kitui west Sub-County had no immediate access to veterinary services, save for a small percentage of farmers with access to veterinary services or health advisor's services. Considerable number of dairy goat's farmers in Kitui west Sub County controlled internal parasites affecting their livestock.

Farmers relied on radio, extension agents, fellow farmers, and local leaders as sources of market information. Apart from dairy farming farmers relied on crop farming, business and casual labour as alternative source(s) of income. Crop farming presented the highest source of income

to most of the farmers and that majority of the farmers milked their does for a period of 4 months after kidding. These findings are in agreement with [46] report which notes that goats' milk begins to level after two months milking and up to 4 months in lactation.

6.0 Conclusion

It was concluded that socio-demographic factors influenced the uptake of dairy goats farming in Kitui West Sub-County. Cultural myths which surround the improved dairy goats in the region have been found to be some of the setbacks in the adoption or uptake of exotic dairy farming in Kitui West Sub-County.

Age factor has been found to play a key role in terms of acceptability and application of sound management practices when handling dairy goat enterprise with the old being slow to adopt improved breeds of goats. This exacerbated the uptake since most development organizations, both public and private in Kitui West Sub-County targeted the most vulnerable who comprises the old or the aged where many resources were invested on them but with very minimal impact in terms of transformational development.

Older farmers in Kitui west Sub County were less willing to change farm management practices, to young and middle level farmers who have acquired education and adequate agricultural extension services.

Local community leadership was shown to influence the uptake of dairy goats farming in Kitui West Sub-County. Local leadership influenced farmers' attitudes, perceptions, and behaviour. Effective leadership stimulates commitment and attracted membership on community development groups. Strong local community leadership was important in linking farmers to social economic stimulants, overseeing smooth implementation of every social economic development that promote the welfare of community members in general.

Farmers' management practices also influenced the uptake of dairy goats farming in Kitui west Sub-County. Inadequate knowledge and skills in record keeping, lack of modern farming skills especially in dairy farming delimited uptake of dairy goats farming in Kitui West Sub-County. It was also concluded that lack of access to livestock extension services negatively influenced the adoption of dairy goats farming in Kitui West Sub-County.

Economic factors were also shown to influence the uptake of exotic dairy goats farming in Kitui West Sub County. Market outlet, lack of funds, inadequate milk for marketing and inadequate land for grazing, have had negative influence on farmers' decision to adopt dairy goats farming in Kitui West Sub-County. Strong civilization on negative attitudes and believes towards dairy farming is important as this will significantly encourage farmers and promote uptake of the dairy enterprise in the area.

From the Pearson moment correlation, there was a weak positive correlation between the uptake of dairy goats farming and socio-demographic factors with a correlation coefficient of 0.333. This strong relationship is statistically significant with a value of 0.001 that is exceeded by 0.05. Therefore, socio-cultural factors play a fairly significant role in influencing the uptake of the livestock enterprise in the area as is the case with managerial skills among the dairy goat farmers who may require more training.

This study contributes significantly to the solutions on the problems of adoption of exotic dairy goat farming among smallholder farmers in Kitui West Sub-County. The findings of the study are useful in planning for enhanced milk production and household income and thus improve the standard of living among the smallholder farmer households. It was from the study that economic factors influenced the uptake of dairy goats farming in Kitui West Sub-County. However, market outlet, lack of funds, lack of sufficient market for milk and inadequate land for grazing, had a negative influence on farmers' decision to adopt dairy goats farming in the sub-County. The study suggested that all the NGOs pushing the change need to enhance measures that promote awareness on the relevance of the improved dairy goats farming.

Recommendations

The following recommendations were made from the study:

9. The study suggests that all the NGOs pushing for the change need to enhance measures that promote awareness on relevance of dairy goats farming in order to promote the adoption of dairy goat farming in Kitui County.
10. The study advocates for strong community leadership policies. Strong leadership will create a smooth path for implementation of change initiatives that endeavour to uplift the social economic welfare of the community.
11. The study also advocates for comprehensive training on dairy goat farming practices as most farmers were found to be non-conversant with the internal goat farming practices. Training on record keeping and agribusiness management skills is an important primary measure towards adoption of dairy goats
12. The County Government should work closely with community groups in order to foster a relation that promotes motivation and encourage participation in social economic activities. Such measures may include setting up of business incubators, sources of markets for farm produce, and favourable trade policies.
13. There is a need to address socio-cultural myths by the community concerning exotic dairy goats in order to encourage them to improve their uptake for improved income and livelihoods.
14. The Ministry of Agriculture, Livestock and Fisheries Development should deploy more Agricultural extension officers in the Kitui West Sub-County as there are few officers are faced with heavy workload with demotivated farmers on adoption of dairy livestock farming practice.
15. Organizational capacity assessment of dairy goat farmer groups should be conducted in order to establish capacity gaps and train them.
16. County Government should work closely with community groups in order to foster a relation that promotes motivation and courage towards the laid social economic activities.

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