DETERMINANTS OF ADOPTION OF DAIRY FARMING TECHNOLOGIES BY RURAL WOMEN IN KAKAMEGA COUNTY, KENYA

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THESIS SUBMITTED TO THE SCHOOL OF HUMANITIES AND SOCIAL SCIENCES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS OF ARTS IN SOCIOLOGY GENDER AND DEVELOPMENT STUDIES OF KENYATTA UNIVERSITY

SEPTEMBER, 2019
DECLARATION

Declaration by the Student:

This thesis is my original work and has not been presented for a degree in any other university

Signed………………………………… Date ………………..

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C50/CTY/PT/27205/2014

Declaration by the Supervisors:

This thesis has been submitted for review with our approval as University supervisors.

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Signature………………………………… Date………………………..

Dr. Pauline Kamau
Department of Gender and Development Studies
DEDICATION

To my family, for the support they have given me during this difficult moment.
ACKNOWLEDGEMENT

This journey was not always smooth sailing. God was with me all the way. The words of Prophet Jeremiah guided my every step: “For I know the plans I have for you,” declares the LORD, “plans to prosper you and not to harm you, plans to give you hope and a future” (Jeremiah, 29:11). Thank you, Lord. Thus far you have brought me.

I am very grateful to my Supervisors Dr. Leah Wanjama and Dr. Pauline Kamau. Thank you for your guidance and encouragement; I learned a lot.

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There are others who too played a very special role: Ms. Mary Khamala hosted me during my field work while supporting me during data collection; talking to her always brightened my days when the light at the end of the tunnel flickered. To my Little Angels Florah and Nikita you were amazing in ensuring all questionnaires are well kept in their respective boxes; Love you! My husband William and children Dolphine, Emmanuel and Paul, thank you for always encouraging me to pursue my dreams. You are the world’s greatest and I love you! And yes, Next stop is PHD! God bless you!
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<tr>
<td>ADC</td>
<td>Agricultural Development Corporation</td>
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<td>ASDSP</td>
<td>Agricultural Sector Development Support Programme</td>
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<td>DFCS</td>
<td>Dairy Farmers Co-operative Societies</td>
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<td>FAO</td>
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<td>FGDs</td>
<td>Focus Group Discussions</td>
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<td>GOK</td>
<td>Government of Kenya</td>
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<td>IDBS</td>
<td>Improved Dairy Breeds</td>
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<td>KALRO</td>
<td>Kenya Agricultural Livestock and Research Organisation</td>
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<td>KCDP</td>
<td>Kakamega County Development Profile</td>
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<td>KDB</td>
<td>Kenya Dairy Board</td>
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<td>KIIIs</td>
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<td>KPHC</td>
<td>Kenya Population Health Centre</td>
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<td>KU</td>
<td>Kenyatta University</td>
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<tr>
<td>MDG</td>
<td>Millenium Development Goal</td>
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<td>NALEP</td>
<td>National Agriculture and Livestock Extension Programme</td>
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<tr>
<td>NDDP</td>
<td>National Dairy Development Programme</td>
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<td>NGOs</td>
<td>Non-Governmental Organizations</td>
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<td>SDGs</td>
<td>Sustainable Development Goals</td>
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<td>SDP</td>
<td>Smallholder Dairy Projects</td>
</tr>
<tr>
<td>SPSS</td>
<td>Scientific Package for Social Science</td>
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<td>UN</td>
<td>United Nation</td>
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ABSTRACT

Adoption of dairy farming technologies in dairy production has potential to allow for higher output and lower per unit cost in rural households. Observation had shown extensive dissemination of dairy farming technologies targeting rural women in Kakamega County. This study therefore, sought to identify the existing dairy farming technologies, assessed the status of adoption of dairy farming technologies, established constraints experienced in adoption of dairy farming technologies and finally explored strategies that would enhance effective adoption of dairy farming technologies by rural women of Khwisero, Kakamega County. The research was guided by Innovation Diffusion Theory, Rogers (2003) and Social Cognitive Theory of Gender Development and Differentiation, Bassey & Bandura (1999). A descriptive survey research design was employed with a total of 72 rural women dairy farmers randomly selected to cover Khwisero Sub-County. Data was collected using questionnaires, observation guides, interview schedules and FGDs. Quantitative data was analysed using descriptive statistics in terms of frequencies and percentages, were utilized in presenting the findings. Analysis of qualitative was done using themes and verbatim. The result rated high awareness level on exotic cow breeds, fodder establishment and conservation technologies. A majority rural women adopted to cross-bred cows, improved variety of nappier grass, mullato grass and sweet potato vines. The study found slow status of adoption of dairy farming technologies characterised by norm based socialisation that promoted hierarchy of power within rural households. These norms relegated rural women to limited rights of resource ownership and household decisions making. Other determinants in adoption emerged as straining practical gender needs, costs of external inputs and technologies characteristics. The strategies suggested for the enhancement of the adoption included, County Government and NGOs as implementers synchronizing their efforts and advocating for the enforcement of gender roles in dairy production. In conclusion, rural women’s roles and constraints need to be fully understood and reflected in all information packaging. This would be propagated by increasing the inclusivity of women’s voice along all the adoption process phases. The study recommend provision of dairy farming technologies programmes directed to all adult members in the household, incorporate gender perspectives in awareness creation, promote laws protecting women’s right of ownership to land at grassroots level.
OPERATIONAL DEFINITION OF TERMS

**Adoption:** This is the acceptance and continued use by rural women of available and accessible dairy farming technologies that may ease their time, energy and lead to optimal production.

**Dairy farming:** Refers to farming systems specializing in the production of milk from dairy cows.

**Dairy technologies:** Denotes dairy farming innovations in milk production which enhance the success of dairy enterprise in Kakamega County. These comprise exotic cow breeds, fodder production and conservation.

**Determinants:** Refers to factors about dairy farming technologies and rural women attributes which intervene in the adoption of dairy technologies at the household level in Kakamega County.

**Gender needs:** Refers to Kakamega County rural women basic requirements resulting from their varied roles and subordination in their community.

**Productivity** This is the milk output both sold and consumed within the household, dairy units owned and efficient utilization of time by Kakamega County rural women.

**Rural women:** Rural women represent the female population living in rural areas of Kakamega County. For the purpose of this study, they are the female farmers trained on dairy farming technologies selected from Kakamega County.

**Technology Adoption** Acceptance and continued use of new ideas due to the advantages accruing from the technology.

**Technology** An idea, practice or information perceived as new by individuals in a community.
CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

The rising global demand for dairy cows and products called for technologies that contribute to more productive, resilient and sustainable dairy farming systems. In their studies, Mohamed, Simeon & Yemesach (2004) observed that dairy farming technology encompassed the use of exotic cow breeds, improved feed production and conservation methods, among other management practices. These were scientifically researched technologies that required an awareness creation and dissemination by dairy stakeholders. King (2006) asserted that governments, development practitioners, and Non-Governmental Organizations (NGOs) around the world were advocating for adoption of dairy farming technologies. This aimed at reducing household resource input as well as for the improvement of dairy production.

The United Nations General Assembly 2030 Agenda set out 17 Sustainable Development Goals (SDGs). The SDG 1 and 2 envisions strategy of eradicating extreme hunger and poverty, (Unesco 2015). The use of appropriate technologies by rural women dairy farmers could help meet envisioned strategies and the continents demand for dairy products. Consequently, other benefits from dairy technologies could mitigate climate variability’s a cross the world.

Food and Agriculture Organisation FAO, (2011) report observed the dairy sector was becoming more technologically sophisticated, commercially oriented and globally integrated. The report, thus, encouraged dairy development agencies to increase their
drive for the gender agenda in the uptake of dairy farming technologies. In order to succeed in this impetus, the missing link between gender and dairy technologies adoption needed to be identified; as addressed in this study. The (ibid) report noted that in most cases, dairy farming technologies were designed in developed countries and then deployed across the world, a factor that could adversely affect their adoption. Understanding gender perspectives in adoption especially in developing countries would go a long way in addressing both the equality and equity of adoption of dairy farming technologies. However, though rural women play a key role in dairy farming as labourers and managers, their status and constraints experienced in adoption of dairy technologies are in most instances overlooked. The aim of the current study was to identify these constraints among rural women dairy farmers and also find out how their subordinate status in the community affect their uptake of suitable dairy technology.

According to FAO (2013) gender mattered in the adoption of dairy farming technology since women and men played different roles in dairy farming activities. In the previous FAO (2011) report, statistics indicated that rural women comprised an average 43% of the daily dairy labour force globally. Yet they had still to fully adopt and utilise the available dairy farming technologies. Rural women played a role in dairy farming activities albeit in varying status and degrees of adoption across the world (ibid). Further, the report asserted that understanding inequalities in adoption and sustainable use of dairy farming technologies by innovators of technologies was less robust in most countries across the world.

According to Mohamed et al. (2004) developed countries recorded immense growth of the dairy industry and income stability at household level on account of gender balance
and equity in adoption of dairy farming technologies. Aditya (2010) also observed that commitment by rural women to adopt dairy farming technologies in the United States led to owning fewer cows, increased milk production per cow, and reduced pressure on available family resource inputs.

On other hand, Garcia et al. (2012) found that in Central Mexico adoption of dairy farming technologies by rural women spanned an increment of over 5000 Kgs of milk per cow in 2010. Likewise, FAO (2010) reported that New Zealand dairy cow produced as much as five dairy cows in India as an outcome of gender equality and equity in adoption of dairy farming technologies among members in households. Studies in India too found out that the adoption of dairy farming technologies by Indian rural women, transformed them into major contributors of national socio-economic growth (Vamsidhar, Baltenwek, and Kumari, 2015; Aditya, and Gilespie. 2014; Reddy, 2010).

Furthermore, Abel, Osoro and Getabu (2015) observed that dairy farming technologies had several benefits namely, excellent reproduction potential, faster growth rate and higher yields for both dairy animals and fodders, and improvement of household welfare. However, they stated that adoption of such technologies by rural women in Sub Sahara Africa was still wanting.

In addition, King (2006) found that milk production in Africa had not kept pace with the growing population and added that there still existed significant levels of traditional dairy production. This might implied a level of inequality in adoption and use of dairy technologies that was yet to be explicitly identified, recognised and integrated in awareness creation.
Accordingly, Chikagwa and Weideman (2010) suggested that dairy farming technologies adoption by rural women was instrumental in increased productivity and household income. They, however, added that this adoption was slow-paced and low, a phenomenon adversely affecting rural women households practising subsistence dairy farming in Africa.

A review of studies in Africa by Doss (2001) and Sulo et al. (2012) established a disparity between dissemination and adoption of dairy farming technologies among rural women dairy farmers. These discrepancies were also observed in other empirical studies carried out in Ethiopia, Ghana, Nigeria, Malawi and Benin (Tiruneh et al. 2001). This might have suggested that dissemination or creation of awareness does not necessarily translate into adoption but interplay between the attributes of the technology and the adopter. Ideally, (ibid), identifying the dairy farming technologies adoption process and gender-based disparities causes was foundation in unravelling why rural dairy women in Africa were slow in embracing helpful technologies.

On the other hand, Bongiwe and Susan (2015) found that dairy development agencies put great responsibility on African rural women than men counterparts in adoption of dairy farming technologies. They also established that women made up 52% of the total population in the dairy sector, and were responsible for roughly 50% of the manual labour on African farm land. This was the reason why more effort was needed in identifying strategies to help them embrace dairy technologies.

A United Nations report (1990), cited by Sulo et al. (2012), indicated that rural women were farmers, livestock managers, workers and entrepreneurs within the sector.
However, noted that the level and quality of participation did not result in sustainable socio-economic development benefits. This was also observed by Anouka Van Eerdewijk and Katrine Danielsen, (2015) who found that rural women often achieved lower yields in dairy farming than men; which was attributed to women’s low demand for and articulation of dairy technologies. Needless to say, there were widespread gender gaps, informalities and disparities hindering the rural women from adopting dairy farming technologies in Africa.

However, there was a marked increase in dairy production in the East African highlands, with an estimated 3 million subsistence dairy farmers, Wanjala and Njehia, (2014). This increase was attributable to the meagre improvement in dairy farming technologies adoption by rural women dairy farmers in this region. For example, in Uganda, Kaaya et al. (2008) contend that women in groups eagerly adopted dairy farming technologies than at household level. In Tanzania, Balija, (2014) found that the majority of rural women groups in Arumeru District adopted to improved fodder and pasture varieties. Whereas there was increased trend in dairy production, the disparities and selectiveness in adoption of dairy technologies among rural women led to unsustainable dairy industry. Therefore, the determinants of dairy technologies adoption by rural women needed to be explored for a future stable dairy industry in the region.

In Kenya, a study by Wakhungu and Kangethe (2008) found out that the dairy sector played a critical role in the livelihood of many Kenyans. The study also established that the industry contributed 4.5% of total Gross Domestic Product (GDP), making Kenya one of the largest producers of milk in East and Sub-Saharan Africa. There was therefore need for a study to assess the existing dairy farming technologies to sustain future milk
production. Likewise, a report by the Kenya Dairy Board, (2014) estimated that 80% of the milk produced in rural areas was dominated by rural women subsistence farmers. A further (ibid) report disclosed stagnation in dairy farming across agro-regional zones characterised by uneven adoption of dairy farming technologies. The report also indicated that this stagnation was occasioned by the persistent use of traditional practices among rural women in their households.

Another study by Muriuki et al. (2003) established that rural women in Kenya were the main actors in the daily activities of dairy farming including cutting and carrying fodder, feeding cows, and fetching water. The report noted, however, that their passion to adopt dairy farming technologies in their households was less robust. In this case, examining the existing dairy technologies in relation to households needs a better approach for future interventions at the household level.

In his study, Karanja (2003) established that 80% of the milk produced in Kenya came from Uasin Gishu and Kiambu Counties. He found that this was due to increased adoption of dairy farming technologies by rural women at the household level. This was also confirmed by a later study by Gitonga (2014) who stated that most women households in Githunguri area of Kiambu County had adopted exotic cow breeds, established fodder and embraced fodder conservation methods. As a result, there were indications of increased milk production per cow and more women economic empowerment through mini dairies.

On other hand, Gitonga (2014) noted that rural women in Kiambu, Nyandarua and Uasin Gishu counties had positively adopted dairy farming technologies.
He further observed that those counties had increased numbers of milk collection centres, milk bars and processing factories, created jobs for youth and established support businesses in feeds and agro-veterinary supplies.

Essentially, the basis for understanding the uneven adoption among rural women across the country was through studies to find out the existing technologies, status and determinants in adoption of dairy farming technologies.

According to Kenya Population Housing Census report for (2009), Kakamega County had a population of over 1,660,651 women and men, people who mainly depended on agriculture (sugarcane, dairy farming, and tea) for a livelihood. Approximately 80% of the population was classified as poor subsistence farmers, made up of mainly women. Due to cultural traditions of land sub-division, the land holding has on average been reduced to below 2.5 acres per household, Kakamega County Government Profile (2013). As a result of these pressures, households had discarded agricultural activities requiring large tracks of land. Consequently, farmers required farm enterprises that not only increased their household incomes but also required less resource inputs. Dairy farming technologies was one such enterprise that if adopted, had the potential of lifting households’ welfare and food security in the county (ibid).

Studies by Makokha (2005) and Nabiswa et al. (2016) in Kenya, established that certain factors such as increasing young population pressure on land, a sagging sugarcane industry, need to strengthen the household income and nutrition drove the National Dairy Development Programme (NDDP), County government dairy initiative and NGOs to implement the dairy farming technologies programme. The awareness of available dairy technologies was carried out through existing rural women social groups. The
introduction of dairy farming technology through women groups was an expeditious move to replicate in most rural households of Kakamega County, Musalia et al. (2007). However, studies by Nalunkuuma et al. (2013) revealed Kakamega County as having continuously registered low growth in the dairy industry. It is against this background that the current study was conducted in order to investigate the determinants of adoption of dairy farming technologies by rural women of Khwisero sub county, Kakamega County, Kenya.

1.2 Statement of the Problem

Rural women were recognised as the main actors in dairy production since they played a key role in the daily farm activities for dairy feeds production. Non-Governmental Organisations, County and National Government had allocated huge amounts of resources through smallholder dairy farmers’ initiative programmes, especially through rural women dairy groups aimed at creating awareness and disseminating different dairy farming technologies amongst farmers. Despite this, the dairy industry in Kakamega County continued to perform way below its full potential. This was evidenced by milk deficit in the county, as most of raw milk sold in Kakamega town was procured from Nandi and Uasin Gishu Counties. This low milk production could be due to low adoption of the dairy farming technologies that had been introduced in the county, by a majority of rural women dairy farmers. As such, there might have been various factors responsible for the low adoption rates of dairy farming technologies by rural women in Kakamega County. Therefore, the objective of this study was to investigate the adoption of dairy farming technologies by rural women in Kakamega County, with the aim of aiding the increase of productivity in the industry.
1.3 Objectives of the Study

1.3.1 Main Objective of the Study

The main objective of the study was to investigate the adoption of dairy farming technologies by rural women in Khwisero, Kakamega County.

1.3.2 Specific Objectives of the Study

i. To identify the existing dairy farming technologies used by rural women in Khwisero, Kakamega County.

ii. To establish the status of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County.

iii. To find out constraints of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County.

iv. To explore strategies that would enhance effective adoption of dairy farming technologies by rural women in Khwisero, Kakamega County.

1.4 Research Questions

The study sought to answer the following research questions:

i. What are the existing dairy farming technologies used by rural women in Khwisero, Kakamega County?

ii. What is the status of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County?

iii. What are the constraints of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County?
iv What strategies could be put in place to enhance effective adoption of dairy farming technologies by rural women in Khwisero, Kakamega County?

1.5 Justification and Significance of the Study

Considering the fact that most rural women are major actors in dairy farming activities in developing countries, this research was critical to ensure that women concerns are integrated in all relevant dairy farming programmes or project designed by implementers such as NGO’s, Kakamega County and National policy makers.

On the other hand, based on the awareness created through women groups in a male dominated community, this research results might lead to a multifaceted community approach. This approach might be inclusion of men, women and younger dairy farmers as a way of promoting inclusivity, equity and equality in the adoption of dairy farming technologies.

The study will be useful in providing information that could assist NGOs, as well as the County and National governments in advocating for change in planning for gender responsive programmes for implementation of dairy farming technologies.

1.6 Scope and Limitations of the Study

The contextual scope of the study was Khwisero, Kakamega County. This was based on the fact that the area has intensive dairy farming activities. This was characterised by the presence of dairy farmers’ co-operatives such as Khwisero Dairy Farmers Cooperative Society Limited and Emuhaya Dairy Farmers’ Co-operative Society. The study was restricted to trained rural women dairy farmers as respondents. These were assumed to
have knowledge on the available dairy technologies variables under study and were therefore able to provide valuable information for the study.

The study focused on three dairy farming technologies; exotic cow breeds, fodder production and conservation as core in dairy production.

The study was limited to Khwisero Sub- County. This means that the recommendations may not apply to many other sub-counties with different women status and approach to women’s empowerment. In addition, the study focused on trained rural women dairy farmers who were members of Khwisero Dairy Farmers Co-operative Society Limited. This limited information from other rural women dairy farmers who were non- members of Khwisero Dairy Farmers Co-operative Society Limited.

Despite these limitations, the researcher managed to get more information from key informants resultant from the diverse dairy farming knowledge, the adoption of its technologies and the fact that they transverse the whole County.
CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature relevant to the research problem. It looks at determinants of and constraints in adoption of dairy farming technologies. Besides, reviews various strategies that might enhance their adoption among rural women. In addition, the chapter presents the theoretical and conceptual frameworks of the study.

2.2 Overview of Adoption of Dairy Farming Technologies

Dairy farming technologies vary globally. They encompassed the use of high-performance cow breeds, coupled with utilization of improved fodder production and more efficient conservation methods, Mohamed et al. (2004). Further, clean milk production and value addition of milk are ways of increasing dairy productivity. The efficiency afforded through the utilization of technology is aimed at easing resource constraints in term of labour, time and money while optimizing on output. According to Gitonga (2014), adoption was the process of acceptance by individual farmers to use and scale up on technology in order to increase dairy production. This might be inferred to mean that there was process that led to acceptance, use and scale up of technologies for effective production. This might be for instance innovation procedures, dissemination techniques and individual attributes as a process of adoption.

Rogers (2003) stated that adoption was a decision to apply an improved practice for the improvement of life skills, objectives and behavioural influences. Due to various dynamics at the rural household level, decisions to adopt were determined by gender.
roles, participation in development, equity in the technology dissemination process, power relations and household income levels. Other factors included immediate practical gender needs coupled with family preferences and priorities. These factors influenced decision making for all dairy industry players such as gender experts, economists, generators and disseminators of dairy farming technologies, in conjunction with rural women as actors in the application of the said technologies.

In their different studies Rogers (2003) and Aditya (2010) observed that the initial adoption of dairy farming technologies was generally followed by the spread that defined the process by which alteration occurred in structure and function of a social system. Conversely, Petrovic and Cikic (2013) as cited by Mirela et al. (2014), studied diffusion of knowledge and innovation in Serbian agriculture. They found out that rural communities were part of a global society and shared its destiny. For this reason, therefore, the process of spread and introduction of innovation, knowledge and technologies was at the centre of social change in rural communities in a process that was complex and contradictory. They added that analysis tailored towards diffusion of technologies and how it altered structures in societies could not be conclusive without exploring certain influences. These comprised information packaging based on gender and adoption of technologies, the methods of dissemination and the perceived attributes of technologies during and after the dissemination. These very factors may be part of what affected dairy farming technology adoption by rural women in Kakamega County.

Another study conducted by Massey (2004) to establish a framework for building technological learning in New Zealand Dairy industry, asserted that factors relating to
family and dairy farming business characteristics influenced adoption of dairy farming technologies.

The findings of the study were subjective and did not bring out specific family and business characteristics that could influence adoption, more so in developing countries. Indeed, the family and business are two separate entities with different demands, needs and priorities. To establish family adoption of technologies, it was necessary to get information on family preferences for dairy technologies and household resource ownership. Besides, the level of rural women involvement in household decision making was also significant.

Bandiara and Rasul’s (2006) study in Northern Mozambique surveyed established that adoption of dairy farming technologies by rural women was affected by social networks. On the other hand, Abdulai and Huffman (2005) studied diffusion of cross-bred cows in Tanzania and found that factors affecting dairy technologies adoption influenced social networks too. In contrast, a study by Bonabana (2002) in Uganda on factors affecting adoption of agricultural technologies among rural women, found social network to be a non-significant factor in technology adoption. However, analysis on social networks as constraints did not explicitly identify gender responsiveness in social networks, individual members’ statuses, equity and equality in leadership as determinants to adoption of dairy farming technologies. In addressing this gap therefore, the current study specifically sought to establish whether membership of social networks was a determinant to individual rural women adoption of dairy farming technologies.
2.1.1 Existing Dairy Farming Technologies among Rural Women

Adoption of technologies entails a behaviour change and acceptance that new technologies had better outcomes than the existing ones. In many places where dairy farming was carried out, some level of adoption, albeit on a small scale did exist. There were many studies that had been carried out on the existence of dairy farming technologies by rural women in different countries and ecological zones. Findings on adoption of exotic cows breed by rural women indicated the influence of social-economic variables.

For instance, Mekonnen (2006) explored rural women’s role in the production, processing and marketing of milk in Ethiopia. The study observed that most rural women households had not embraced exotic cow breeds and persistently kept traditional cows, despite the known benefits of embracing improved cows’ breed. Similarly, a study by Chawala et al. (2014) in Tanzania on status of adoption of dairy farming technologies found that the few rural women who had adopted exotic cows breed attributed this to social influences and low resource input available to them. The research focused on the social influences and resource input as a factor in adoption. This might be true, but understanding the labour requirement to benefit from exotic cows breed as well as household labour division; women’s rights and authority to household resource ownership would better inform on the reasons behind low adoption of exotic cows.

Meanwhile, Karanja’s (2003) study in Kenya on the post liberalisation of dairy industry observed that there existed more exotic cows in the highlands of Kenya due to cultural adaptability, smaller land sizes as well as dairy farming being undertaken as a business enterprise by rural women.
The findings focused on the socio-economic structures, and ignored the influence of gender role in the adoption of dairy technologies by individual households. In addressing this gap, the current study sought to identify and define the determinants in adoption. Specifically, explored the role of socialisation and how it influenced decision making in adoption of dairy farming technologies, management of the technologies and hierarchy of powers in the use of benefits from technologies.

Abayomi’s (2014) study on factors explaining dairy cattle adoption behaviour by smallholder farmers in Kenya exposed the fact that dominance by indigenous breeds hampered every effort of dairy farming technology adoption. On the other hand, Baltenweck and Staal (2006), in their study on the dynamic changes in dairy technologies uptake in the Kenya highlands, found that the adoption of exotic cows was hampered by risks related to diseases, fodder requirements, unreliable milk market and breeding challenges. FAO (2006) too reported poor linkage and low advisory services as a factor in the low adoption of dairy technologies by rural women farmers in the Kenyan highlands. The above studies focused on economic factors, awareness processes and traditional practices while the current study tackled the gender divisions of labour and roles among members in the family, household resource ownership, complexity and perceived attributes of technologies.

Gitonga’s (2014) study in Githunguri on adoption level of fodder establishment and conservation methods noted that there existed low quality and quantity of feed resources. This was due to more focus being put on food crops than fodder production and conservation. There might be a level of competition between human food and cow feeds. In a response to the finding, the present study sought to find out implementers’ response
to different gender needs and household preferences in allocation of resources to fodder establishments. These resources include land, labour and level of income at their disposal to purchase external inputs.

Another study by Cikic (2003) in Serbia, recognized fodder production had existed as a practice in a traditional peasant society, while fodder establishment and conservation technologies are modern practices based on up-to-date scientific knowledge. He also asserted that integration of modern scientific knowledge in the traditional knowledge of local farming practices and circumstances was still lacking. Therefore, there was need to identify the language used in dissemination of improved variety fodder, women’s motivations in fodder establishment as well as the method of dissemination to influence behaviour change from traditional fodder to improved fodder establishment and conservation.

Kiptot et al. (2010) defined fodder technology as fodder shrubs, herbaceous legumes, and pasture grasses, weeds gathered from cropping areas, crop by-products and residues, agro industrial by-products and purchased concentrates. These definitions needed to take into consideration the understanding level of rural women in regard to content and context. In essence, this study sought an understanding of information packaging and how implementers contextualise scientific application to rural situations. This could be a more practical way to improve on the methods used during dissemination of fodder technologies and conservation methods. In the same (ibid) research on preferences and adoption of fodder practices among farmers in dairy management groups in Kenya, noted that availability and access to feed resources had been hampered by competition for feed resources especially grain between human and dairy cows.
FAO (2011) too reported that dairy fodder production and use was driven by increases in human population and reduced income. The report further revealed that the demand for milk in Kenya would grow and thus called for increased demand for dairy cow feeds. From literature, it could be ascertained that there was a need for assessment on existing fodder technologies, levels of adoption as well as household practical gender needs as a measure for future implementations. Thus, the current study sought to identify the relationship between influences of family basic needs and the adoption of fodder establishment technologies as a future reference point in positioning of fodder technologies by implementers. It also sought to determine how fodder establishment was integrated with food crops within individual farms.

A study by Ngigi (2005) in East Africa on building on successes of smallholder dairying established that fodder production in Kenya was facing challenges due to the rising trend of input prices, global warming and global inflation, as a result of which, dairy cow production has been most hit in terms of scarcity and seasonality. This was supported by Odero-Waititu’s (2017) study in Kenya on smallholder dairy production which found that the greatest constraint to dairy cow productivity in the country was the shortage of fodder especially in the dry season. The findings also stated that scarcity of fodder was due to climatic change, seasonal variability’s, input costs and high population of dairy cows. The above studies focused on nature and resources, notwithstanding how activities were carried out within the period of seasonal variability’s. The above studies did not focus on gender roles in fodder production and concentrated on seasonal variability. As such, this study identified specific roles and decision to fodder production within their households.
On the influence of climate change on smallholder productivity, Kirui et al. (2015) observe that adoption of fodder technologies by rural women dairy farmers varies and is household-specific rather than dairy-specific. They (ibid) further noted that fodder conservation methods (hay and silage making) level of adoption was low due to discrepancies between awareness and adoption of these practices. Examination of the existing fodder technologies, constraints experienced and the status of adoption of fodder establishment by rural women could better inform on future process evaluation and planning’s of technologies by stakeholders.

In 2017, the Kenya Dairy Board estimated that Kenya had annual processing capacity of 1.4 billion litres of milk which translated to 3.9 million litres a day, (KDB 2017). The study also established that the volume of milk produced in the country went down by 17% to 535million litres from 648 million litres in 2016 due to low quality and quantity fodder conservation. Although the drop in milk production could have many causes, it was not difficult to relate it with the existing dairy feeding systems existing among rural women dairy farmers. There was a possibility that one of the reasons for low adoption could be the lack of direct linking in the women’s mind of the low feeding of dairy cows and the low milk production. It was therefore important to find out the level of rural women understanding on the relationship between fodder production and milk output. It was assumed that this would in turn help inform both the County and National governments planning for integrative and sustainable dairy sector.
2.1.2 Status of Adoption of the Dairy Farming Technologies by Rural Women Dairy Farmers

There was a direct relationship between the level of adoption of dairy farming technologies and dairy produce output. Rural women’s involvement in the adoption of these technologies was crucial owing to the essential roles they play in the industry. Understanding the status of adoption by rural women dairy farmers was important as these influenced farming decisions, choice and adoption of dairy technologies. There is a general notion that the state of adoption by rural women was not vibrant as compared to that of men across the world. This required data due to the rising progress on rural women empowerment and skill transfers in adoption of dairy farming technologies.

A study by Njuki et al. (2013) in Mozambique on the gendered impact of agricultural asset transfer found low status of adoption because dairy cows were considered as men’s property, except where women were heads of households. From common knowledge, gender power relations do existed in most African households due to socialisation on gender roles and resource ownership among families (ibid). In order to support the notion, information is required on different status of adoption by rural women. This could be an avenue to help dairy stakeholders in understanding the implication of gender perspectives, especially, implication of resource ownership to adoption of these technologies as well as the process in household interventions.

Another study by Njarui et al. (2012) in Kenya and Uganda on production characteristics and gender roles in dairy farming established that 15% more female-headed households in Uganda adopted dairy farming technologies as compared to their counterparts in Kenya. This was attributed primarily to Non-Governmental Organization (NGO)
donations of dairy cows to widows whose husbands had succumbed to HIV and AIDS. In contrast, a study by Baltenwek et al. (2006) in Kenya and Uganda on dynamic changes in dairy technologies uptake indicated that the majority of cows owned by rural women dairy farmers were purchased from own savings or loans from micro-finance banks. While adoption can be through own savings and loans, there may be other determinants that may need to be identified which this study sought to establish. The answer to these questions would be vital to both National and County governments’ dairy initiative programmes.

Doss et al. (2015) study in East Africa on gender matters and understanding farm level technologies revealed that women and men differences in preferences and choice, influenced the levels of adoption of technologies. They (ibid) added that unequal gender relations were taken for granted during innovations of technologies. In addition, Kingiri (2010) study on gender and agricultural innovations indicated that unequal access to resources and gender disparities in labour division had made technological innovations of more benefit to men than women by lessening the workload of men and increasing the activities linked to women. This might implied women status in the society was influenced by socialisation that a scribed women physical labourers and men property owners and users of machinery. Thus, a more proactive and practical strategies are yet to be determined, that could unlock socio-cultural bottlenecks that have rendered women not to demand for and use of technologies, to ease the experienced labour burdens.

Another study by Ragasa (2012) found that women’s values of financial transactions, women’s mobility, patriarchal power and assumptions reinforced gender stereotypes and led to their low status of adoption of technologies. The current study sought to explore
rural women’s values of dairy farming technologies, knowledge on savings for investments and socialization; to help determine influences to their choices of adoption of dairy farming technologies.

Micere et al. (2016) also conducted a study in Kenya on dairy stratification, women’s decision making, time use and implications for child nutrition. They found that the status of adoption of dairy farming technology to improve household welfare in rural areas was still lacking. This, they said, was due to unforeseen cost of operation. In the study, technologies were perceived in terms of costs rather than end benefits. This then calls for a study to find out the effectiveness of awareness at entry point. The dissemination approach would have been based on business perspective. Therefore, the present study was carried out to examine in part the status of adoption of dairy technologies in the light of constraints experienced and strategies in place that would influence decision-making to adopt dairy farming technologies. The information collected could alert and inform dairy stakeholders in positioning of technologies and help understand the cause of different statuses in adoption of the dairy farming technologies by rural women dairy farmers.

2.1.3 Determinants of Adoption of Dairy Farming Technologies among rural women

There is no doubt that adoption of dairy farming technologies is absolutely vital to the growth of the dairy industry. Rural women, being key players in dairy farming, need to adopt available dairy technologies in order to reap maximum benefits from this huge and growing industry.
In addition, an understanding of determinants of adoption of dairy farming technologies was essential in planning and executing technology related programmes and meeting challenges in dairy industry.

Dairy farming technologies adoption was a multidimensional process driven by capacities distributed through technologies characteristics and society. Consequently, the literature on dairy technologies adoption is enormous and somewhat difficult to summarize closely. Conventionally, analysis of dairy farming technologies adoption focused on imperfect information, risk, uncertainty, institutional constraints, human capital, input availability, and infrastructure as potential explanations for adoption decisions.

A study in Ghana by Akudugu et al. (2012) on adoption of modern agricultural technologies by farm household classified the determinants of adoption of technologies into three categories, namely, economic, social and institutional factors. However, the study did not look into women roles, gender needs and the role of implementers as determinant in adoption of dairy farming technologies.

On other hand, Obayelu et al. (2017) study in Nigeria on determinants of adoption of agricultural technologies by smallholder farmers categorized the determinants into: traditional, social, economic and physical. The study generalized on smallholder farmer in general agriculture and did not specifically look into adoption of dairy farming technologies. To help the dairy stakeholders and implementers visionalize on positioning of dairy farming technologist by rural women, specific determinants affecting rural women as key farm hold managers need to be identified. Determinants specifically targeting women’s gender needs, roles and resource ownership within households, which this study focused on.
Doss’s (2003) study in East Africa on understanding farm level technologies adoption categorized the factors into: farmer characteristics, farm structure, institutional characteristics and managerial structure. The study looked into general determinants and did not look into gender roles and women needs in adoption of dairy farming technologies which this study sought to establish.

According to Samuel et al. (2016) study in Southern Ethiopia on adoption and impact of dairy production technologies classified determinants to adoption into informational, economic, infrastructure and ecological, while Muchangi (2016), Gitonga, (2014), Makokha et al. (2007) study in Western Kenya and Kiambu County classified the determinants into human capital, production, market availability, policy and natural resource characteristics. Grouping determinants may not be representative on it is effect on women. Generally, the scholars’ focus on determinants of adoption was based on technology characteristics, economics, human capital finance, infrastructure, farm and institutional structures. However, decisions on adoption of dairy farming technologies has an interplay of gender dynamics within a household. These dynamics might be, power relations, resource ownership, access and equity in allocation to activities influence the decisions and priorities of the users, in this case rural women. It was therefore essential to assess the needs and priorities of every individual member in a household in determining their adoption level to the dairy farming technologies. This could help both implementers and rural women in setting priorities towards adoption, and sustainable use of dairy farming technologies in production.
2.1.4 Constraints in Adoption of Dairy Farming Technologies by Rural Women

There are many identified hindrances to the uptake of dairy farming technologies by different scholars. It is also clear from some studies that these hindrances tend to vary across different genders. Literature examination shows that a farmer’s gender affects the rate of adoption of dairy farming technologies.

On their part Obayelu et al. (2017) established social-cultural practices as a hindrance to dairy farming technologies adoption by rural women. They found that culture played a role in containing adoption through rural women socialisation, peer effects and norm-based diffusions. Social and cultural perspectives might diminish the role of women, deny their individual needs and ways of meeting those needs, and so acted as push factors against adoption. It was thus crucial to carry out further analysis of rural women’s needs assessment, the level of inclusion during programme designs, and opportunities available to raise their voice during implementation of technologies. Moreover, an evaluation of the role of training and methods of training being used to influence rural women’s behaviour change was needed. This could enable innovators to put in the needs of rural women in all processes of design to implementation of dairy farming technologies.

Another study by Ageya et al. (2016) in Uasin Gishu County, Kenya, on gender participation and commercialisation of smallholder dairy farming established that rural women lack of access to and minimal control over benefits from dairy technology were a constraint to adoption of dairy farming technologies. On the other hand, Anounka et al. (2015) found that risk of men capturing control over resources and benefits from technology adversely affect adoption. Their study (ibid) also found that men typically moved into women’s activities once they become profitable.
The study focused on male-headed household yet in rural areas there is heterogeneity and differences in contribution to household resources. As such this study sought to examine rural women’s resource ownership and gender-based differences in use and adoption of dairy farming technologies. This could be useful in identifying strategies to enhance adoption, women participation and for implementers to get insight of evaluating their implementation processes.

In another study by Anounka and Katrine (2015) observed that rural women dairy farmers shied away from perceived labour-intensive technologies. This might have implied that implementers did not exhaustively understood the perceptions, benefits and challenges of technologies in place. Adoption or non-adoption of technologies could be characterised as an influence of implementers and part to the roles of adopters individual attributes. Thus, the implementers approaches in awareness and receptive of women need to be identified. This would be through gathering information on the perceived technologies attributes as well as individual women capability and capacity in adoption as a basis to enhance future adoption planning processes in rural communities.

FAO (2011) had also argued that inadequate training of rural women dairy farmers was a hindrance to adoption. The report further stated inadequate training affected the basic processes relating to communication of information, knowledge and skills, exchanging opinions and experiences that could create a desired change in adoption of dairy farming technologies. However, was important to acknowledge training was a dependant on expertise of the trainer to execute information, cognitive preferences of the women trained, level of exposure and gender of trainer. In addition, the training methodology used and the level of experience with other technologies could also act as constraints to
adoption. It was paramount to explore communication structures, adequacy of training and perception towards trainer/trainings, as this influenced the way in which a family pooled their resources towards adoption of new technologies. As such, the present study focused on the approaches and effectiveness of training in order to identify specific training challenges as a guide to future dairy farming technologies implementation.

Mwangi and Kariuki (2015) study in developing countries on factors determining adoption of new agricultural technologies by smallholder farmers in East Africa, asserted too that institutional frameworks and farmer perception towards technologies were a constraint in adoption of technologies. This showed that it was necessary to find out the role of NGOs, county and national government institutions in addressing gender roles and needs, and an empowerment strategy that could stimulate dairy farming technologies adoption among rural women households.

2.1.5 Strategies for Adoption of Dairy Farming Technologies by Rural Women

There are distinctive findings from varied researches on strategies to enhance adoption of dairy farming technologies. In one study, Mekonnen et al. (2009) established that development and implementation of policies in dairy farming programmes was predominantly exclusive after a clear understanding of the factors affecting adoption of dairy farming technologies. Nevertheless, a study was required to disclose the awareness levels of policies governing the dairy sector, gender concerns and other areas crucial to the industry. Findings on how these policies are applied and their gender implications in influencing sustainable dairy farming technology uptake by rural women dairy farmers were also significant.
A study by Anuonka et al. (2015) also established that engaging rural women in identifying features of dairy technologies that respond to their realities, opportunities and constraints was crucial. Further, (ibid) engaging with norms and assumptions that affected women’s articulation of demand for adoption of dairy farming technologies would be an apt strategy for boosting adoption. Interplay on cultural norms and values might affect the value proposition of dairy farming technologies. Exploring this, could help understand the motivations behind adoption of dairy technologies, and help inform dairy development agencies to direct their effort to those technologies that could cause lesser conflict with traditional cultural practices, as an envisioned strategy to promote more rural women acceptance and sustainable use of dairy farming technologies.

According to Kelsey’s (2013) study in developing countries on market inefficiencies and the adoption of dairy farming technologies found that in East Africa, systematic evaluation of the true profitability of technologies, provision of low interest rate loans to empower rural women, secure property rights, efficient markets and approaches for addressing underlying constraints on the broader adoption benefits a better strategy to enhance adoption of dairy farming technologies. Whereas improvement of infrastructure could drive adoption, this study sought to understanding of gender needs in rural areas, collaborative effort among dairy stakeholders and linkages of rural women to other dairy producing zones as an empowerment strategy that could enhance adoption of dairy farming technologies.

2.1.6 Knowledge Gaps

Although there are many generalised methods for grouping determinants of dairy farming technologies adoption, there was no clear distinguishing feature on specific determinants
of dairy farming technologies among rural women dairy farmers. The review of literature presented knowledge gaps which this study sought to fill.

i. A study by Mekonnen (2006) focused on rural women’s role on production, processing and marketing of milk in Ethiopia. His findings were based on level of production, processing and marketing of milk. The current study focused on status of adoption of dairy farming technologies, determinants in adoption and strategies that could enhance adoption of dairy farming technologies by rural women.

ii. Chawala et al. (2014) emphasised on factors affecting adoption of exotic cows by smallholder dairy farmers in Tanzania. This study focused on rural women and three core variables of dairy farming technologies, namely, exotic cow breeds, fodder establishment and conservation technologies.

iii. The study by Abayomi (2014) concentrated on factors explaining dairy cattle adoption behaviour among smallholder farmers in Kenya. The study did not specifically focus on exotic cow breeds, fodder production and conservation technologies by rural women in Kenya. This study, however, did focus on.

iv. Gitonga (2014) researched on dairy farming technologies among smallholder farmers in Githunguri while this study focused on Kakamega, thus presenting a contextual difference.

Overall, most of the existing literature is on level of awareness, economic and financial factors as determinants of adoption of dairy farming technologies. The gender angle in adoption of dairy farming technologies by rural women was lacking. Based on these
gaps, the researcher studied determinants of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County, Kenya.

2.2 Theoretical Framework

The study adopted Rogers’ Innovation Diffusion Theory, Rogers (2003) to help ground study on technologies process from innovation to adoption. On other hand, Bassey & Bandura Social Cognitive Theory of Gender Development and Differentiation (Bassey & Bandura, 1999) was useful in exploring the gender concerns in adoption of dairy farming technologies.

2.2.1 Innovation Diffusion Theory

The innovation diffusion theory by Rogers (2003) focuses on understanding formation, diffusion and the level of technology acceptance in a social system.

According to Rogers (2003), Innovation is the practice perceived as new characterised by knowledge, persuasion and decision by individual or a social system. On the other hand, diffusion is deemed as the process that entails communication channel, time and social system. He stated that potential adopters’ assessed attributes of technology majorly relative advantage, compatibility, complexity, trial-ability and observability. The researcher found this theory relevant in many ways.

This study looked at the level (status) of dairy farming technologies acceptance (adoption) in Khwisero, Kakamega County. Besides, it sought to establish the determinants of these technologies. Further, the theory defines innovation as being driven by factors such as knowledge (awareness), persuasion and decision by individual. In agreement with this theory, the Khwisero study alongside other reviewed studies
identified these factors as sure determinants of dairy farming technologies adoption. Additionally, knowledge and persuasion were found to be influenced by diffusion. Diffusion as defined by Rogers (2003) implied the process that entails communication channel, time and social system. All the three factors making up diffusion were identified in the current study as determinants of adoption. In addition, the role of the County government, NGOs and other information disseminators in awareness creation as well as a support system in adoption of dairy farming technologies needs to be enhanced for effectiveness.

The social system mentioned in the theory could in light of this study be viewed as the social cultural dictates that defined the uniqueness of rural women needs, gender roles, resource ownership and household decision making. All these are variables in adoption of dairy farming technologies. The existing cultural values, experiences, socialisation, and individual rural women households’ immediate preferences in Khwisero were examined in the study as the social context. The theory observed, potential adopters’ assessed attributes of technology and looked at their relative advantage, compatibility, complexity, trial-ability and observability. These factors too were found to affect adoption in this study.

2.2.2 Social Cognitive Theory of Gender Development and Differentiation

The study also adopted Social Cognitive theory of gender development and differentiation by Bassey & Bandura (1999). The theory was an integration of psychological and socio-structural determinants to individual in a community. It holds that gender conceptions and role behaviour were the products of a broad network of social influences operating both familiarly and in the many societal systems encountered.
in everyday life. The theory also stipulated that human differentiation on the basis of gender was a fundamental phenomenon that affects virtually every aspect of individual daily lives. It specified how gender conceptions were constructed from the complex mix of experiences and how they operate in concert with motivational and self-regulatory mechanisms to guide gender-linked conduct throughout the life course. The theory then assumed that gender differences were socially founded, and most of the stereotypic attributes and roles linked to gender arose more from cultural design than from biological endowment (Bandura, 1986; Beall & Sternberg, 1993; Epstein, 1997).

The theory helped the research to link the established socio-structural factors such as gender roles, gender disparities with household division of labour, gender power relations and decision making within the families. On the other hand, all these dynamics affected the level of adoption of dairy farming technologies among rural women in Khwisero, Kakamaga County. This was fundamental issue to explore because, some of the most important aspects of rural women development, for example their talents, conceptions they hold of themselves and others, socio structural opportunities and constraints they encounter were heavily prescribed by societal gender stereotype. This in turn affected adoption of dairy farming technologies.

In summary both Rogers’ Innovation Diffusion Theory and the Bassey & Bandura Social Cognitive Theory of Gender Development and Differentiation were useful in grounding this study. Innovation Diffusion theory assisted in identifying social contextual factors, as well as technology attributes and awareness as determinants in the adoption process. Additionally, the social cognitive theory supported the study on finding out the influence of external factors in adoption process. These included the role of socialisation, culture
and societal expectations of women in adoption of dairy technologies. Therefore, both theories were instrumental in establishing the determinants of adoption of dairy farming technologies by rural women in Khwisero, Kakamega County, Kenya.

2.2.3 Conceptual Framework

![Conceptual Framework Diagram](image)

**Independent variables**

- Existing dairy farming technologies among rural women dairy farmers
- Status of adoption of disseminated dairy farming technologies
- Constraints of adoption of dairy farming technologies among rural women

**Dependent variable**

- Adoption:
  - increased number of rural women adopting dairy farming technologies
  - increased capacity of rural women in dairy technology
  - Increased household income from dairy farming

**Intervening variables**

- Strategies to enhance adoption of dairy farming technologies among rural women dairy farmers

*Figure 2.1: Conceptual Framework*

The conceptual framework depicts the interaction between independent variables, intervening variables and the dependent variable. The independent variables are the study objectives, namely, the existing dairy farming technologies, status of adoption, constraints of adoption and strategies that could enhance adoption of dairy farming
technologies by rural women in Khwisero. The mentioned independent variables are largely influenced by individual characteristics, technological and Institutional factors. The individual and household characteristics are made up of socio-cultural influences (gender roles, division of labour, women participation, access and control of resources, etc.) On the other hand, technological determinants were made up of costs and technologies characteristics, notably, relative advantage, compatibility, complexity, trialability and observability. Institutional determinants for this study meant the strategies and approaches used by implementers in dissemination and awareness of technologies to drive adoption.

The intervening variables checks and drive the independent variable in order to get perceived outcome. Thus, awareness creation of gender equality in adoption of dairy farming technologies, rural women’s capacity building on resource ownership, availability of credit facilities and gender inclusion used in extension services were the intervening variable for this study.

Adoption of dairy technologies and the ensuing benefits of adoption acted as the dependent variables of this study on the determinants of adoption of dairy farming technologies by rural women in Khwisero. The dependent variable included increased number of rural women adopting dairy farming technologies, increased capacity of rural women in dairy farming and overall family wellbeing (Fig. 2.1).
CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1 Introduction

This chapter outlines the methodology that was used to conduct this study. It presents the research methodology in terms of research design, study site, study population, sampling techniques and sample size, research instruments, pilot study, validity and reliability, data collection, data analysis and ethical considerations.

3.2 Research Design

This study used a descriptive survey research design. Carrie (2007) defines descriptive research design as a basic research method that examines the situation as it exists in its current state. It also involves identification of attributes of a particular phenomenon based on an observational basis or exploration of correlation between two or more phenomena. Saunders et al. (2012) state that a descriptive survey research design is an approach to utilise and gain an accurate profile of events or situations on the ground.

According to Kothari (2004) a descriptive survey research design is concerned with analysing, describing, recording and reporting conditions that exist or existed. In applying to this study, the approach helped the researcher to analyse, describe and document the determinants of adopting dairy farming technologies by rural women dairy farmers in Khwisero. It also enabled the examination of respondents on their perception of the available dairy farming technologies, technology adoption process, status of adoption, determinants and strategies that might enhance adoption of the dairy farming technologies.
3.3 Study site

The study was conducted in Kakamega County which is one of the 47 counties in Kenya, located in the Western Region and occupies an area of approximately 3,033sq. km. The County is bordered by Vihiga County to the South, Uasin Gishu County to the North-East, Busia and Siaya Counties to the West, Bungoma and Trans Nzoia Counties to the North and Nandi County to the East (Fig.3.1). The County consists of 12 sub-counties and 60 wards with a population of approximately 2 million people. The average annual temperature is 25 Degrees Celsius with an annual average rainfall of 1.747 1/ mm. Kakamega town is the administrative headquarters of the County and is the most populous urban area in Western Kenya with nearly 70,000 residents. Dairy farming and production are one of the main economic activities in the county with sugar cane being the principal cash crop. The food processing industry thrives in the county with three main sugar milling factories, namely, Mumias, West Kenya and Butali Sugar Companies. Other crops include, maize, beans, millet, sorghum, beans and groundnuts, Kakamega County Profile (2013).

Unlike the other sub-counties of Kakamega that mostly grow sugarcane, Khwisero sub-county relies mostly on small scale dairy farming, horticulture, chicken rearing and growing of annual crops KCDP (2013). According to the same development profile, the County Government through its flagship project, Smallholder Dairy Farming Initiative facilitated and established model dairy farms within the Sub-county. The study area was chosen because of the intensive nature of dairy farming activities as well as presence of a Central Dairy Farmers Cooperative Society (DFCS), namely, Khwisero Dairy Farmers
Cooperative Society Limited. The research was carried out in two locations, Kisa Central and Kisa East.

Figure 3.1: Location of the study Area in Khwisero, Kakamega County

Source: IEBC, 2003

3.4 Study Population

The target population for the study comprised all women who were dairy farmers in the cooperative groups. The total population was 720 comprising of trained rural women in dairy farming technologies.
3.5 Sampling techniques and sample size

The study used strategies to select respondents from the target population. These methods were probability sampling (random sampling) and non-probability (purposive sampling) techniques. The probability sampling method was used to select the locations, sublocations and respondents to be involved in the study. Based on the qualitative research study and diversity of the study area, sample selection for questionnaire was based on distances from one farmer household to another and marital status. As such, the study targeted a sample size of 10% of respondents selected from a population of 720 trained women dairy farmers registered at Khwisero Dairy Farmers Co-operative Society Ltd. This was representation of 720 woman’s’ household across the study area. Oso and Onen (2005) state that a sample of 10% of the population is an acceptable representative of the total population. The study therefore sampled 72 respondents. The 72 respondent were perceived a good representation since there was observable uniformity in distribution of same dairy farming technologies in most households in study area. In addition, there was same procedures used in dissemination and awareness creation through rural women groups. Based on the uniqueness of the area, 72 respondent helped in getting information to answer the study objectives.

Random sampling was used to sample location and sub-location. The location and sublocation was selected by assigning unique numbers. The numbers were then rolled in a bowl and the researcher was blindfolded to select one at a time until the two locations and four sub-locations were achieved. The selection was done separately and in turns, thus, first location and lastly sub-location.
The respondents for the study were selected using random sampling. This was done through computer generated from Khwisero Dairy Farmers Co-operative Society data entries of trained rural women dairy farmers as well as existing groups. The number one name on computer list was selected and then for every 10th number, a selection was done until 72 respondents were achieved.

Table 3.1: Sample Size

<table>
<thead>
<tr>
<th>Category of Respondents</th>
<th>Women</th>
<th>Total of Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married women</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Single women</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Widows</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Woman farmer</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>No status indicated</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>72</strong></td>
<td><strong>72</strong></td>
</tr>
</tbody>
</table>

3.6 Pilot Study

A pilot study was carried out to test the instrument. The questionnaires, interview schedules and FDG guide were tested on trained rural women dairy farmers from Ikolomani and Butere Sub Counties. These two sub counties were not involved in the final study. The purpose of this pre-testing was to ensure clarity of the final instruments for the actual data collection. Furthermore, the testing assisted in finding out any weakness that might be contained in the instruments of the study. Thus, the pilot test was conducted to determine the reliability and validity of the research instrument.

3.7 Data Collection Methods and Research instruments

The study used different instruments to collect both primary and secondary data. For the primary data collection, questionnaires, key informant interview guides, focus group
discussions guides and observation checklist were the main tools. Both closed and open-ended questions were prepared before embarking on the field work and divided into various sections based on specific study objectives. Open-ended questions enabled the researcher to get meaningful information from the individual rural women and dairy farmers on their views in regard to land size, income from sale of milk, off-farm income, technology awareness, existing dairy farming technologies, status of adoption, determinants and strategies that need to be put in place to enhance adoption. Closed-ended questions helped to understand age, education level, marital status, number of dairy cows, types of cows, fodder established and conservation technologies on farm. (See annex 1).

Observation check list was developed to help the researcher observe the presence of any technologies within the homestead like types of cow, fodder grown, size of land allocated to fodder, hay or silage availability and feed storage. This was to compliment data from the questionnaire. (See annex 3).

Key informant interview guides were used due to their flexibility in allowing for the interpretation of the meaning of the questions, developing rapport with informants, and allowing face-to-face contacts with interviewees.

Focus group discussion guides were used to gather information from discussants in two groups in Munjiti and Mundaha locations. Mundaha FGDs, 9 women and Munjiti comprised of 7 women dairy farmers. FGDs, were used to obtain in depth information through interactions with participants and clarified concerns that were not clear during questionnaires surveys.
Primary data were collected at the source through questionnaires, key informant interviews guides, FGDs guides and observation checklists. Questionnaires were distributed to the respondents and collected after 30 minutes to one hour depending on distance and upon checking with the respondent. To avoid inconveniences during data collection, the researcher did prior arrangement with respondents through phone calls and planned for farm visit at the respondent’s convenient time.

In the event that a respondent was illiterate, the researcher administered the questionnaire and read out the items in the questionnaire, interpreted them in Kiswahili and then the responses were written on paper.

Direct observations were used in areas such as determining presence of hired labourers, number of dairy cows, fodder grown in the farm, size of land allocated to fodder establishment, farming type, hay or silage and feed storage. This was by looking around the homestead and ticking on the checklist any observable feature related to the study. Additionally, key informant interviews were carried out in places that were convenient for the informants. Most of them took place in key informants’ offices.

Finally, the researcher organised two FGDs in Munjiti and Mundaha Sub-locations. This two sub-locations are milk catchment centres for Khwisero Dairy Farmers Co-operative Society Ltd. In addition, a number of farmers’ general meetings take place here.

For secondary data collection, document analysis from available literature on gender and dairy technology was analysed. This involved systematic collection and review of relevant works and records from government reports. Individual publications, research reports and project reports were also perused so as to obtain information on what had
been done as well as to assess the extent to which it was done. This exercise provided additional information to the research objectives.

3.8 Validity and Reliability

After the pilot study, the study instrument were tested for both reliability and validity. This was done to safeguard the accuracy of data collection for analysis.

3.8.1 Reliability of the Research Instrument

To ensure reliability of the data, triangulation was used where the researcher used different techniques to collect data. Ali and Yusof (2011) describe reliability as the reassurance that another researcher investigating the same issue or using the same tools could derive the same or similar findings. For this study the researcher used questionnaires, observation checklist and key informant schedule interviews to check reliability. The questionnaires were administered by researcher to a small number of rural women dairy farmers of different ages, education level and marital status. In addition, key informant schedule was carried out in two separate sub county extension offices. These was a pilot test and any inconsistency nor ambiguity observed corrected before application to actual study.

3.8.2 Validity of the Research Instrument

Validity of the research instruments was achieved through engagement, observation, and member checking to establish credibility. Opanga (2013) explained that validity is concerned with the questions, whether the researcher is actually measuring what is anticipated to measure in order to assess the legitimacy of the applied measures, and their appropriateness in achieving the research objectives. For this study, questionnaires were
designed to address specific and relevant objective of the study. In addition, expert judgment of the supervisors as well as pilot testing of the instruments helped to assess validity. Therefore, clear and well related questions to adoption of dairy farming technologies by rural women were administering for this study.

3.9 Data Analysis and Processing

The Statistical Package for the Social Sciences (SPSS) version 21 was used to analyse quantitative from the survey. This was best suited for providing a mean of establishing quantitative association of variables, thus, age, marital status among others. Computation was conducted to ensure accuracy in analysing and interpreting data. The researcher established frequencies of the variables in order to accurately come out with conclusions from the respondents’ responses. A table was constructed with three columns, thus, first table with all data values for instance age bracket 35-50years in ascending order of magnitudes. In the second column, tally marked at appropriate and corresponding data value for every data. Finally, the number of tally were counted and written in frequency column before totalling up and presented.

Qualitative data collected using key informants interview and FGDs were analysed using qualitative methods of analysis notably themes and codes. Data were organised, cleaned, labelled and coded within an explanatory data framework.

Data from observation checklists were organised according to the focus of the research. The information from checklists provided a basis for establishing the quality of information from survey. Additional information from checklist was incorporated and helped to strengthen study findings.
3.10 Data Management and Ethical Considerations

Ethical considerations protect the rights of respondents by ensuring confidentiality. According to Creswell (2013) ethical considerations maintain the integrity of the study as well as the integrity of the researcher. This was done through training of research assistants and asking them not to discuss information raised from interviews and FGDs with other people within and outside the study area. This was aimed at safeguarding confidentiality of the collected data.

Secondly, all questionnaires, whether filled or not, were obtained from respondents, separated from any other documents and put in a file labelled ‘confidential file’ then kept for safely.

For the data presentation, the respondents were just referred as respondent one, two, three; and so forth, so as to maintain confidentiality.

The researcher also obtained approval from Graduate School and obtained permit from The National Commission for Science, Technology and Innovation (NACOSTI) for the research. These were presented to County Chief Officer Livestock as well as Sub County livestock officers for consent to collect data in the region.
CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter presents and discusses the findings of the study. It outlines the results based on the four objectives: existing dairy farming technologies; the status of adoption; adoption determinants; and strategies that may enhance adoption of dairy farming technologies by rural women dairy farmers in Khwisero. In addition, it presents the demographic characteristics and results on the existing dairy farming technologies as they influence aspects of adoption of dairy farming technologies by rural women dairy farmers in Khwisero.

4.2 Responses Rate of the Study

For this study, 45 participants responded to the questionnaires and 9 key informants were interviewed. 18 respondents attended two FGDs in Mundaha and Munjiti villages of Khwisero. Therefore, the research data were accounted on the views of women dairy farmers in the study area.

4.3 General Information on the Respondents

This section describes the characteristics of the respondents in terms of age distribution, marital status and level of education which were seen as important to the study.

4.3.1 Respondents

The purpose of this section was to establish the number of women respondents in the study.
Figure 4.1: Respondents

The pie chart above shows that 96% of the respondent responded to study while 4% no response. Thus, the ratio of 96% might have been an indication that more women were left in homestead as caretakers and managers of dairy farming activities. This might be true as women have been widely recognised by the roles taken in dairy farming at household level. The study is affirmed by Kakamega County Profile, (2013) report that 70% women and 30% men were practising dairy farming. The study finding is also in line with FAO (2013) findings that rural women were the majority participant in dairy farming activities.

4.3.2: Age of Respondents

The study also sought to establish the age variable as determinants of adoption of dairy farming technologies by rural women, Kakamega, Kenya. This is presented in table 4.1
Table 4.1: Age of respondents

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 – 35 Years</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>35 – 50 Years</td>
<td>19</td>
<td>42</td>
</tr>
<tr>
<td>51 – 65 years</td>
<td>21</td>
<td>47</td>
</tr>
<tr>
<td>Over 65 years</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

Table 4.1 shows that 47% of respondents were aged 51 to 65 years; 42%, 36 to 50 years; 7%, 21 to 35 years. The respondents with over 65 years and considered old were 4%. As shown on Table 4.1, the average age of majority rural women dairy farmers was between 51-65 years.

Table 4.2: Age as adoption determinant

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Women</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>4</td>
<td>72</td>
</tr>
<tr>
<td>Agree</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Disagree</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Strongly disagree</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>33</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

The study also sought to check whether age was a determinant of adoption of dairy farming technologies. The respondents (72%) were in agreement that age was determinant in adoption of dairy farming technologies.

From the foregoing, it could be inferred that the older the rural women become, the more they find dairy farming appealing. Further insight from respondent revealed that younger
persons were unwilling to adopt dairy farming technologies due to effort expectation and waiting period needed before reaping benefits from technologies. Key informant noted that most young farmers lacked resources especially land. Majority relied on family resources while some pursuing different careers.

This can be inferred to mean that age becomes a determinant in adoption in term of resource ownership, individual willingness and perceived technologies attributes. The study finding is in line with Abel et al. (2015) that farmers would adopt technologies based on the foreseen relative advantages such as income.

This finding is affirmed by innovation diffusion theory (Roger, 2003) that technologies attributes and perceived result of technologies during diffusion process determined the acceptance of technologies.

4.3.3: Respondents’ Marital Status

The study also sought to establish whether marital status determined adoption of dairy farming technologies in the study area. The findings are presented in Table 4.3.

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married</td>
<td>35</td>
<td>78</td>
</tr>
<tr>
<td>Single</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Widowed</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>No Response</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 4.3 above, shows (78%) in significant relationship between marital status and adoption of dairy farming technologies. This means that married women adopted dairy farming technologies more than other categories of women. When the women were asked whether they thought marital status was a factor in adoption of dairy farming technologies, they stated that shared household responsibilities in term of resources among married households gave them opportunities to adopt dairy farming technologies as compared to single women or widows. They further stated that resources are contributed from men non-farm income, farm household income and women off farm income generated from social support groups. As such marital status was a determinant of adoption of dairy farming technologies. This finding from the current study is in line with Wambugu et al. (2016) conclusion that Kenyan married women households exhibited a higher likelihood of keeping exotic cows.

4.3.4 Respondents’ Education Background

This section was meant to establish the different education levels as a determinant to adoption. The results are portrayed in Figure 4.2.
The data shows that a majority of the respondents (44%) had primary education level. Those that had secondary level of education were 36% while only 7% had a college or university education. This may be indicative of majority of rural women dairy farmers in Khwisero, Kakamega County holding at least some formal education. Therefore, it can be deduced that formal education played a role in determining adoption of dairy farming technologies. This is consistent with Kimaro et al (2013) study which argued that basic literacy is essential to dairy farming technologies adoption.

4.3.5: Summary of Demographic Characteristics

From the findings discussed, majority of rural women practising dairy farming were of range 35-65 years and with at least some formal education. Specifically, adoption of technologies was more among married women than single women or widows.
In summary therefore, adoption of dairy farming technologies was intervened by a number of factors, namely, age, level of formal education and marital status. This result reinforced Kakamega county profile, (2013) and Gitonga (2014) studies in Kakamega County and Githunguri, Kiambu County respectively reported aged and educated rural women took up a majority roles and responsibilities in dairy farming than their men counterparts. As such, provision of extension programmes should be directed to all available adult members in community to contain knowledge gaps and promote equitable adoption of dairy farming technologies.

4.4 Existing Dairy Farming Technologies by Rural Women Dairy Farmers

The first objective of the study was to identify the existing dairy farming technologies among rural women dairy farmers in Khwisero. The study concentrated on three areas of dairy technologies namely: Exotic cow breeds, fodder establishment and conservation as core variables in dairy production.

4.4.1 Types of Dairy Cows

The study set to find out the types of dairy cows owned by rural women and men dairy farmers in Khwisero, Kakamega County. The results are shown in Table 4.4.
Table 4.4: Dairy Cows Owned

<table>
<thead>
<tr>
<th>Dairy Cows Owned</th>
<th>Women</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exotic Friesian</td>
<td>8</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Cross bred cows</td>
<td>20</td>
<td>20</td>
<td>42</td>
</tr>
<tr>
<td>Indigenous cows</td>
<td>5</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Mixed of exotic, crossbred, indigenous cows</td>
<td>7</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Exotic Friesian and Cross bred cows</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>45</td>
<td>45</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4.4 data portrays, 42% of the respondents adopted cross bred cows as compared to other breeds of cows in the study area. This was also observed while distributing questionnaire that most rural women of Khwisero had one cow per household mostly cross bred cows. This was attributed to the level of awareness of cross bred cows than other breeds of cows. Key informants asserted that cross bred cows were encouraged due to the characteristics that had similarities with traditional dairy farming practices such as resistance to diseases and requirements of less fodder as compared to pure breeds.

On the same view, one key informant commented;

“Farmers are trained on different types of cows. The selection of cows though to be donated is done by project Veterinary Doctors and dairy experts. Generally, the women are given cross bred cows which are less labour intensive compared to exotic cows and resistant to disease. Selection of women to benefit on technologies is based on amount of fodder planted as well as assessments on individual willingness to adopt. Only training on exotic cows is done in groups but the allocation is per household which aims improving livelihood” (KIs Livestock Office).

Similarly, the response from woman in FGDs, reflected that;
“Those cows at our farms were bought and brought to us in selected women groups through donor support and smallholder dairy initiative programme by county government of Kakamega.” (FGDs, Mundaha).

The study further asked during KIs interview why rural women were the majority adopters of cross bred cow as compared to men and the response was;

“...Rural Women have ease way of forming social groups, attend most of the trainings and carryout dairy activities through social network which costs time not money. When it comes to registration to be allocated cows, men fear and send women to be registered since they are to take care of cows at homestead and .....” (KIs, Lead Farmer).

The findings revealed that there were more cross bred cows than other types of cows in the study area. The responses showed that women were not involved in selection of the dairy cows to adopt, but rather donors dictated what was donated. The study also found out that more rural women than men had adopted cross bred cows. From FGDs perspective, women reckoned that men perceived the cross bred cows had lower yields hence not motivated to adopt them. While others noted that rural women were the caretaker of homestead activities as men searched for alternative incomes away from homestead.

Key informants, however, revealed that gathered skills, women social group support and men’s willingly let their wives to adopt since they were the main caretakers of homestead activities. In addition, the study found women to have been the majority adopters due to awareness creation that had targeted women groups. This can be inferred to mean that men in study area were willing to support women to adopt technologies which seemed non-productive to them. Furthermore, women being recognised as caretakers was on a result of socialisation that scribe’s women as home makers and men off farm income generators. This finding was in line with Anounka et al (2015) conclusions that rural
women adopted technologies based on their gender needs, social network and support of men in the society. The finding is also supported by social cognitive theory of gender development and differentiation which holds that gender concepts and role behaviour are the products of broader influences operating in individual households as well as a major factor on household choices and preferences.

In summary, the types of dairy cows adopted by rural women in study area were crossbred cows. This was based on the choices of selection done by implementers mainly NGOs and County Government Smallholder Dairy Initiative Programme. Consequently, gender training should be integrated during awareness as a facilitative process of developing all inclusive capacity on gender issues. This is approach that engages men and women as beneficiaries in addressing their personal responsibilities and supporting partners in adoption of exotic cows. Furthermore, the implementers should base dairy cow selection in accordance with identifiable gender roles and needs of rural women as a way to promote buy in from programme design, implementation and sustainability upon programme exit.

4.4.2 Fodder Establishment and Conservation

The study also sought to establish the types of fodder establishments on the farm. This was in addition to the understanding of gender roles at each stage of production; from purchase of inputs, land preparation, planting, cutting, transportation and feeding of cows. The findings on fodder establishment are presented in Table 4.5.
Table 4.5: Fodder Established

<table>
<thead>
<tr>
<th>Fodder Established on Farm</th>
<th>Women</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweep potato vines</td>
<td>4</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Mixed improved variety nappier and mullato grass</td>
<td>12</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td>Lucerne</td>
<td>4</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Maize fodder and Caliandra</td>
<td>6</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Mixed sweet potato vines and improved variety nappier</td>
<td>11</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td>Mixed sweet potatoes, improved variety nappier, maize fodder</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Nappier and Lucerne</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>No Response</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>45</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.5 show that 28% of respondent adopted improved variety nappier grass and mullato grass, followed by 26% that adopted sweet potato vines and improved variety nappier grass. Other scientifically researched fodder like caliandra, lucerne, maize for fodder and fodder conservation were the lowest in adoption.

To determine the strength behind adoption of more improved variety nappier grass and sweet potatoes vines, the research learned that sweet potatoes vines were popular as a source of food for the family and surplus sold for income. On the other hand, it was established that improved variety nappier grass was easily accessible through women social network in community, less labour intensive and occupied less land as compared to other fodders as reported by FGDs. The research therefore deduced that improved variety nappier grass and sweet potatoes vines were adopted more, due to the fact that they are beneficial to the family in terms of food, income, require less labour and land. In
addition, it was clear from the observation that rural women dairy farmers allocated smaller portions of land for fodder production, especially improved variety nappier grass and sweet potatoes vines in comparison to food crops. Key informant commented that the NGOs, County and National government as implementers of dairy technologies; carry out gender need analysis and technical planning processes. This were procedures of technologies that might meet the most essential needs of rural women in their household as well as address socioeconomic outcome in the community. Further, interview with key informants on the role of men in adoption of fodder technologies pointed out that:

“Socialisation rendered fewer men to support fodder establishment since this was seen as woman’s roles and men took active roles of non-farm activities; and they leave women to work on farms to avoid stigma” (KIs, Dairy Co-operative)

The above shows that gender stereotypes on the role of women and men in dairy farming determined the level of adoption. It was established that men in study area were more active in non-farm activities hence left women as dairy farm labourers. The study also established that rural women in the study area had common shared social responsibilities and depended on one another for inputs; for instance, cuttings from improved variety nappier grass, mullato and sweet potato vines. Therefore, it could be argued that dairy farming technologies that were available at affordable costs were less labour intensive, and fitted into the existing household basic needs would be adopted by rural women in study area. This finding is consistent with the study of Balija (2014) who stated that rural women in Tanzania adopted fodder technologies that were common among them and improved household family wellbeing. The results were also in agreement with social cognitive theory of gender development and differentiation Bassey & Bandura (1999)
which stipulated that gender conception and role behaviour operates in a social system and influences an individual’s everyday life decisions.

In summary, improved variety nappier grass, mullato and sweet potato vines was more adopted than other scientifically researched fodder. In the study area, there was no observed farm household that practiced fodder conservation technologies. The adopted fodder was attributed to immediate benefit to household family as food, income and relatively less resource input. In addition, it was established that men had moved outside homestead in search for non-farm income as women were left with all activities related to fodder establishments. Therefore, the study envisioned that women and men empowerment be carried out on other scientifically researched types of fodder. It could entail building capacity of all members in households to overcome socio economic and other power inequalities; in context where these abilities were previously denied. This as an expansion effort towards fodder establishment and conservation technologies.

4.5 Status of Adoption of Dairy Farming Technologies by Rural Women Dairy Farmers

The study sought to find out the status of adoption of dairy farming technologies by rural women dairy farmers in the study area. It was found out that the status of adoption was low as shown in Figure 4.3.
Figure 4.3: Status of Adoption of Dairy Farming Technologies by Rural Women Dairy Farmers

All respondents (100%) confirmed low status of adoption of dairy farming technologies. In addition, the key informant classified progress of adoption as slow, low, and selective; singling out family priorities on pressing basic needs and poverty. This might be an indicative of more unknown barriers that are slowing rural women from adopting dairy farming technologies. In response to the question on reasons for low status of adoption during FGDs, respondents disclosed resource constraint in form of land being unavailable and low disposal income divided between family welfare and dairy technologies management.

The FGDs also disclosed that allocation of farming activities on available land was the role of men. On their part nevertheless, men tended to place priority on food crops as well as sugarcane growing at the expense of dairy farming. Other established causes of low status of adoption during FGDs were the experienced low farm gate milk prices, distance
from main dairy markets, and inability by the County Government to establish milk market structures.

This was also pointed out by key informants that,

“Based on poor structures, some rural women here sold off adopted cows and they are planting fodder for sale to other dairy farmers” (KIs NGOs Representative)

From the view of respondents, it was pointed out that dairy farming activities in the study area were not taken as an economic activity but rather on basis of individual household gender needs, roles, responsibilities and power relations in term of resource allocation; resulting in the low status of adoption of dairy farming technologies. It could also be ascertained that low status of adoption was due to family preferences and unavailable disposable resources to meet immediate family needs as well as the complexity of managing dairy farming technologies. The findings are in line with Social cognitive theory of gender development and differentiation Bassey and Bandura (1999) positing that gender differences were fundamental phenomenon that affects virtually every aspect of rural women dairy farmer’s lives.

In conclusion, socio economic factors, gender needs, roles, responsibilities and household power relations determined the status of adoption. It was established that in many households in study area, land activities and resource put was planned by men. This implies that most women were left out in decision making concerning land and activity allocated to it. As such, household gender differences are likely to influence women’s capability of dairy technology’s choices and capacity to adoption. In this regard, therefore, implementers should note the different roles played by women and men as well
as involvement of both genders in the dairy farming technologies calendar. This, as a way to ease tension, coping with technologies awareness processes and improved the status of adoption.

4.6: Determinants of Adoption of Dairy Farming Technologies

This section discusses the third specific objective of the study which aimed at identifying constraints of adoption of dairy farming technologies among rural women in Khwisero.

Table 4.6: Determinants of Adoption of Dairy Farming Technologies

<table>
<thead>
<tr>
<th>Determinants of Adoption of dairy farming technologies</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of formal education</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Level of involvement in decision making</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Cultural values and norms</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td>Cost and Dairy farming technologies characteristics</td>
<td>10</td>
<td>22</td>
</tr>
<tr>
<td>Unforeseen risks and uncertainties</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Resistance to change to new technologies</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td><strong>45</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.6 indicates a mixture of determinants that adversely affected rural women dairy farming technologies adoption. The results show that 27% of respondents in Khwisero reported cultural values and norms as a determinant to adoption while 22% observed cost and dairy farming technologies characteristics. The level of involvement in decision making (18%) and unforeseen risk (13%) of technologies was also indicated as a determinant in adoption by respondents. The other determinants thus Level of education and resistance to change to new technologies were 11% and 4.4% respectively. These are discussed here below,
4.6.1: Cultural Values and Norms

Cultural values and norms (26.7%) determined adoption of dairy farming technologies. A further finding from key informants revealed that culture played an important role through rural women socialisation, peer effects and norm-based flow of information; affecting how adoption took place. Key informant further observed that cultural norms had effect on information processing capability hence technology’s awareness messages perceived as complex and competitive to traditional practices. This, in turn affected the rate of diffusion of technologies as explained by key informant.

A key informant also held that there was interplay between culture and rights to land ownership. An example was given on land rights being only accorded to men spouses and upon their death the same were passed on to sons. Furthermore, stated that there were elaborate conflicts in resource allocation in polygamous families in the study area. Further, observed that sharing land among cowives made them unresponsive to the adoption of dairy farming technologies. It can be deduced that land ownership and activities allocation is taken as the role of men. As such, women might not greatly take advantage of the wide range of dairy farming technologies associated with ownership and control of land.

A key informant also informed that rural women’s ignorance of their rights to land and lack of dissemination of the legislation to the grassroot levels made women to lag behind in resource ownership in comparison to other Counties. It is apparent in study area that men enjoyed rights of land ownership than women. Further added that the rights were influenced by cultural values and norms through socialisation on gender roles. On the same note, key informant held that implementers focused more on technical application
of technologies than put in considering the gender perspective on resource allocation for technology uptake. Key informant concluded on the need to put in considering the role played by rural women and repackage the information to include land and it is allocation to specific dairy farming technologies in place. In addition, called for inclusion of stakeholders, for instance, Ministry of lands in sensitisation on land policies regarding women and men ownership. This, as a path to increasing rural women’s access to land and properties right, remove gender disparities in resource ownership, and promote adoption.

Another key informant also stated that men had full ownership of family property and implied that immediately dairy farming technology entered a homestead, it became the property of household head; that is to the man of the house. Further, explained that lack of property ownership placed rural women at a reduced level of advantage in areas of security of home and in adoption of dairy farming technologies. Consequently, awareness on existing land laws and sufficiency in legal redress should be taken as one step in effort to increase rural women access to resources and in adoption as reported by key informant.

Land ownership is a key factor in dairy farming technologies adoption. Dairy farming technologies adoption require space, time and labour in order to derive benefit. In view of land ownership as reported by key informant, greatly affected rural women more than men, yet they were the target in implementation of dairy farming technologies. This might also be the reason to dairy farming technologies adoption being higher in groups than at household level. Accordingly, technologies implementers should take into account
the gender dynamics in resource put and it is significance in adoption of technologies as one way to reduce land ownership barriers and accelerate adoption by rural women.

A further interview with key informant pointed out that women had been socialised to respect and depend on men, denying them autonomy. This was with an exception of few economically empowered married or single women. The key informant was quick to single out the fact that women with autonomy were labelled in the society as rebels. It made them be stigmatised and detached from adoption of dairy farming technologies. This means that women irrespective of a level of empowerment would not make decision on dairy farming technologies adoption. Key informant called for implementers to look into unforeseen gender biases in terms of technologies’ application, labour requirements and accessibility. This as a mean to grant women independent autonomy of choice and selection of dairy farming technologies.

On another point, a key informant, disclosed lack of in-service training on gender roles and their applicability in trainings to extension officers as a long standing constrain on adoption of dairy technologies in the study area. When the sentiment was posed during interview with another key informant, it was established that most rural women were driven by customary law of patriarchy and gender roles tended to favour men than women. In addition, pointed out that traditional structures denied women representation in village land and asset ownership committees which acted as scare to women in adoption. From the findings, gender differences in roles, rights of resource ownership, and lack of inclusion of information on gender roles in awareness determined the rate of adoption of dairy farming technologies by rural women in study area. In summary, gender mobilisation and joint awareness with implementers using a variety of pathways,
and inclusion of topics related to household gender concerns could be a better mechanism to break the customary laws affecting rural women in adoption.

During FGDs, one respondent narrated thus,

“Implementers of dairy farming technologies follow traditional socialisation where more farm work activities are assigned to women than men. Men attend most workshops as women are left to carry out fodder establishment in the model farms and feed cows” (FGDs Mundaha)

From the sentiment, socially constructed norms had been embraced by implementers to believe women are active farm workers while men were upheld as seekers of information. This might as well be one cause of low status in adoption that can be attributed to lack of exposure to outside realities. It was also learnt from FGDs that social cultural perspectives diminished the role of women, denied their individual needs and ways of meeting those needs; hence acted as push factors against adoption.

In another FGD in Munjiti, a respondent expressed concern that;

“Certain taboos does not allow adoption of technologies. For example, implementer require us using maize as fodder for cows than grain for our family food. When maize fodder is given to cow, community might get natural calamity of not getting rain leading to hunger” (Woman respondent, FGDs Munjiti)

The sentiment reveals that some dairy farming technologies practices not compatible with communities, culture and tradition. A typical example, as pointed out above in FGD, is value attached to maize crop cannot permit their use as a fodder production to feed cows. As such, training and exposure to the successful stories of dairy farming technologies could help to break the long-time culture and tradition phenomenon.
From the argument, it can be concluded that persistent cultural values and norms lead to gender inequity and inequality in term of household hierarchy of powers, resource ownership, participation and role allocation which as a result determined adoption of dairy farming technologies. The statement is supported by the work of (Makokha 2005 and Luyomba 2014) that traditional norms and historical injustice on women are a hindrance to adoption of dairy farming technologies. The findings on lack of dissemination of the legislation to the grassroot are in line with a study by Muriuki et al. (2017) who observed that there are many publications on policies related to dairy development and gave an example of the National Livestock Development Policy which has not been disseminated in rural areas and affected processes in adoption of dairy technologies. Besides, Anuonka et al. (2015) posited that women’s access to, ownership of property and rights especially in regards to land, as a basis for adoption and survival of technologies. Likewise, the social cognitive theory of gender development and differentiation Bassey and Bandura (1999) can be employed which holds that gender differences are socially constructed; and most of the stereotype’s attributes, and gender roles arise from cultural norms/practices.

Therefore, it can be summarised that dairy development agencies should take affirmative action and ensure direct participation of women and men in dissemination of technologies. This would ensure contribution and input from men on gender roles and implication of customary laws in adoption of dairy farming technologies at village level.

4.6.2: Cost and Dairy Farming Technologies

Table 4.6 above, showed that 22% of the respondents indicated that cost and dairy farming technologies characteristics were a key determinant in adoption.
This was consistent with socio demographics characteristics where women respondents disclosed an average income per month of Ksh. 2000 obtained from off farm activities. This kind of income would make adoption almost impossible due to its direct competition with the basic needs’ requirements. Key informant expressed low income coupled with low knowledge on resource mobilisation, savings, and lack of registration of rural women dairy farmers groups as legal entities, relegated rural women to spectators of technological investment. Adaptability of dairy farming technologies is a factor of finance availability. Another interview with key informant revealed low income to access to fodder production inputs and external inputs from agro veterinary supplies to manage cows. Further, singled out that banks demanded collateral; situation often difficult for most women who have no rights to family resource ownership. Rural women empowerment to form credit scheme to assist in financial needs was suggested by key informant as a reasonable approach to improving rural women income stability and promote adoption of dairy farming technologies.

In another interview, a key informant observed that cost constraints in terms of distance from extension officers, model farm training and milk market centres a determinant in adoption. The officer argued that location from household was a factor as the further the location, the higher the improbability of rural women willing to spend time and money to access services. This could also be attributed to workload and schedules ranging from household chores to farm work that gave rural women little time to participate in activities far away from home. As such, dairy farming technologies implementers should ensure all components required in management of technologies are in closer proximity of the dairy farmers.
Similarly, a key informant also noted that unwillingness of rural women to incur cost to adoption was caused by the nature in which dairy farming technologies were introduced into the County. The officer regretted that NGOs and the County Government smallholder dairy initiatives programmes introduced exotic cows and fodder establishment as a corporate welfare to improve household nutrition which had rendered dairy farming a social welfare item rather than an economic one in the study area. The findings from the FGDs echoed this view that cost and dairy farming technologies characteristics determined adoption. This was articulated by one respondent in FGD who said,

“Low income from sale of vegetables and cash crops cannot meet family needs and manage technologies” (a women in Munjiti FGDs)

From the comment, it could be deduced that rural women generate income from sale of farm produce. However, the income could not meet their respective household basic needs and in adoption of technologies. It was also reported in one FGD that there was a level of dynamics of how different resources generated within household were accessed and accounted for by household members. As such, it deems necessary for the implementers to determine intra-household resource distribution as a factor in adoption of the technologies. Combination of dairy farming technologies with other food crops that could bring faster and higher returns to meet the family basic needs and manage process of adoption of dairy farming technologies was also recommended in one FGDs.

In another FGD, discussants intimated that low knowledge on money matters, long waiting period to reap benefit, low off farm household income that could not meet pressing basic family needs, high cost of external input to manage technologies and
experiences from past technologies were a limitation to adoption. On the basis of the results obtained in the study, it meant that rural women low level of financial knowledge was aggregated by structures in institutions that focused more on technical support than financial empowerment.

Technologies characteristic were also reported a determinant in adoption of dairy farming technologies during FGD. It was mentioned that women were overburdened with domestic activities and any technology that would add work load was not attractive to rural women. This sentiment seems to establish that rural women are not well updated on the advantages and disadvantages of technologies. This might be a cause of them perceiving technologies as complex and labour intensive. Other comments that emerged from FGDs were use of model farms verses individual farms. Concerns in FGDs were raised that majority training was carried out in model farms that are under best environmental controls and management practices which could not bring same result when carried out at farmstead. From the basis of data collected, implementers need to show case the technologies process and results of technologies at women’s household farms than at the model farms only. This, to ease ambiguity in adoption of dairy farming technologies. The findings are affirmed by several studies that technology characteristics determined adoption among rural women (Makokha, 2001; Ouma et al., 2002; Reardon et al., 2007; Ellis & Freeman 2004; Diro, 2013; Mulugeta et al., 2001; Muchangi 2016).

4.6.3 Involvement in Decision Making

Results in Table 4.6, further, show that 18% of the respondents specified involvement in decision making as determinant in adoption of dairy farming technologies. The key informants interviewed were not certain on the involvement in decision making as a
determinant in adoption of the technologies. In one interview, key informant observed that despite the historical Luhya culture where men were the sole decision makers in all matters pertaining to household resources even where a woman had income, the recent observed trend has been men leaving women to make most of farming decisions. Seemingly, this could be due to men accepting the roles of women in farm activities and provision of family food security. Furthermore, it was reported that a majority men ventured into non-farm income for instance Boda Boda (public transportation using motor bikes) business, and other related white-collar jobs. In this case, effects of involvement in decision making in technology adoption can be twofold; from implementer’s and at the household level. Implementers might be selective in technologies that meet their goals at expense of rural women realities; while at household level, the gender power relations and hierarchy of powers may limit rural women decision making in adoption of technologies. Thus, implementers ought to involve rural women in decision making. One way might be through seeking their opinion on types of technologies presented and inclusion of their men counterpart during awareness of technologies. It can also be achieved by involving women representatives in the actual discussion before a dairy farming technologies project launch. Therefore, rural women should not be perceived as adopters of dairy farming technologies only, but rather as part of dairy farming technology development.

A woman key informant objected to the idea and stressed that women could only make decision after consultation within the family, and added that it varied from family to family. In another meeting with Dairy Manager who was also a key informant, she
observed that decision making depended on communication structures and family priorities.

Consultation, communication structures and family priorities as established influenced decision making. Therefore, creating a platform that could enable all adult individuals in a household to be involved during the awareness stage of a project could encourage women inclusivity in decision making and thus enhance adoption.

However, women in FGDs maintained that there was low level of involvement in decision making both from the dairy technology implementers and within their respective households. In one FGD, it was disclosed that authority to make decision on adoption of dairy technologies in households was only done after consultation with adult men in family or men opinion leaders in the village. A part from consultation, respondents stated that authority was only granted by men based on perceived immediate benefit to family and as such decision making becomes a determinant in adoption. It also emerged from respondents during FGDs that men gave rights to acquire dairy farming technologies but limited rights on access and use of benefits from technologies; leading to low interest from women to adopt dairy technologies. Since gender roles and power relations issues seems to cut across all areas of dairy farming technologies adoption, there is need for the technology’s implementers to know how programmes are likely to affect the social relationship among different members in households.

In another FGDs, it was established that right to decision making in household depended on marital status and type of marriage. This was held by one respondent who informed;
“A polygamous man does not allow women to make decision due to resource constraint and fear that if one woman adopts and other left out would bring a conflict in the family” (FGDS Mundaha)

From the sentiment, it might mean that the level of consultations, preferences of men as opinion leaders, type of marriage and lack of authority by women to use benefits from technologies affected household decision making; hence a determinant to adoption. As such implementers should target all members of household during dissemination and also carry out needs’ assessment after each stage of disseminations. This would enable to gauge the perceived benefits to individual adult member in a household. This could also increase women and men inclusion and reduce barriers to decision making in adoption.

The research further wanted to find out the mode of decision making in a female headed household in regard to adoption of farming technologies. A female key informant pointed out that a decision to adopt dairy farming technologies by single women or widows would only occur in household that had no adult men. This could mean socially ascribed gender roles are predominant in the study area that women are viewed lesser in decision making irrespective of their position in a household. Therefore, implementers should address gender power relations at every stage of awareness creation. This could be through planned field trips to other counties practising dairy farming to expose women and men to cultural diversity and women roles in dairy farming. This might be an eye opener in decision making and may result to women taking up decisions on adoption of technologies.

Another male key informant, an extension officer, stated that female headed household mostly sought the opinion of leaders in the village and dairy practitioners before they
made a decision. On other hand, FGDs revealed that most of rural women could not easily come up with a decision to adopt dairy farming technologies due to fear that when a decision does not bear fruit, they would be blamed for it.

From the findings, it could be concluded that rural women involvement in decision making was a determinant in adoption of dairy farming technologies. Inclusion of rural women dairy farmers in technological process of adoption might be reasoned out to mean involvement in actual discussion before implementations and seeking their ideas at household level. Women consulting their men in decision making could be construed to mean that rural women in Khwisero lacked resource ownership, authority to fully exploit resources at their household, in addition to patriarchal structures and expectation. These might have had implication in decision making and led to low status of adoption of dairy farming technologies. These findings are supported by social cognitive theory of gender development and differentiation by (Bassey and Bandura 1999) and Makoro et al. (2015) who posit that the adoption of technologies was a function of the level of inclusion and decision making by the users of the technologies.

4.6.4: Rural Women’s Education Level

Table 4.6 on page 58, shows that 11% of respondents revealed that level of formal education was a determinant in adoption. The level of education was an individual woman characteristic as reported in key informant interview. This was explained as a form of individual woman ability to comprehend the technologies’ characteristics and attributes. Key informant argued that low level of education affected the basic processes relating to communication of information, knowledge and skills, exchanging opinions
and experiences. This might have meant that formal education could create a desired change in adoption of dairy farming technologies by rural women dairy farmers.

Other responses from key informants interviewed brought out different perspectives albeit related to the level of education and behavior change. An interview with a female key informant supported the idea that level of women education a determinant to adoption of dairy farming technologies. She based this on the awareness process and stipulated that low level of education among rural women in study area inhibited the assimilation of information and understanding of different dairy farming technologies. This might mean rural women had challenges in application of different dairy farming technologies learnt at individual household level, hence affected the adoption of technologies.

Another interviewee was also in agreement that low level of education a main problem in adoption of dairy farming technologies. She conceded that education was important in adoption as it explained individual responsiveness to change, assisted the understanding of extension education as it was taught without it being translated into another language. Accordingly, these factors could lead to loss of meaning in trying to explain technical terminologies in a local language. For instance, most technologies are scientifically researched and given English terminologies; required a level of education for individual understanding. Therefore, different pathways with different extension agents of various types and background should be used in contribution to rural women understanding and technology adoption.

There was a contradiction with a majority male key informant who said that education had no effect in adoption of dairy farming technologies. In one interview, key informant
argued that most dairy farming technology awareness was demonstrable in a model farm. He therefore concluded that rather, limited exposure of rural women to other counties where dairy farming is undertaken as a business was the culprit. Women exposure outside their local realities through exchange programmes would hence enlighten them on dairy farming as an economic enterprise according to the respondent. It is possible that technology implementer had overlooked the importance of rural women education capacities and capabilities in adoption of dairy farming technologies. As such, joint planning during implementation and knowledge transfers might dramatically offer rural women new opportunities to close the gender disparities in adoption of the technologies as well as utilisation of technologies in development of human and material resources. Another male key informant too was not in agreement that level of education per se a determinant in adoption. He expressed low allocation of funds to extension department, and synergies among implementers a determinant in adoption and follow up trainings of dairy farming technologies. The role of county government to establish structures and framework for dairy technologies implementation was observed as lacking by key informant. For instance, it was reported that structures and framework that could improve adult education and training in technologies adoption included equitable distribution of resources, decisions that influences the level and adaptable technologies in rural areas. In addition, clarified that stronger linkages through public private sector in research, extension and training services was for sustainable adoption of technologies. This, was justified by key informant as a better mechanism to stimulate learning and understanding dairy farming technologies in local context.
To confirm this, the same question was raised during FGDs and respondents were of opinion that;

“Low level of education was a hindrance to adoption because of different technologies that are taught at the same time, having different procedures to follow, and required different ways of managing them” (FGDs Munjiti)

The above reveals that different technologies, with different procedures of application required a level of education. In most instances, implementers packaged and created awareness of all dairy farming technologies together as expounded during FGDs. Despite a majority woman views that level of education a determinant in adoption, men key informant was of contrary opinion. This might be interpreted to mean a lack of gender analysis on rural women and men education levels as well as assumption of implementers that based their approach on model dairy farms demonstrations. Although field demonstrations were done, rural women might require a level of education to help differentiate one aspect of technology from the other. As a consequence, the assumption could be misleading as not all rural women will perceive technologies the same way hence education became a determinant to adoption of dairy farming technologies.

The analysis of study also revealed resistant to change, unforeseen risks and uncertainty as determinant in adoption. This could be linked to the assumptions held by implementers on rural women level of education as well as approaches used in dissemination of the technologies. However, interviews with majority key informants elucidated that resistance and uncertainties’ were caused by implementers desire to meet deadlines of their project goals without focusing on women socialisation in terms of gender roles as well as gender disparity in resource ownership and control. One key informant
categorically stated that men’s fear of empowered women as an impediment to adoption. He asserted that men feared women could get benefits from their resources and run away or become unruly in the home. The fear could be related to awareness that targeted more women than men in awareness. Consequently, men not fully informed on intra-household interaction changes resulting from technologies outcome became a determinant in adoption.

Further, discussions with the FGDs revealed that;

“There is a level of resistance and risk uncertainty to adoption because several NGOs and county government extension promote same dairy farming technologies with different procedure which has penalty if not followed. They also assume all women in the groups are same with same resources within family, which is a problem” (Key informants Mundaha)

From the above comments, it could be implied that the level of resistance to change and fear of unforeseen risk was as a result of different assumptions and procedure on dissemination of technologies that override the existing women practices. It could also be deduced to mean uncertainties were as a result of failure of NGOs and county government as implementers to embrace aspect of social justice during implementation of dairy technologies. As such, rural women might have felt lack of fairness and equalities, as a right to all members in the community; in the outcome of development, through processes of social transformation.

This could in addition, inform, that implementers tended to put their project interests first without putting into consideration the needs and local realities of rural women in study area. This may conceivably be a source of resistance to change, unforeseen risks and
uncertainties”; thus, a determinant in adoption of dairy farming technologies. This study findings on level of education, resistance to change, unforeseen risk and uncertainties’ are in line with (Gitonga, 2010; Tefera et al. 2014; Wafula, 2014; Obayelu et al.2017) studies in Kenya, Ethiopia and Nigeria respectively that process of technology awareness and farmers exchange programmes determined adoption of technologies. The finding is supported by (Makokha, 2005; Wakhungu, 2007; Nalunkuuma 2013) study outcomes positing that resistance to change was an aspect that led to less effort in adoption of dairy farming technologies by rural women. It is also in line with innovation diffusion theory of Evertt M. R., (2003) which held that adoption of technology is determined by the process of diffusion from one system to the other.

In summary, level of education, resistance to change and the unforeseen risks from the technologies determined adoption. Specifically, dairy technologies implementers should carry out an assessment on rural women statuses, embrace gender inclusive approaches and organise awareness as per assessed needs than treating all rural women as homogenous groups during disseminations. In addition, they should be objective, exhaustive, open to elaborate out the merits and demerits of technologies during disseminations. It therefore requires county government together with other dairy development agencies to develop a unified training approach that could drive dairy farming technologies awareness and sustainable use among rural women; with duplications and clashes.

4.6.5 Summary of determinants of adoption of dairy farming technologies

From the findings, the study established different determinants of dairy farming technologies. This were cultural values and norms, cost and dairy farming technologies
characteristics, level of women involvement in decision making to adopt technologies, fear of unforeseen risks and uncertainties, rural women level of education as well as resistance to change to new technologies. The study also identified that cultural values and norms led to gender inequity and inequality in term of household hierarchy of powers, resource ownership, participation and role allocation which as a result determined the level of adoption of dairy farming technologies. On regard to cost and dairy farming technologies characteristics, the study learned that rural women low income, low knowledge of resource mobilisation, and distances to access information and inputs determined adoption. Furthermore, the level of rural women involvement in decision making was established as determinant in adoption. This was linked to two folds; implementers and at the household level. The study established that implementers put interest on project goals at expense of rural women gender needs. In addition, it was found out that household power relations and hierarchy of power limited women decision making in adoption. On other hand, the study identified fear of unforeseen risk and uncertainties attributed to lack of gender inclusion in technology awareness. The level of education was perceived as determinant to adoption. This was also identified in demographic characteristics that a majority rural woman in study area had primary level of education. The low level of education was associated with lack of women exposure to other counties practising dairy farming as a business.

Therefore, the study concluded that implementers take affirmative action and ensure direct participation of women and men in dissemination of technologies. This would account for unified knowledge and input on gender roles in adoption of technologies. In addition, dairy development agencies ought to use multisectoral and multifaceted
approach in order to minimise constraints in adoption of dairy farming technologies among rural women in study area.

4.7: Strategies for Enhancing Adoption of Dairy Farming Technologies by rural women

This section, presents findings on suggested strategies to adoption of dairy farming technologies among rural women dairy farmer in Khwisero. Findings are shown in Table 4.7 below,

Table 4.7: Strategies to enhance adoption of dairy farming technologies

<table>
<thead>
<tr>
<th>Strategy to enhance adoption of dairy farming technologies</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement on training methods and frequency</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>Promote more women mentors in rural areas</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>County Government and NGOs support</td>
<td>12</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>45</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Table 4.7 portrays that 40% of the respondents were of the opinion that improvement on training methods and frequency of training a mechanism would enhance adoption; while 33% suggested the need to promote more women as mentors. On the other hand, 27% indicated support from the County Government and NGOs as a way to enhance adoption of dairy farming technologies. Whereas, information was a key to rural women making sound decision in adoption, there might be no guaranteed procedure to ensure transfer of technological knowledge. The question on training methods as a strategy to enhance adoption of dairy farming technologies was asked and different interviews with key
informants yielded varied answers. In one interview, it was stated that information packaging to promote gender equity in access and utilisation of resources should be included in future trainings. This, a way to promote household equality; embrace inclusivity of both women and men in decision making as well as encourage allocation of household resources in dairy farming technologies adoption as identified by key informant. It is therefore crucial that implementers put into account a gender-based selection criteria that will enable most women and men access information and awareness of gender implication in adoption.

In another interview, there was a question seeking information on whether there existed training and demonstration farms in each sub division as training centres. In response, a key informant confirmed availability and accessibility of training centres at no costs. He however noted that to enhance future adoption, dairy development agencies in their intervention should explore use of integrated, systematic participatory methodologies; to diagnose socially constructed norms and their applicability in dairy technology trainings. One way, as reported, was to promote integrated and systematic approach is reach out to all farmers through allied field days organised in villages and Dairy Farmers Cooperative society centres; accompanied with exposure field visits, attend to county, national and international exhibitions. As consequence, implementers could embrace use of joint trainings presented by professionals drawn from different backgrounds in extension, for instance, agribusiness, sociology, gender and development. All these to enhance the women knowledge on dairy farming technologies, provide encouragement and social guidance to adopt these technologies. The suggested measure could as well
draw an all-inclusive gender framework of training to ease household decisions and foster more adoption of dairy farming technologies.

FGDs, suggested the promotion of more women mentors. However, a key informant stated that the use of women mentors was regarded as a biased strategy. He suggested that gender sensitisation training initiatives to all extension personnel to navigate perception change within male dominated extension, research bureaucracies and donor agencies as a more proactive approach to adoption of dairy farming technologies than women mentorship. Conversely, an extension officer endorsed development of specialised gender training materials such as posters and designing a method for gender analysis aimed at challenging socio-cultural bottlenecks to adoption of dairy farming technologies. From the sentiments, there was a need for integrated training approaches that gradually envelop the ingrained traditional sex differences in roles and responsibilities as a strategy to enhance adoption of dairy farming technologies by rural women dairy farmers in study area. This could be short and long duration training programmes for both men and women on implication of socio-cultural norms in adoption.

Another key informant brought out different views on the role of the County Government and NGOs support as a strategy to enhance adoption and sustainability of technologies. In one interview, a key informant suggested that County government and NGOs as implementers needed to dedicate time and connect with local administrators. Considering the role played by local administrator in most rural areas as family mediators, handle varying societal roles and act as opinion leaders to influences decisions in community. Key informant recommended one way would be to carry out a gender need-based assessment through local administrators, gain understanding on community structures and
infrastructure requirement for successful implementation of dairy farming technologies. In addition, stated that gender need-based assessment could be done through formal commitment to develop a culture that builds respect, inclusiveness, promote project diversity and embraces men and women uniqueness’s in adoption. The suggested strategies might be interpreted as a path to aid implementers to clearly understand the gender dynamics and structures in place for dairy farming technologies adoption.

Another key informant advised that the County Government be proactive in strengthening existing extension services and build capacity of extension personnel on gender issues in dairy farming technology trainings, as a strategy to ensure equal participation in adoption. Further, explored that adoption was a factor of access to technical know-how to reduce knowledge gap and support mechanism in management of the technologies. Therefore, clarified that strengthening existing extension services would require county and national government as policy holder to carry out comparative analysis of current different extension strategies. From the key informant perspectives, it might mean, transforming and strengthening a more practical driven extension system that help rural women in dealing with escalating changes in dairy farming technologies to improve the adoption status.

Further, another key informant stressed that aid in facilitation and donation of dairy farming technologies to rural women should be withdrawn. He suggested that dairy stakeholder ought to pursue for an alternative technique that could entice rural women to incur costs and invest in dairy farming technologies as an enterprise. Key informant commented;
“In order for rural women to invest in dairy farming technologies, financial knowledge, resource mobilisation and flexible ways to access credit facilities would be a better mechanism for initial adoption.....”

Above statement, could be deduced to mean, financial knowledge, a strategy to empower women economically and put them in a position to seek financial services for sustainable dairy farming technologies adoption in study area.

Dairy Farmers Co-operative Society Manager; who was also a key informant advocated for the County Government to strengthen structures and systems to address challenges on land ownership, and provision of security of tenure. Land ownership in most instances in rural area was communally owned and governed by customary law of inheritance. It therefore calls for education of rural women and men on implication of customary laws, in respect to land ownership not only to dairy farming technologies adoption but to overall household land economic activities. This strategy might in turn encourage investment in dairy farming technologies by rural women.

Another key informant proposed that the County Government should align with NGOs on standard operation procedures, create linkage in information flows, and develop collaborative effort to steer dairy farming technologies adoption agenda in the county.

The question of this support initiative as a strategy to enhance adoption was put forth during FGDs too. Respondents in FGDs recognised the role played by NGOs and the County Government in facilitation and provision of incentives in dairy farming and suggested inclusion of other food crop technology for immediate and long-term benefits. For sustainable dairy farming technologies’ adoption, dairy farmers, NGOs and county government may require to revisit their primary goals. In addition, reach formal agreement on strategies needed in their effort to improve livelihood of rural women and
development. These a path to ensure different partners play a more effective role in achieving these goals.

During FGDs, respondents also settled on promotion of women mentor and rewarding women role models as a mechanism to stimulate effort of others in adoption. It can be concluded that the use of women mentorship in addition to linking it to the changing gender dynamic structures are strategies that might enhance adoption of dairy farming technologies.

In another FGDs, respondent advocated for use of vernacular radio in sensitisation on the role of men and women in adoption of technologies. They indicated that sensitisation should also shed light on customary laws and its implication to dairy farming technologies. The strategy ought to be away to content cultural impediment in dairy farming technologies adoption.

In one FGDs, preference was on use of farmer to farmer training as a candid strategy to enhance adoption; and a pathway compatible to the needs of rural women who had to juggle dairy farming activities with household chores. This was observed as an action-based plan geared to help future dairy farming technologies stakeholders in putting inconsideration the gender needs, roles and responsibilities before roll out of programme activities. Other views that emerged from FGDs were for implementers to come up with mechanisation technology like small tractors to dig and weed land to reduce labour challenge. Therefore, it could be concluded that establishing normative framework by county government and collaborative effort to address the gender roles a more proactive strategy to enhance future adoption of dairy farming technologies among rural women dairy farmers in Kakamega County, Kenya. This finding was in line with (Doss 2001;
Odongo 2010) that effective partnerships and collaboration with other interested organisations could be an avenue to generate substantial synergy to accelerate the adoption rate of dairy farming technologies.

4.7.1 Summary on strategies to enhance adoption of dairy farming technologies by rural women

From the findings, rural women dairy farmers as well as key informants suggested different strategies that would enhance adoption. The strategies included improvement on training methods and frequency. This was counted on use of integrated training approach through information packaged to promote gender equity and equality in adoption. In addition, promotion of more women mentors and rewarding women role model in dairy farming technologies’ adoption was foreseen as a strategy to help appreciate women and cultivate improved adoption. Other established strategies were, strengthening the capacities of extension officers, understanding gender needs, motivating women to invest as well as NGOs and county government developing a unified approach in dissemination among other strategies. As such, integrated, multisectoral and multifaceted approach that is inclusive of both men and women in a broader strategy to enhance adoption of dairy farming technologies in study area.
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarises the findings of the research, conclusions and provides recommendations in line with the research objectives and areas of further study.

5.2 Summary

This study investigated determinants of adoption of dairy farming technologies by rural women of Khwisero, Kakamega County, Kenya. It responded to four specific study objectives: to identify the existing dairy farming technologies among rural women in Khwisero, Kakamega County; to establish the status of adoption of dairy farming technologies among rural women in Khwisero, Kakamega County; to find out constraints of adoption of dairy farming technologies among rural women in Khwisero, Kakamega County and to explore strategies that would enhance effective adoption of dairy farming technologies among rural women in Khwisero, Kakamega County. The study concentrated on three areas of dairy farming technologies namely; exotic cows breed, fodder establishment and conservation technology.

The existing dairy farming technologies were mainly cross bred cows, improved variety nappier grass and sweet potatoes vines implemented on small portion of land. This was advanced through NGOs and the County Government dairy farming support initiative programmes. Fodder conservation technologies were the least adopted by rural women dairy farmers.
On regard to the status of adoption of dairy farming technologies, slow and low progress in adoption was identified in comparison to amount of time and expenditure spent in awareness creation. Sociocultural and institutional determinants were established as important determinant in adoption of dairy farming technologies by rural women.

Strategies that would enhance dairy farming technologies adoption was found in two different levels; first, strategies to accelerate women responsiveness to training and adoption of dairy technologies. It was found out that dairy farming technologies implementers needed to continuously invest in studying the changing conditions of social-economic factors, agro-ecological context, gender roles, the extent and depth of gender inequalities that hindered rural women’s participation in dairy farming and the opportunities for promoting equality. This should be an integrative strategy to gender equity tailored in all awareness training of dairy farming technologies. Furthermore, strategies that could minimise constraints experienced by rural women in adoption of dairy farming technologies were welcome. The County Government needed to develop a normative framework and collaborative effort to curb gender aspects in order to enhance future dairy farming technologies adoption among rural women dairy farmers in Khwisero, Kakamega County, Kenya.

### 5.3 Conclusions of the Study

In conclusions, this study established that rural women were acknowledged as important actors in dairy farming. This was observed in awareness that targeted a majority rural woman dairy group. The technologies were envisioned to contribute substantially to the household livelihood, and more rural women dairy farmers stood to benefit more from dairy farming enterprises. However spatial differences in the rates of adoption of dairy
technologies, in the face of the available opportunities, in part reflect the existence of impediments to dairy development in Khwisero sub-county. The study revealed that the status of adoption of dairy farming technologies still remains low due to sociocultural and socio-economic constraints in adoption. From the perspective of this study, the solution to increasing adoption of dairy farming technologies in Khwisero was dependent on many determinants including the need to have an integrated, multifaceted approach and addressing gender concerns that inhibit adoption of dairy farming technologies by rural women.

5.4 The study recommends:

1. The study recommends gender need-based assessment carried out, sensitisation on gender concerns and policy development in all processes of dairy farming technologies adoption.

Specifically, the study calls on all key dairy stakeholders to carefully evaluate their dairy farming activities and programmes, approaches and incentives in process of implementation to rural women. This course of action might reduce the resources incurred on trainings and awareness to rural women dairy farmers, who in the process disadopt dairy farming technologies.

5.5 Recommendations for Further Study

Based on understanding that this study focused on adoption of dairy farming technologies by rural women of Khwisero, Kakamega county; Specific study be carried out to find the additional workload experienced by rural women in adoption of fodder establishment technologies, Kakamega county, Kenya.


http://www.fao.org/Wairdocs/ILRI/x5485E/x5485e0o.htm#dairy industry development policy and constraints


Western Kenya. University of Nairobi, college of agriculture and Veterinary Science.


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Annex 1. Questionnaire Survey

Dear respondent,

My name is Maindi Lilian Janetrix, a student at Kenyatta University currently pursuing masters’ degree in gender and development studies. I am carrying out a research on determinants of adoption of dairy farming technologies among rural women dairy farmers in Khwisero sub-county, Kakamega. I kindly request you to spare sometime to fill the questionnaire below with honesty and truth. The information that will provided will be strictly for academic purpose and it will be treated as confidential. Thank you in advance for support.

SECTION A: DEMOGRAPHIC INFORMATION

Location………………………………………
Sub-Location………………………………
Village………………………………………

1) Please indicate your age bracket
   21-35 years ( )
   35-50 years ( )
   51-65 years ( )
   Over 65 years ( )

2) Gender
   Male ( )
   Female ( )

3) Marital status?
   Married ( )  Single ( )  Divorced ( )  Separated ( )

4) What is your level of education?
   No formal education ( )  Adult Education ( )  Primary Education ( )
   Secondary Education ( )  college/ University ( )

5) Indicate your Occupation
   Dairy Farmer ( )  Mixed farmer ( )  Employed ( )
6. How many children do you have? .................

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under school age</td>
<td></td>
</tr>
<tr>
<td>In Primary school</td>
<td></td>
</tr>
<tr>
<td>In Secondary school</td>
<td></td>
</tr>
<tr>
<td>College/university</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td></td>
</tr>
</tbody>
</table>

7. How many members of family live on the farm? Indicate number
   Female (  ) Male (  )

8 a) How many members of your family participate in dairy farming activities?........... (Number)
   b) Of the family members above how many are
      Female (  ) Male (  )
   c) If some family members left the farm, why did they leave the farm?
      Due to lack of land (  ) Better Income (  ) Attitude on dairy activities (  ) Others (Specify)........

9. How do you rate your daily dairy farming workload?
   High (  ) Average (  ) Low (  ) Manageable (  )

10. a) How many workers have you employed on your farm?
    Less than 3 persons (  )
    3 to 5 persons (  )
    6 to 8 persons (  )
    b) Of those working on the farm, how many are aware of the dairy farming technologies?......

11. Please indicate if you are aware of any or all of the following dairy technologies
    a) Fodder establishment technologies (  )
    b) Exotic Cows (  )
c) Artificial Insemination (  )
d) Feed Conservation Technologies (  )
Others (Specify) ........................................

12. a) Which of the following fodder have you established on farm?
   Sweep potato vines (  ) Improved variety Nappier grass (  ) Lucerne (  ) Boma
   Rhodes grass (  )
   Maize fodder (  ) Sorghum fodder (  ) Caliandra hedge tree (  )
b) Which of the following dairy cows do you have on your farm?
   Exotic Friesian (  ) Cross bred cows (  ) Indigenous cows (  ) Mixed of all
c) Which of the following feed conservation do you have on your farm?
   Hay (  ) Silage (  )
d) Which method do you use to breed the dairy cows?
   Artificial Insemination (  ) Natural Mating (  )
e) Of the technologies adopted in (a) and (b) above, please give reasons for adoption……………………………………
f) If not adopted any of the (a) and (b) above technologies, please give reasons for non-adoption…………………………………………………………………………
   ........

13. Where did you get dairy farming technology from?.......................... (Name)

14. a) Apart from being a farmer, do you have any other form of employment? (Tick)
    Yes (  ) No (  )
b) If yes, how much income do you earn per month on average from off-farm employment?
   Less than 5,000 Ksh (  ) 5,000-10,000 Ksh (  ) 10,000 + Ksh (  ) Others
   (Specify) ............

15. What is your estimated income from dairy farming activities......... (Kshs per year)

16. Which income do you use to invest in dairy technologies?
   Sale of milk (  ) Sale of cows (  ) Sale of other crops on the farm (  ) Sale of milk
   and other enterprise on farm (  ) Income outside the farm (  ) Combination of all the
   above (  )

17. On your farm, please indicate who carries out the following activities; (F-Female; M-
    Male)
   a) Seed purchases (  )
   b) Fodder Establishment on the farm(  )
c) Weeding of fodder( )
d) Cutting of fodder( )
e) Transportation of fodder( )
f) Fodder conservation( )

18.a) Do you have feed storage? (Tick) Yes ( ) No ( )
   b) If yes, which type of feed do you conserve?
      Hay ( )
      Silage ( )
      Hay and silage ( )
      Others (Specify) ...........................................

c) Which of the following farm machinery is used at the farm
   a) Hay bailer ( )
   b) Wooden hay box ( )
   c) Silage tubes ( )
   d) Chaff cutter

19). In your own view, what are determinants of adoption of dairy farming technologies?.................................................................

20) Please suggest strategies that in your own opinion could enhance adoption of dairy farming technologies.................................................................

......

SECTION B: DETERMINANTS OF ADOPTION OF DAIRY FARMING TECHNOLOGIES AMONG RURAL WOMEN DAIRY FARMERS IN KHWISERO SUB COUNTY

In this section please tick (✓) the most appropriate response for each of the questions in the table below with the scores in the bracket. Strongly agree (SA) = 5, Agree (A) = 4, undecided (U) = 3, Disagree (D) =2 Strongly disagree (SD) = 1
i) To what extend do the following status of rural women determine adoption of dairy farming technologies

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gender has an insignificant determinant to adoption of dairy farming technology</td>
<td></td>
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<tr>
<td>2</td>
<td>Rural women dairy farmers with disposable income has the power to make decision to adopt to dairy farming technologies</td>
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<tr>
<td>3</td>
<td>Rural women dairy farmers with male headed household has power to make decision to adopt to dairy farming technologies</td>
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<tr>
<td>4</td>
<td>It is the responsibility of rural woman dairy farmer to decide on the technology to be adopted</td>
<td></td>
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<tr>
<td>5</td>
<td>Assets in the farm is seen as property of all the family members and not for the husband</td>
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<td></td>
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<tr>
<td>6</td>
<td>Availability of members in household to perform labour determines adoption of dairy technology</td>
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</tbody>
</table>

In this section please tick (√) the most appropriate response for each of the questions in the table below with the scores in the bracket. Strongly agree (SA) = 5, Agree (A) = 4, undecided (U) = 3, Disagree (D) =2 Strongly disagree (SD) =

ii) Determinants of adoption to dairy farming technologies among rural women dairy farmers in Khwisero Sub County

i) In your own opinion what are the main determinants of adoption of dairy farming technologies…………………………….
ii) In your own view, what strategies may be used to enhance adoption of dairy farming technologies………………………………………………………………………………………………

i) Below please indicate what best suits:

<table>
<thead>
<tr>
<th></th>
<th>Access to knowledge and input determines adoption of dairy farming technologies</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<tr>
<td>2</td>
<td>Rural women dairy farmers attitudes, beliefs and subjective norms determines adoption of dairy farming technologies</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Women will only adopt to what they term as culturally acceptable technologies</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Risk and uncertainty that men will capture benefits accrued from technology</td>
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</tbody>
</table>

In this section please tick (✓) the most appropriate response for each of the questions in the table below with the scores in the bracket. Strongly agree (SA) = 5, Agree (A) = 4, undecided (U) = 3, Disagree (D) = 2 Strongly disagree (SD) = 1

ii) Technology Characteristics as determinant for adoption of dairy farming technologies by rural women dairy farmers in Khwisero Sub County.

<table>
<thead>
<tr>
<th>Technology Characteristics</th>
<th>SA</th>
<th>A</th>
<th>U</th>
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<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Technology is adopted irrespective of land size</td>
<td></td>
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<tr>
<td>2 Flexibility and ease to use technology is adopted by rural women dairy farmers</td>
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<tr>
<td>3 Women will adopt dairy technology due to perceived labour reduction than productivity</td>
<td></td>
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<tr>
<td>4 Initial and running cost of dairy technology determines adoption</td>
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<tr>
<td>5 Women will only adopt to technologies that saves time and money</td>
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</tbody>
</table>

In this section please tick (✓) the most appropriate response for each of the questions in the table below with the scores in the bracket. Strongly agree (SA) = 5, Agree (A) = 4, undecided (U) = 3, Disagree (D) = 2 Strongly disagree (SD) = 1
### iii) Strategies that may enhance adoption of dairy farming technologies by rural women dairy farmers in Khwisero sub County

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Stakeholders should take in the views of rural women dairy farmers during design and implementation of technologies</td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>The training methodology and frequency of training determines adoption</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>More women should be promoted to rural areas to mentor on dairy farming technology</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>NGO’s facilitative and provide incentives for technology uptake and is sustainable</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>County Government dairy initiative policies and programmes enhance adoption</td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>
Dear respondent,

My name is Maindi Lilian Janetrix, a student at Kenyatta University currently pursuing masters’ degree in gender and development studies. I am carrying out a research on determinants of adoption of dairy farming technologies among rural women in Khwisero sub-county, Kakamega County. I kindly request you to spare sometime to allow carry out an interview with you on dairy farming technology adoption in the sub county. The information that will provided will be strictly for academic purpose and it will be treated as confidential. Thank you in advance for support.

1. a) Where do rural women dairy farmers obtain information about dairy farming technology in Khwisero Sub County? ……………………………
   b) If from Agricultural Officers, do the Agricultural Extension Officers visit farms? Explain briefly…………………………………………………..
   d) Are Extension Officers Trained in all dairy farming technologies? Explain ……………………………………………………………………………………………

2. Which are the key dairy technologies that rural women dairy farmers are aware of in Khwisero sub county?…………………………………………………………

3. What methods are used to disseminate information to rural women dairy farmers? …………………………………………………………………………………………………

4. a) How often are the dairy technology disseminations held in Khwisero Sub County? …………………………………………………………………………………………………
   b) How do you rate their importance as methods of improving dairy farming practices? …………………………………………………………………………………………………

5. What are other sources of information about dairy farming technology to rural women dairy farmers in Khwisero Sub County? ………………………………………

6 a) In your own explanation, how do you rate status of adoption of dairy farming technology among rural women dairy farmers in Khwisero Sub County? …………………………………………………………………………………………………
   b) What do you think can be done to improve adoption of dairy technology among rural women dairy farmers in Khwisero Sub County?………………………………………………………………………………………………

7. What are the key determinants of adoption of dairy farming technologies among rural women dairy farmers in Khwisero Sub County?………………………………………………………………………………………………
   …………………………………………………………………………………………………
8. In your own opinion what could be the possible strategies to enhance adoption of dairy farming technologies among rural women in Khwisero Sub-County?

…………………………………………………………………………………………………………………………
……

9. a) What are the benefits of adopting dairy farming technologies as seen from your own experience? (List them) ..........................

(ii) In your view, what help could the technology disseminators/implementers be accorded in order to promote more adoption of dairy farming technologies among rural women dairy farmers in Khwisero Sub County?

…………………………………………………………………………………………………………………………
Annex 3. Observation Guide

1. Size of the land estimated in acres.................................................................
2. Presence of dairy cows....................................................................................
3. Number of dairy cows ....................................................................................
4. Presence of a cow shed..................................................................................
5. Fodder grown in the farm............................................................................... 
6. Fodder conservation.........................................................................................
7. Presence of water tank/reservoir.................................................................
8. No of workers in the farm............................................................................... 
9. Presence of adult family members...............................................................
Annex 4: Focus group discussion guide

Dear respondent,

My name is Maindi Lilian Janetrix, a student at Kenyatta University currently pursuing master’s degree in gender and development studies. I am carrying out research on determinants of adoption of dairy farming technologies among rural women in Kwisero, Kakamega County, Kenya. I kindly request you to spare sometimes to answer the focus group discussion with honesty and truth. The information provided will be strictly for academic purpose and it will be treated as confidential. Thank you in advance for support.

1. In your observations, what are the existing dairy farming technologies among rural women in Kwisero sub county, Kakamega County………………..

2. In your own views, what is the status of adoption of dairy farming technologies among rural women in Kwisero Sub county, Kakamega County………………………………

3. In your opinion, what are the determinants of adoption of dairy farming technologies by rural women in Kwisero sub county, Kakamega county………………………………

4. What strategies would you suggest to enhance adoption of dairy farming technologies among rural women in Kwisero sub county, Kakamega county………………………………

Thank you for your cooperation.
Annex 5. Research Authorizations

NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Ref: No. NACOSTI/P/17/79250/19396

Date: 28th September, 2017

Janetrix Lilian Maindi
Kenyatta University
P.O Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on “Determinants of adoption of dairy farming technologies among rural women in Kakamega County, Kenya,” I am pleased to inform you that you have been authorized to undertake research in Kakamega County for the period ending 28th September, 2018.

You are advised to report to the County Commissioner and the County Director of Education, Kakamega County before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a copy of the final research report to the Commission within one year of completion. The soft copy of the same should be submitted through the Online Research Information System.

BONIFACE WANYAMAI
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kakamega County.

The County Director of Education
Kakamega County.
KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 810901 Ext. 4150

Internal Memo

FROM: Dean, Graduate School
DATE: 12th September, 2017

TO: Maindi Lilian Janetrix
C/o Gender & Development Studies Dept.

REF: C50/CTY/PT/27205/2014

SUBJECT: APPROVAL OF RESEARCH PROPOSAL

This is to inform you that Graduate School Board at its meeting of 6th September, 2017 approved your Research Proposal for the M.A Degree Entitled, “Determinants of Adoption of Dairy Farming Technologies among Rural Women in Kakamega County, Kenya”.

You may now proceed with your Data Collection, Subject to Clearance with Director General, National Commission for Science, Technology and Innovation.

As you embark on your data collection, please note that you will be required to submit to Graduate School completed Supervision Tracking Forms per semester. The form has been developed to replace the Progress Report Forms. The Supervision Tracking Forms are available at the University’s Website under Graduate School webpage downloads.

Thank you.

HARRETT ISABOKE
FOR: DEAN, GRADUATE SCHOOL

cc. Chairman, Gender & Development Studies.

Supervisors:

1. Dr. Leah Wanjama
   C/o Department of Gender & Development Studies,
   Kenyatta University

2. Dr. Pauline Kamau
   C/o Department of Gender & Development Studies,
   Kenyatta University

Hf/inn
KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: C50/CTY/PT/27205/2014

DATE: 12th September, 2017

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MAINDI LILIAN JANETRIX – REG. NO.
C50/CTY/PT/27205/2014.

I write to introduce Ms. Maindi Lilian Janetrix who is a Postgraduate Student of this University. She is registered for M.B.A degree programme in the Department of Gender & Development Studies.

Ms. Maindi Lilian intends to conduct research for a M.A Proposal entitled, “Determinants of Adoption of Dairy Farming Technologies among Rural Women in Kakamega County, Kenya”.

Any assistance given will be highly appreciated.

Yours faithfully,

[Signature]

MRS. LUCY N. MBAABU
FOR: DEAN, GRADUATE SCHOOL