# AN ASSESSMENT OF DETERMINANTS OF FARMERS' CHOICE OF DAIRY GOAT MARKETING CHANNELS IN MERU COUNTY, KENYA

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## DECLARATION

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

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## DEDICATION

This thesis is dedicated to my family and Dr. Patience Mshenga whose earnest love and guidance has always inspired my life.

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## LIST OF ACCRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ASDS | Agricultural Sector Development Strategy |
| FAO | Food and Agriculture Organization (of the United Nations) |
| IIA | Independence from Irrelevant Alternatives |
| IGAD | Intergovernmental Authority on Development |
| GDP | Gross Domestic Product |
| GoK | Government of Kenya |
| KNBS | Kenya National Bureau of Statistics |
| MDG | Millennium Development Goals |
| MGBA | Meru Goat Breeders Association |
| MNL | Multinomial Logit |
| MNP | Multinomial Probit |
| MOLFD | Ministry of Livestock and Fisheries Development |
| OLS | Ordinary Least Squares |
| RUM | Random Utility Model |
| SCP | Structure Conduct and Performance |
| VIF | Variance Inflation Factor |

## ABSTRACT

Dairy goats have become increasingly popular among government and development agencies that target resource-poor smallholder farmers with food security and poverty alleviating programs. However, one of the key challenges that dairy goat farmers in Kenya face is lack of proper and effective marketing channels to sell their goats. Secondly, there is little information about farmers' choice of different dairy goat marketing channels as well as the factors that influence that choice. To address this research gap, this study assessed farmers' choice of dairy goat marketing channels in Meru County. The specific objectives were; to characterize the dairy goat marketing channels used by farmers, to evaluate the efficiency of different dairy goat marketing channels and to assess the factors influencing the choice of those channels among dairy goat farmers in Meru County. One hundred and ninety six farmers were randomly selected and interviewed using a pre-tested semi structured questionnaire. A clustered multinomial probit model was employed to account for the problem of independence from irrelevant alternatives. Stata version13 software was used for data analysis and VCE (CLUSTER) command employed to model the clustering. Marketing efficiency was assessed using Shepherds Method. The following factors had a positive influence on the likelihood of a farmer choosing any of the three dairy goat marketing channels. They include; own farm income, farmer's education, number of dairy goats that a farmer had, age of the dairy goat, sex of the dairy goat price of the dairy goat, access to credit, and membership to dairy goat marketing group. Meru County government agricultural policy makers should establish and strengthen access to market information, extension and credit services to dairy goat farmers and link them with organized marketing channels and higher level marketing techniques to bolster their incomes.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background

Agriculture contributes 25 percent of Kenya's gross domestic product (GDP), 65 percent of export earnings and employs 70 percent of the population in the rural areas (GoK, 2010). In addition, it plays a central role under the economic pillar of the Vision 2030 and is therefore closely linked to the Economy of Kenya (Gitau, 2009). The livestock sub-sector employs close to 50 percent of Kenya's agricultural labor force, is a primary source of livelihoods to pastoralists and agro-pastoralists and provides raw materials to other agro processing industries in Kenya (KNBS 2009).

It is estimated that livestock sector contributes 12.5 percent of Kenya's GDP (Behnke and Muthami, 2011). In addition it is estimated that contribution to agricultural GDP ranges from 30 percent (Muthee, 2006) to 47 percent (FAO, 2011). Kenya's livestock population includes 14.1 million indigenous cattle, 3.4 exotic (primarily dairy) cattle, 17.1 million sheep, 27.7 million goats and 3 million camels (KNBS, 2009).

Livestock play a significant role in rural livelihoods and the economies of developing countries. They provide income and employment for producers and others working in sometimes complex value chains. They are a crucial asset and safety net for the poor, especially women and pastoralists, and provide an important source of nourishment for billions of rural and urban households (Herrero et al., 2012). In the 2009 livestock census, Kenya had 251,000 dairy goats 80 percent of which were kept in the Mt Kenya region (MoLFD, 2009).

The main dairy goat breeds kept in Kenya are German Alpine, Toggenburg, Anglo-Nubian and Saanen and their crosses (Ogola et al., 2009). It is estimated that sheep and goat milk production in Kenya is about 1.3 billion litres with a gross value of Kshs 44.6 billion in 2009 (IGAD, 2013). Dairy goats have received increased attention from both research and development workers in the last two decades due to their suitability and importance in small farming systems in developing countries. This importance is related to their varied role and size of the herd, relative proportion to the other animals scale and intensity of production (Ahuya et al., 2005)

Dairy goats can be reared in small land holdings which is useful especially in densely populated areas (Karanja, 2010)**.** In line with sustainable development goals 2015-2030 number 1 and 2, dairy goat farming is an enterprise which has a lot of potential for poverty alleviation and provision of household nutrition and income. Besides milk production, dairy goats are also kept for meat, hides, manure, wealth accumulation insurance against contingencies and as a status symbol (Moll, 2005; Chenyambuga et al., 2012). Dairy goats therefore constitute an important income-generating enterprise especially among poor households (Gebremedhin et al., 2015). Since they are more prolific and require less investment compared to large ruminants, goats are more suitable for livelihood strategies for resource poor households, and particularly for women who are often the most vulnerable members of society in the developing world.

The demand for dairy goats in Kenya is rising due to the increasing awareness of dairy goat milk's medicinal and nutritional value (Kinyanjui et al., 2007). Goat milk is argued to be of higher quality and is less prone to causing allergies in humans than cow milk (Farm Africa, 2005). Secondly, the farm-gate price of goat milk is higher compared to cow milk leading to high household incomes (Jerop, 2012).

Among the key constraints facing dairy goat farmers in Kenya are lack of breeding stock, diseases, inaccessible credit, lack of dairy management skills, un-assured markets, poorly organized marketing channels, unavailability of commercial feeds formulated for dairy goats, acceptance of goat milk and lack of goat milk processing plants (Mbindyo et al., 2014). These constraints have locked the potential of the dairy goat industry in Kenya to alleviating poverty, provision of household nutrition and income. In addition, these constraints slow the speed of achieving Sustainable Development Goals (SDGs) number 1 and 2 and vision 2030 considering that goats play a vital role in ensuring the food security of a household often being the only asset possessed by many poor families.

Marketing channels play an important role in rural development in terms of income generation and food security (Luoga et al., 2008). Agricultural marketing is pre-requisite for development of the dairy goat enterprise. Lack of market information services limits farmers' participation in input and output agricultural markets (Gebremedhin et al., 2015). Identifying the failures in the performance of a marketing channel and improving the market opportunities for both dairy goats and their products is important in providing appropriate marketing support which is critical to the commercialization of the sub-sector. Efficient market infrastructure is essential for cost-effective marketing as it provides facilitating services to marketing channels therefore ensuring high gross margins (Fadipe et al., 2015). The study of the determinants of farmers' choice of dairy goat marketing channels is essential for identifying gaps in dairy goat marketing.

## 1.2 Statement of the research problem

Research has shown that dairy goat farming has emerged as a high-return enterprise for small-scale farmers in Kenya and Tanzania (Karanja, 2010, Chenyambuga et al., 2014). For instance, farmers with dairy goats had higher annual incomes than their peers in Meru County, Kenya (Peacock, 2005). In addition, dairy goat enterprise was found to contribute correspondingly about 15.2 percent and 4.8 percent to the total livestock and overall household income and was viable in Kwale, Homabay, Nyakach, Rongo, Siaya, Suba and Bomet sub-counties in Kenya (Ogola et al., 2010).

Despite the higher return, one of the key challenges that dairy goat farmers face is lack of proper and effective marketing channels to sell their dairy goats. This is because the dairy goat market is not as organized as that of the dairy cow and can be improved. In terms of market access, several constraints affect the marketing of dairy goats in Kenya, key of which are poor marketing infrastructure, high transaction costs and weak bargaining power of small-scale producers (Mbindyo et al., 2014).

Although several studies have been undertaken on dairy goats in Kenya, there exists a knowledge gap on marketing channels of the live goats. Some studies have focused on livelihood diversification and community-based goat productivity (Farm Africa, 2007), production practices (Nguyo et al., 2010), economic contribution and viability (Ogola et al., 2009), diseases and health problems (Mbindyo et al., 2014), consumer's perceptions towards goat milk (Jerop et al 2014), adoption and profitability (Karanja, 2010), consumer willingness to pay for dairy goat milk, (Jerop, 2012), magnitudes and determinants of transaction costs (Mburu et al., 2013), and

goat milk in human nutrition (Haenlein, 2004). Accordingly, there is little information about farmers' choice of different dairy goat marketing channels as well as the factors that influence that choice and hence the need for this study.

### 1.3 Objectives of the study

The purpose of this study was to assess farmers' choice of dairy goat marketing channels in Meru County.

The specific objectives of this study were:

1. To characterize the dairy goat marketing channels used by farmers in Meru County.
2. To evaluate the efficiency of different dairy goat marketing channels in Meru County.
3. To assess the factors influencing the choice of dairy goat marketing channels among dairy goat farmers in Meru County.

### 1.4 Hypotheses tested

The hypotheses to be tested were;

1. Different market channels in Meru County are similar in terms of contractual arrangements, sales volumes and prices
2. The efficiency of various marketing channels is similar in Meru County
3. That socio-economic, farm-level, channel-specific and institutional factors as well as transaction costs taken singly have no influence on farmers' choice of alternative dairy goat marketing channels in Meru County.

## 1.5 Justification

The findings of this study will guide goat farmers' marketing decisions as it will inform them on the most profitable and efficient marketing channel. This is expected to have a positive impact on farmers' welfare and increase dairy goat sales. Improving dairy goat sales is key to attaining the goals of Agriculture Sector Development Strategy (ASDS, 2010-2020) and Vision 2030. One of the strategies for accelerating agriculture sector growth is to improve market access for smallholder farmers through better supply chain management (GOK, 2007). For policy implementers like extension agents, the current study results will give insights on the current organization of dairy goat marketing channels and put them in a better position to assist farmers. Improved extension is expected to yield higher marketable output thereby accelerating the commercialization of the dairy goat sub-sector.

For project designers, researchers and policy makers, the results of this study are expected to aid in the formation, restructuring, strengthening and development of policies aimed at developing dairy goat marketing infrastructure. This will improve and facilitate dairy goat farmers' marketing and contribute to poverty reduction. This study will also contribute to the literature on the organization of dairy goat marketing channels in Kenya, which is scarce.

## 1.6 Organization of the thesis

Chapter 1 of the thesis is a general overview of the role of agriculture, specifically livestock and in particular dairy goats in poverty reduction, especially among poverty prone rural farmers in Kenya. The problem statement, objectives of the study as well as the justification and objectives of the study are also presented here.

Chapter 2 is a review of literature and studies on market channel choices. Chapter 3 presents a description of the methodology, which includes the conceptual, theoretical, and empirical frameworks. In these sections, the theory on which the study is based is discussed, as well as the sampling procedure and data collection methods. Chapter 4 presents the results of the study, while chapter 5 presents a summary, conclusions and policy recommendations from the study.

### 1.7 Scope and limitation of the study

The primary data used in the study were collected from the farmers based on their recall memory and therefore lack of proper farm and marketing records was a limitation during data collection. The study was limited to a time period of one year and in one locality due to financial and time constraints. Hence, generalization of the results may be made with caution.

# CHAPTER TWO: LITERATURE REVIEW

## 2.1 Theoretical review on choice of marketing channels and marketing efficiency

### 2.1.1 Marketing channel

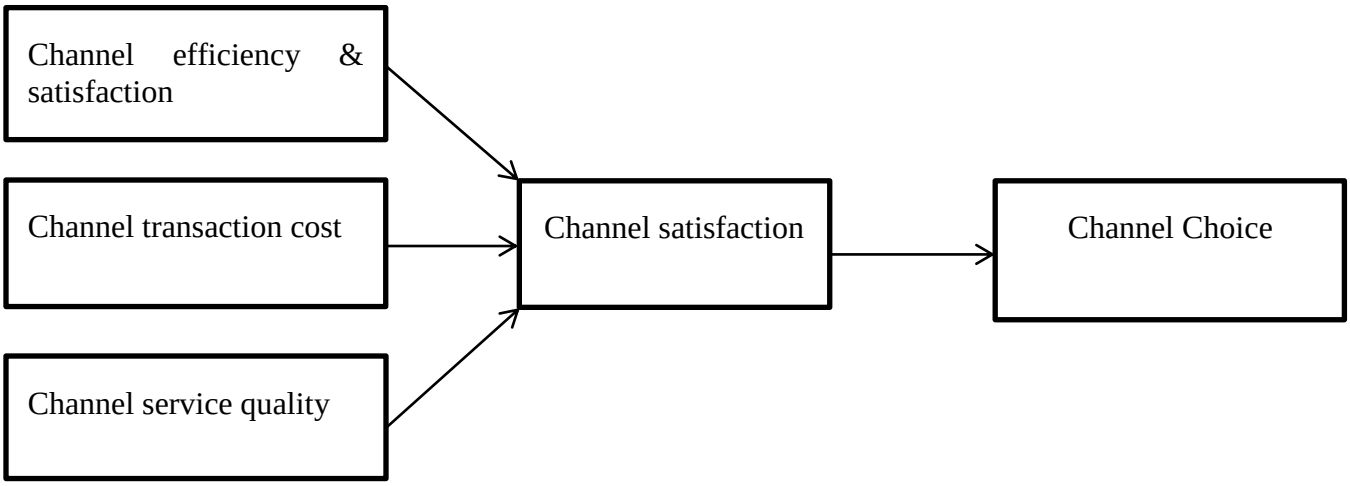
Han (2011) defines a marketing channel as the specific organizations that are interdependent and interrelated with products and their relevant services that can be transferred from producers to consumers or sellers. This institutional oriented perspective draws attention to channel actors (for example wholesalers, distributors, retailers) comprising the distribution system and engaged in the delivery of goods and services from the point of conception to the point of consumption (Anderson and Coughlan, 2002). A marketing channel ensures flow of information, products and funds. It encompasses the activities surrounding where the product must be delivered and how and whether the producer directly delivers the product or if there are intermediaries (Nishadh, 2016)

Kaplinski (2000) describes a value chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use. Feller et al., (2006) defines a value chain as the range of activities that adds value at every single step in designing, producing, and delivering a quality product to the customer.

### 2.1.2 Marketing channel efficiency

Marketing efficiency is defined as the ratio of marketing output over input (Sheth et al., 2002). Marketing efficiency is related to the prices of products, the costs incurred and profits/incomes obtained by the participants (Lutz and Ferguson, 1994).

**Figure 2.1 Antecedents of channel choice**




Source; Devaraj et al., (2002)

Following Devaraj et al., (2002) a farmer's marketing channel choice is mediated through farmer's perceptions of channel efficiency, transaction costs and service quality, which are antecedents of channel satisfaction and therefore preference. Channel efficiency is an important construct in studying channel relationships because it affects participants' motivation to stay with the channel and makes them less prone to exit the channel (Geyskens et al. 1999, Ping 1999). Channel satisfaction is an attitude construct that affects customer's behavioral intention. Channel preference is an individual behavior choice resulting from prior experience (Coughlan et al. 2001), and consumer preferences vary with the channel efficiency (Heilman et al. 2000).

Channel service quality measures the difference between expected service and perceived service to assess the service gap. This involves a survey to operationalize an individuals' perceived service quality through reliability, responsiveness, empathy and assurance of the marketing channel. When farmers find a channel convenient, time efficient, and price saving, they will be satisfied with the general effectiveness and efficiency of the channel.

Marketing channel efficiency is directly related to the cost involved in moving goods from the producer to the consumer and the quantity of services offered (Das & Prakash 2002). If the cost incurred when compared with the services involved is low, then the channel is judged efficient. The improvement in marketing efficiency means the reduction of marketing cost without reducing the quality of services to the consumer (Daveraj, 2002). Apart from stimulating production, an efficient marketing channel also accelerates the pace of value chain development which is important for raising producer incomes levels and consumers' satisfaction (Bagchi, 2011).

Currently there exists information gap on dairy goat marketing channel efficiency and, thus, it is not quite known if the existing channels are facilitating marketing activities. Therefore, it seems useful to understand the efficiency of the dairy goat marketing channels in order to provide a framework to compare performances of the different marketing channels. The issues involved would come into focus and it would lead to the development of strategies to improve the plight of the dairy goat farmers through market growth and improvement in the market systems.

## 2.2 Review of theoretical literature

### 2.2.1 Theories underpinning choice of marketing channels

Choice based studies have their foundations on three interrelated theoretical constructs. The first of these is the traditional consumer theory that postulates that the consumer has well defined preferences over all of the alternative bundles and that the consumer attempts to select the most preferred bundle from among those bundles that are available (Miller, 2006). However, this theory relies on an unobservable utility function which represents a weak foundation to base consumer theory.

In his seminal work on a new approach to consumer theory, Lancaster (1966) modified the traditional consumer theory by breaking away from the traditional approach that goods or services are the direct objects of utility and that it is the properties or characteristics of the goods from which utility is derived. Based on Lancaster's theory of value a consumer's total utility function is separable into preferences for specific components (attributes) of the good or service, rather than measuring satisfaction from the aggregate product package. This theory fits the current study as choice of marketing channels are based on revealed preferences based on characteristics of the marketing channels as proposed by Paul Samuelson in the late 1940's.

The third important construct in which choice-based studies are based on is the random utility theory or model (RUM). Popularized by McFadden (1973) RUM states that a consumer will choose a certain good or service that he/she derives highest utility from. In the RUM framework, utility is considered to be unobservable (to the analyst), i.e., a random variable, which can be

measured as a probability that rational consumers make observable choices of goods or services from which they obtain the highest utility in any given choice set.

This random utility theory has a potential application in a study as this one because marketing channels have characteristics and it is in these characteristics themselves in which the farmer's preferences are exercised. Thus, if farmers were allowed to choose among alternative marketing channels, each farmer would choose that channel that maximizes his or her utility (McFadden, 1980). For example, assuming *n* farmers and *m* alternative channels to choose from, farmer *i* assigns each alternative *j* in his choice set of perceived utility $U_j^i$ by choosing the channel that maximizes his/her utility (Rahm & Huffman, 1984).

The utility assigned to each choice alternative depends on a number of measurable attributes of the alternative itself and the farmer who is the decision maker (Samuelson, 1938). Because the utility derived from the chosen marketing channel is neither observable nor known to the analyst with certainty, it is considered random (Fernandez-Cornejo, 1996). Thus, the utility $U_j^i$ is specified as a function of deterministic $V_j^i$ and a stochastic ($\epsilon_j^i$) component.

$$U_j^i = V_j^i + \varepsilon_j^i \tag{2.1}$$

### 2.2.2 Methods for operationalizing random utility theory

Choice-based studies use discrete choice models to evaluate consumer choice (Irungu et al., 2006). Discrete choice analysis involves situations in which the dependent variable is a qualitative response (i.e., choice among finite set of alternatives) rather than a continuous mathematical measure as in ordinary regression (Maddala, 1983). The primary task in such cases

is to specify and estimate a model that would explain the probability of occurrence of the qualitative response or choice event of interest (Greene, 2003).

The appropriate model for qualitative responses depends on the range of possible values for the dependent variable (Maddala, 1983). Binary choice models can be applied in situations where the possible outcomes for the dependent variable are dichotomous representing presence or absence of the outcome of interest. In such instances, the model of choice is either probit or logit. On the other hand, when the qualitative response has more than two outcomes, multinomial choice models are suitable (Greene, 2003). Such models include multinomial logit (MNL) and multinomial probit (MNP).

Majority of studies on choice of marketing channels have used either logit or probit models (e.g. see Mburu et al., 2010; Chalwe, 2011; Makhura et al., 2001). In these models, the choice decisions are dichotomous (i.e., whether or not to choose) where a functional relationship between the probability of choice of a marketing channel and a set of explanatory variables are estimated econometrically using either a logistic or normal distribution for the logit and probit models respectively (Gujarati, 2007).The two models give more or less similar results except that the tails of a logistic model are flatter than the probit models (Gujarati, 2007). Hence, the choice of which of the two models to use is innocuous although computational ease could be a criterion.

The multinomial probit model (MNP) was chosen from other probabilistic choice models as the data used on market channel choice was unordered (McFadden, 1980; Jepsen, 2008). MNP was adopted in favor of multinomial logit model (MNL) in the consideration of the assumption related to the residual. MNL assumes residuals as identically and independently distributed,

while MNP consider residual as independent and normally distributed (Maddala, 1983). Besides MNP takes cognizant that other alternative choices also influence the outcome unlike MNL which doesn't (Lerman and Manki, 1982).

Because there were multiple marketing channels to choose from, MNL was considered appropriate for the study. The model has been widely used in empirical studies with multiple choices (e.g. see Moturi et.,al (2015), Chalwe, (2011), Tsourgiannis et al. (2008). One of the strengths of MNL is that it has simple mathematical computation (Gujarati, 2007). However MNL suffers from the problem of independence from irrelevant alternatives (IIA). The IIA problem arises from the assumption that the random errors of the residuals are independent and homoscedastic. In other words, the ratio of the choice probabilities of any two alternatives is affected by other alternatives which are not in the choice set (Luce, 1959; Ben-Akiva and Lerman, 1985)

An important implication of the IIA problem is that removal (or introduction) of irrelevant alternatives from (into) the choice set alters the relative odds of choosing one alternative over the other and there by a systematic influence on parameter changes (Hausman and McFadden, 1984). The presence of IIA problem is tested using either the Hausman-McFadden (Hausman and McFadden, 1984) or Small and Hsiao test (1985). Correction of IIA problem is made by employing other statistical methods which relax the assumption, they include; Multinomial Probit, Nested Logit (McFadden, 1981), and Random Parameter Logit model (RPL), (Train, 1998).

### 2.2.3 Methods for estimating channel efficiency

Marketing studies suggest several methods for estimating channel efficiency. These include Acharya and Agarwal's marketing channel efficiency formula (Acharya and Agarwal, 2001) and Shepherd's Method (Shepherd, 1965; Murthy et al., 2004).

#### a) 2.3.1 Acharya and Agarwal's Method

In this method, channel efficiency is computed from the following formula

$$MME = \frac{NPF}{MC+MM+ML} \quad (2.2)$$

where,

$MME_i$ = Modified measure of channel i efficiency

$NPF_i$ =Net price received by the farmer in channel i

$MC_i$ = Marketing cost in channel i

$MM_i$ = Marketing margin in channel i

$ML_i$ =marketing loss in channel i

A higher value denotes higher channel efficiency. This method incorporates marketing loss which shows the returns that could be improved if proper measures are taken to prevent the losses. However this method is only applicable in agricultural commodities that have post-harvest losses like vegetables. Adjustment for a loss on account of wastage and spoilage in processing and handling is very difficult in dairy goat marketing channels.

### 2.3.2 Shepherd's formula

Shepherd (1965) suggests that the ratio of total value of goods sold along a marketing channel and the total marketing cost is a measure for channel efficiency. This method eliminates the problem of measurement of value added. This is important when a good (same good) moves in two different channels of marketing involving different market functionaries. The greater the ratio the higher the channel efficiency and vice versa. Shepherd's formula for marketing efficiency is specified as;

$$ME = \frac{V}{I} - 1 \qquad (2.3)$$

where:

$ME_i$ = Channel efficiency of channel i

$V_i$ = Value of goods sold in channel i

$I_i$ = Total marketing cost or input of marketing in channel i

The strength of this formula is that the costs and margins are evaluated for each market functionaries within the channel until the produce reaches the consumer and accurately measures channel efficiency. The cost of marketing is the main indicator of efficiency of marketing. The study employed this channel efficiency formula because of its simplicity in calculation and interpretation.

## 2.4 Empirical studies on choice of marketing channels

Mburu (2010) assessed the factors influencing the choice of smallholder milk market channels in Keiyo District in Kenya using a logit model. Education of the household head and number of cows owned positively influenced farmers' decision of using the formal milk market channel. While the application of the logit model in Mburu's study was justified based on the objectives, such cannot be used in the presence of multiple channels as is the case with the current study. In addition, the current study assesses the efficiency of marketing channels as an antecedent to channel choice.

Chenyambuga et al. (2014) examined the profitability and contribution of small-scale dairy goat production to income of smallholder farmers in Babati and Kongwa districts of Tanzania using descriptive statistics and gross margin analysis .The study found that dairy goats were mainly kept for home consumption, provision of manure and served as insurance against future uncertainties. Dairy goat production was found to be a profitable enterprise contributing 30.8 percent and 25.7 percent of household income in Babati and Kongwa districts respectively. While the use of simple descriptive statistics in Chenyambuga et al. (2014)'s study provides general information about the system under analysis, they do not offer much insight into the complex nature of process that producers have to go through when making choices of available alternatives as is the case of the current study.

Ndoro et al. (2015) evaluated farmers' choice of cattle marketing channels under transaction cost theory in rural South Africa using a multinomial logit model. The study found transaction costs to be more pronounced among farmers who marketed their cattle to auctioneers and speculators

due to opportunity costs of time and efforts associated with selling at the auction. This study differs from the current one which focuses on choice of dairy goat marketing channels in Kenya. However, it provides important information on how to model the choice of marketing channels which is used in the current study.

Muthini (2015) examined the determinants of mango farmers' choice of marketing channels in Makueni County, Kenya, using a multinomial logit model. The results showed three main channels i.e. brokers, export, and direct market. The main determinants of channel choice were membership to a marketing group, access to training, contact with extension personnel, distance to a tarmac road, household income, farming experience, and number of mango trees owned by the household. Muthini's study provides important guidance on how to model choice of marketing channels and explanatory variables to focus on in the current study.

### 2.5 Empirical studies on channel efficiency

Several studies in Africa have focused on channel efficiency. For instance, Fadipe et al. (2015) estimated the marketing margin, marketing efficiency in cocoyam marketing in Sagamu, Ogun state, Nigeria using a combination of Shepherd's marketing efficiency index and the Gini coefficient. The study found that cocoyam marketing in the study area was competitive and that there was relatively high level of inequality among the traders.

Ayieko et al. (2014) studied the efficiency of indigenous chicken marketing channels in Makueni County, Kenya using the Shepherd index and multiple regression techniques .The study found that the marketing cost, number of intermediaries, marketing margin, profit and price of indigenous chicken had a significant effect on the marketing efficiency. Ayieko's study does not

focus on the determinants of channel efficiency but it provides useful insights on the application of Shepherd's index to compute channel efficiency.

Thamizhselvan et al. (2012) examined the efficiency of marketing channels of grapes in Theni District, India using a combination of Shepherd's Index's, Acharya and Agarwal's method, Composite and marketing efficiency indices. The study examined marketing cost, marketing margin, price spread, effects of variation in the consumer's price on the share of producer and efficiency of marketing. The results show poor efficiency in channels with high marketing costs. The application of various methods of computing channel efficiency provided guidance to the current study.

Aparna et al. (2012) examined the efficiency of supermarket supply chains versus traditional marketing channels in the Rangareddy District of Andhra Pradesh using Acharya and Agarwal's method. The study compared marketing cost, marketing margins, price spread, share of producer price in consumer price, marketing efficiency and marketing constraints. The study found that the net price received by farmers and their share in consumer's price were higher in supermarket than in traditional channels indicating higher efficiency. Aparna and colleague's study provides important guidance on how to assess marketing channel efficiency and key indicators to focus on.

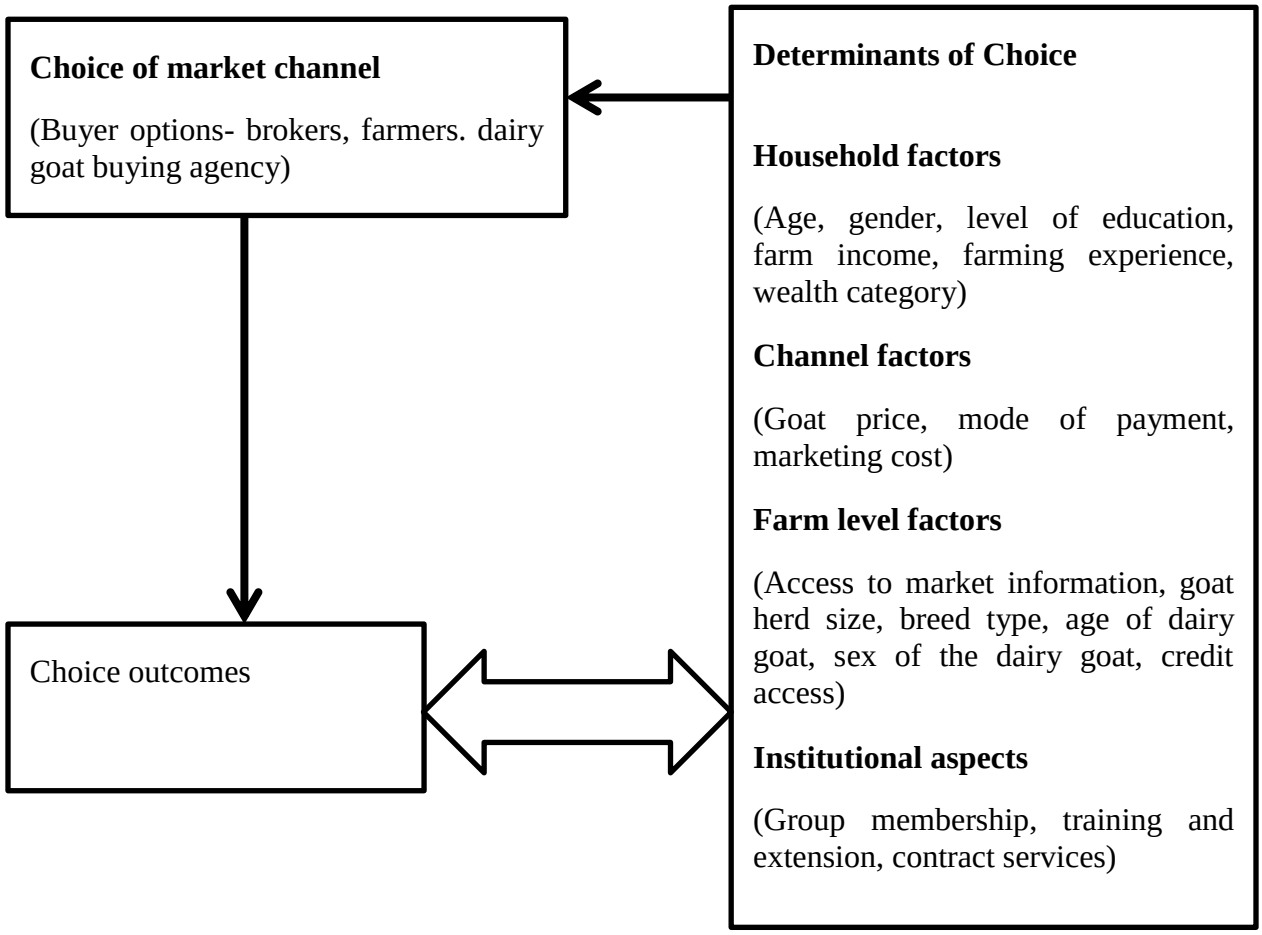
## 2.6 Summary

The literature reviewed above shows that there are many types of models which have been used to assess the determinants of farmers' choice of markerting channels. The main ones are Logit, probit, tobit and multinomial logit. Of these, MNL is the most widely used in the presence of multiple choices. On the other hand, the main method used to determine channel efficiency is Acharya and Agarwal's method. Based on the reviewed literature, no study has been undertaken to assess the determinants of choice of dairy goat marketing channels as well channel efficiency in Meru County and hence this study.

## CHAPTER THREE: METHODOLOGY

### 3.1 Conceptual framework

**Figure 3.1 Conceptual framework for the analysis factors influencing the choice of dairy goat**




Source: Author

As shown in Figure 3.1 farmer's choice of a marketing channel for his produce can be conceptualized to depend on personal, farm, channel, institutional and market factors. Assuming bounded rationality, the type of marketing channel chosen is an outcome of the complex

interplay between these factors and availability of information, tractability of the decision problem as well as farmer's cognitive limitations and idiosyncrasies. Such idiosyncrasies in turn influence the magnitude of the gap between farmer's competence (C) and the difficulty (D) of the decision problem solved, what Heiner (1983) refers to as the C-D gap (p. 562). The C-D gap introduces uncertainty in selecting most preferred alternative leading to the well-known bounded rationality problem (Munier et al., 1999). The final decision made is mediated through farmer's perceptions of channel efficiency, transaction costs and service quality, which are antecedents of channel satisfaction and therefore preference.

Personal socio-economic factors include age, level of education, farming experience and wealth endowment of a household. For instance, education increases a farmers understanding of market dynamics and therefore it improves decision making. Channel-specific factors include channel price, mode of payment and channel marketing costs. Channel price is an important factor in market choice for both buyers and suppliers. Farm level factors such as access to market information, credit access, and production factors like number of dairy goats a farmer has influence on choice of where to sell. Farmers with market information are expected to make more informed decisions.

Institutions are defined as the rules and expectations governing exchanges and organizations. Institutional factors determine a farmer's access to different types of capital. Institutional aspects in marketing include group membership, farmers training and extension, contract services, market information flows and credit facilities. Institutions play a central role in reducing transaction costs and can improve access to efficient marketing channels by farmers.

### 3.2 Theoretical framework

Choice-based studies are premised on random utility model (Gujarati, 2005). A farmer will choose a particular marketing channel based on his/her desire to maximize some welfare-enhancing measure such as the utility of income associated with the choice, subject to internal and external factors (McFadden, 1973). In other words, the farmer will choose the particular marketing channel that he/she perceives to yield the highest benefit (McFadden, 1973).

As shown in Figure 2.1, Devaraj et al., (2002) a channel's efficiency, transaction costs and service quality are antecedents of channel satisfaction and therefore a farmer's channel choice. Following Gujarati (2007), the utility (U) of farmer *i* associated with the choice of marketing channel *j* is expressed as;

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (3.1)$$

Where;

$U_{ij}$ is the utility derived by the $i^{th}$ farmer from choosing marketing channel choice *j*,

$V_{ij}$ is the systematic (or deterministic) component of utility

$\varepsilon_{ij}$ is the random/stochastic part of utility.

The deterministic component of utility is considered to be a function of the observable attributes of the choice alternatives and individual-specific characteristics of the respondent i.e., a conditional indirect additive utility function that can be expressed as a linear-in-parameters equation (Gujarati, 2005).

$$V_{ij=}X_{ij}\,ß \quad (3.2)$$

Where X is a vector of observable attributes, while ß are the unknown parameters of the observable attributes and a series of alternative specific constant terms to be estimated. Thus, given a choice set (C) of alternative market channels, the random utility theory assumes that a rational farmer *i* will choose alternative *j* that yields higher utility than other alternatives. The probability that the farmer *i* prefers one market channel *j* compared to the other is restricted to lie between zero and one. The probability that market channel j is selected by farmer i within choice set C is;

$$Prob(Y_i = j) = \frac{e^{\beta'_j x_i}}{\sum_{j=1}^{m} e^{\beta'_j x_i}}, where\ 0 < P_{ij} < 1\ and\ j = 1,2\ and\ 3 \quad (3.3)$$

Therefore,

$$Prob(Y_{ij} = 1) = P(\beta_0 + \beta_1 x_1 + \cdots + \cdots . \beta_k x_k) + \varepsilon_i \quad (3.4)$$

where;

$Y_{ij}$ is probability of farmer i choosing marketing channel j

$X_i$ is the vector of household, farm level, channel specific and institutional variables

$\beta_i$ is the vector of coefficients to be estimated

### 3.3 Empirical framework

#### 3.3.1 Factors hypothesized to influence farmers' choice of dairy goat marketing channels

This study modeled the choice of dairy goat marketing channels using a MNL as the standard method for estimating unordered, multi-category dependent variables.

The following empirical model was fit into the data:

$$\mathrm{CH}_{\mathrm{CHOICE}} = \beta_0 + \beta_1 \mathrm{AGE} + \beta_2 \mathrm{GENDER} + \beta_3 \mathrm{HHFARMINCOME} + \beta_4 \mathrm{EDUC} + \beta_5 \mathrm{EXPERIENCE} + \beta_6 \mathrm{WEALTHCATEG} + \beta_7 \mathrm{MARKETINFO} + \beta_8 \mathrm{HERDSIZE} + \beta_9 \mathrm{BREEDTYPE} + \beta_{10} \mathrm{AGEGOAT} + \beta_{11} \mathrm{SEXGOAT} + \beta_{12} \mathrm{GOATPRICE} + \beta_{13} \mathrm{LANDSIZE} + \beta_{14} \mathrm{CREDITACCESS} + \beta_{15} \mathrm{MARKETINGCOST} + \beta_{16} \mathrm{MODEPAYMENT} + \beta_{17}\, \mathrm{GROUPMEMB} + \beta_{18} \mathrm{EXTENSION} + \beta_{19} \mathrm{CONTRACT} + \varepsilon_i \quad (3.5)$$

**Table 3.1: Description of explanatory variables hypothesized to influence the choice of dairy goat marketing channel in Meru County and their expected signs**

| Variables | **Meaning** | **Measurement** | **Expected signs** |
|---|---|---|---|
| AGE | Age of household head in years | Continuous | + |
| GENDER | Gender of the household head | Dummy(1=Male,0= Female) | +/- |
| HHFARMINCOME | Monthly household farm income in Kenya shillings | Continuous | + |
| EDUC | Years of schooling of household head | Continuous | + |
| EXPERIENCE | Years of rearing | Continuous | + |
| WEALTH CATEG | Number of assets owned as a proxy for wealth | Dummy(1=Poor, 2=Middle, 3=Rich) | + |
| MARKET INFO | Access to market information | Dummy (1=yes, 0 otherwise) | + |
| HERD SIZE | Number of dairy goats kept | Continuous | + |
| BREED TYPE | Breed of dairy goat sold | Dummy (1=Pure breed, 2= Cross breed) | + |
| AGE GOAT | Age of the dairy goat sold | Continuous | + |
| SEX GOAT | Sex of the dairy goat sold | Dummy (Male=1,0=female) | + |
| GOAT PRICE | Price of dairy goat sold in Kenya shillings | Continuous | + |
| LANDSIZE | Land in cares owned by the household | Continuous | + |
| CREDIT ACCESS | Whether a farmer acquired credit for dairy goat production in the last one year | Dummy (1=Yes 0=No) | - |
| MARKETINGCOST | Cost of negotiating, information search and transport in Kenya shillings | Continuous | - |
| MODEPAYMENT | Mode of payment for dairy goat sold | Dummy (1=Cash , =Credit) | + |
| GROUP MEMB | Whether or not the farmer was in a marketing group | Dummy (Yes=1, 0=No) | |

| | | | |
|---|---|---|---|
| EXTENSION | Number of times of contact with extension services in the last 1 year | Continuous | + |
| CONTRACT | Whether or not the household head was in a contract or not | Dummy (Yes=1, 0=No) | + |

### 3.3.2 Justification for inclusion of independent variables

**AGE:** Age is related with a farmer's resource endowment. In dairy goat production and in choice of marketing channels a farmer gains expertise and develops marketing networks over time. Nkwasibwe (2014) found that the age of the household head was positively related to farmers' choice of formal marketing channel in Kiruhura District, Uganda. This was linked to experience from repeated transactions for every extra year of farming. Ouma et al. (2010) noted that intensity of banana sales increased for every extra year of farming experience household head gained. Based on this, age of the household head was hypothesized to positively influence farmers' choice of dairy goat marketing channel.

**GENDER:** This variable was coded as a dummy. The introduction of dairy goats in Kenya was done through organized farmer groups supported by Farm Africa since 1988 (Farm Africa, 2007). These projects targeted the poor and particularly women (Davis, 2000). However, subsequent adoption of dairy goats spread across genders with men in particular dominating the enterprise due to its commercial orientation (Davis, 2000). Mwaura (2014) found higher adoption of dairy goats among male-than female -headed households compared to female headed ones in Nakuru North, Murang'a North, and Meru Central sub-counties of Kenya. This study hypothesized a positive relationship between gender and choice of dairy goat marketing channels in Meru County.

**HHFARMINCOME:** This variable was measured in terms of the annual income the household makes from the farm. Household farm income provides farmers with capital to invest in dairy goat breeds as well cash to purchase inputs such as feeds, veterinary drugs and labour (Luoga et al., 2008). Muthini (2015) found a positive relationship between household income and farmers' choice of the export marketing channel as compared to brokers in Makueni County. Based on this literature, this study hypothesized a positive relationship between household farm income and farmers' choice of dairy goat marketing channels in Meru County.

**EDUC:** This variable was measured in terms of the number of years the household head spent in formal schooling. The more the years of education of the household head, the higher the likelihood of uptake of new ideas and innovations such as dairy goat enterprise. (Marenya & Barret, 2006). Education influences a household head's understanding of market dynamics and therefore improves decisions on where to sell (Muthini, 2014).

In addition, education enhances the knowledge of the household head in the uptake of improved managerial practices at the farm level (Marenya and Barret, 2006).Nkwasibwe (2014) found a positive relationship between education and dairy farmers' choice of formal milk marketing channels in Uganda. This is attributed to more education and knowledge exposure which increased chances of choosing the more paying marketing channel. A positive relationship was expected between education level and the choice of a dairy goat marketing channel.

**EXPERIENCE:** Experience has an important impact on farmer's channel selection as farmers gain expertise and develop networks with fellow farmers and traders over time. However, the experience variable did not show a strong relationship to the dependent variable in a study of

transaction costs and cattle farmers' choice of marketing channels in China (Gong et al., 2006). The number of years of experience in dairy goat rearing was hypothesized to positively influence the choice of marketing channels in Meru County.

**WEALTHCATEG:** This variable was constructed from Principal Components Analysis (PCA) (see Appendix I) as described in Irungu et al., (2006). Key variables for computing the index included the number and type of housing and farm transport owned, livestock species kept by the household and other valuable assets. The status of wealth was derived as follows: if the asset index for a particular household was less than the mean for all households, that household was designated as "poor"; if the index was between the sum of the mean plus one standard deviation, the household was designated as "middleclass." All households with an index greater than the mean plus one standard deviation were deemed "rich."

High wealth was expected to boost a farmer's effective demand for goods/services which enhance production. Wealthy farmers are better able to finance their market information needs and therefore make informed choices of marketing channels. Srinivas et al. (2014) found that wealth had a positive relationship with choice of marketplace. Wealthy farmers had preference to select district as their choice of marketplace due to high prices offered. Wealthy category was hypothesized to positively influence the choice of a marketing channel in Meru County.

**MARKETINFO:** Market information with regard to marketing functions such as transportation, prices, benefits like advance payments, and payment period dictate the choice directions of the producers. In addition, source of information has a direct association with institutional structures that play a critical role in reducing costs and can influence the development and organization of

market channel economic activity. Matere (2009) found that publicly available information on prices and supplies positively influenced farmers marketing decisions as they would timely and adequately plan their production on where, how much, when and what price to sell their produce. Marketing information increase product sales as there is more willingness to participate in such channels that avails information (Otieno et al., 2009). In this study, availability of marketing information was expected to positively influence farmer's choice of dairy goat marketing channels in Meru County.

**HERD-SIZE***:* This variable was measured in terms of the number of dairy goats the household kept. Numbers of dairy goats kept in a household determine a farmer's channel choice and access to some marketing channels due to bulk marketing, price incentives, high bargaining power as well as lower transaction costs. In Greece, Tsourgiannis et al. (2014) found that large-scale cattle and milk producers preferred wholesalers relative to retailers. This is because the farmers were large-scale livestock and milk producers and the wholesalers had capability of purchasing large quantities of livestock.

On the other hand, farmers with small and medium size flocks of sheep and goats preferred retailers to wholesalers. This was influenced by personal relationships and being small-scale livestock and milk producers. Moturi et al., (2015) found that farmers that had big herd sizes produced higher volumes of milk and sought after channels that more easily accepted larger quantities of milk. This is because the farmers obtained price incentives and experienced reduced transaction costs because of rise in bargaining power. As the herd size increases, farmers' shift to

more organized dairy channels. In this study therefore, herd size was hypothesized to positively influence farmers' choice of a marketing channel in Meru County.

**BREED-TYPE**: This variable was measured in terms of the number of pure or cross breed goats in the herd. Breed type affects takes care of inbreeding and reproduction therefore preference based on breed attributes affect farmers choice of marketing channels is important. At the farm level, the average milk production per day and number of dairy goat kids per goat depends on the breed type. In Ethiopia, flock holders indicated that large size, white colored goats with thick and straight horn have better market value and are fast marketable than other colored goats (Endeshaw, 2007). The breed type was hypothesized to influence the choice of a marketing channel positively.

**AGEGOAT***:* This variable was measured in months the dairy goat had lived by the time of selling. The age of the dairy goat determines milk productivity and siring capability. Srinivas et al. (2014) found that the age of goats positively influenced the producers' choice of market place in Afghanistan. The age of the dairy goat was hypothesized to be positively related to the choice of marketing channels in Meru County.

**SEXGOAT***:* This variable was coded as a dummy. Some dairy goat characteristics such as body condition of goat, breed, sex, age are considered by traders due to breeding and meat quality purposes. Traders prefer does for breeding purposes and to increase the total lifetime herd production of milk. Young bucks are kept for breeding and older bucks fattened for meat. Endeshaw (2007) found that farmers in Dale District Ethiopia mainly retained female goats in the flock for replacement purpose and removed male goats either by directly selling them or

castrating and feeding them prior to selling. Sex of the dairy goat was hypothesized to positively influence the choice of marketing channels in Meru County.

**GOATPRICE:** This variable was measured as the price offered by different channels in the previous year before the survey. Pricing is a significant aspect when choosing a particular marketing channel because it greatly influences the amount of revenue earned. Muthini (2015) noted that the choice of the marketing channel by mango farmers in Makueni County was dependent on the price, *ceteris paribus*. This study hypothesized that dairy goat price would be positively related to farmer's choice of marketing channels in Meru County.

**LANDSIZE:** This variable was measured in terms of the number of acres owned by the household. Households with relatively bigger land holdings have access to more pasture and more grazing land. Higher land availability to the farmer enables the farmers to optimize production by bringing the land under production to meet the demand. Mutura et al., (2015) found a positive relationship between land size and farmers choice of farm-gate milk marketing channel over cooperatives in Lower Central Kenya. This study hypothesized that landsize would be positively related to farmer's choice of marketing channels in Meru County.

**CREDIT-ACCESS**: This variable was coded as a dummy. Farmers were asked if they had access to credit or not in the previous year before the study. Credit access is considered as a precondition for adoption of agricultural innovations (Luoga et al., 2008). Farmers with access to credit are expected to have the ability to buy good quality dairy goat breeds, use improved inputs such as commercial feed supplements and pay hired labour. Kinyanjui et al., (2007) reported that farmers in Murang'a and Nyandarua counties complained of lack of capital to adopt dairy goats.

In this study, credit access was hypothesized to positively influence farmers' choice of marketing channels.

**MARKETINGCOST:** These were calculated as the total costs incurred on marketing by the farmer on dairy goat marketing activities. This involved the computation of all transaction costs incurred by farmers in sourcing, transporting and negotiating for dairy goat sales in different marketing channels. Higher marketing costs reduce farmers' gross margins. Mutura et al., (2015) found that marketing costs had a negative effect on the choice of marketing channels which had higher marketing costs. Marketing costs were hypothesized to have a negative effect on farmers' choice of dairy goat marketing channels in Meru County.

**MODEPAYMENT**: This was coded as a dummy variable. Farmers were asked if they sold goats on credit or cash. Farmers that receive their income within a short period are expected to realize more benefits than those that sell on credit because of the opportunity cost of money. Hence the mode of payment could be an incentive for choosing channels that pay cash. Nkwasibwe (2014) noted that both credit sales and delayed payment disincentivized farmers' choice of milk marketing. Further, Shiimi et al. (2010), found a positive relationship between quick payment and the number of cows sold through formal marketing channels in Namibia. They noted that the speed of payment acted as a motivation for producers to increase sales. In this study, the mode of payment was expected to positively influence farmers' choice of fairy goat marketing channels in Meru County.

**GROUPMEMB:** This variable was coded as a dummy. Group membership is important for farmers' social capital and in reducing transaction costs due to collective action. A farmer in a

marketing group increases his/her access to market information. In Murang'a County Matere (2009) found that banana farmer associations provided inputs and also linked them with other services providers. Further, Mburu et al. (2007) used group membership as a proxy for social capital and found that it had positive effect toward farmer participation in the cooperative marketing channel. Group Membership was therefore hypothesized to be positively associated with farmers' marketing channel choice.

**EXTENSION:** This was coded as a dummy variable. Extension service providers are important in disseminating and increasing ease of access to information on veterinary services, diseases, feeds, dip tanks and improved marketing technologies. Farmers with access to extension services easily identify the most efficient marketing channels that can assist them in enhancing their marketing efforts. Matere (2014) explains that extension information passed to farmers influence the farmers to carry out good agricultural practices, crop and livestock husbandry and farming as a business. Similarly, Muthini (2014) found that contact with extension personnel had a positive influence on farmer's choice of exporter channel relative to brokers. The number of times of contact with extension personnel was hypothesized to positively influence the choice of a marketing channel.

**CONTRACT**: This was coded as a dummy variable. Contracts are an instrument to promote value chain efficiencies and smallholder market linkages. Pre-agreed contracts help farmers to reduce costs and increase their bargaining power. In Northern Cape South Africa, citrus farmers under contract were found to benefit from increased incomes, better access to inputs and services and new opportunities to participate in markets for certified products (Anseeuw et al., 2011).

Based on these findings, being in a contract was hypothesized to positively influence farmers' choice of dairy goat marketing channels in Meru County.

### 3.3.3 Diagnostic tests

The following tests were undertaken on the data prior to data analysis:

**a) Testing for independence from irrelevant alternatives (IIA)**

This assumption requires that the inclusion or exclusion of categories does not affect the relative risks associated with the regressors in the remaining categories. The IIA Property requires that the relative probabilities of two options being selected are unaffected by the introduction or removal of other alternatives McFadden (1984). The Hausman test was carried out to determine IIA. All choices gave a p-value of unity implying presence of IIA. If IIA is violated, other statistical methods which relax the assumption are used, they include; Multinomial Probit, Nested Logit (McFadden, 1981), and Random Parameter Logit model [RPL] (Train, 1998).

**b) Testing for multicollinearity**

The problem of multicollinearity arises when there are correlations between independent variables. In this study, the Variance Inflation Factor (VIF) method was used to test for presence of multicollinearity. This was achieved by estimating artificial ordinary least squares (OLS) regressions with each of the farm characteristics as the "dependent" variable and the rest as independent variables. Following Maddala (2000), that have VIF<10 were considered to have no multicollinearity (See appendix II). A VIF greater than 10 indicates that the variable is highly collinear. To further confirm absence of multicollinearity, a Pearson correlation matrix was generated based on Karl Pearson (1880). Variables with statistically significant correlation

coefficient values greater or equal to one would exhibit multicollinearity. The results in Appendix III show that there were no variables with high correlations.

### c) Testing for heteroscedasticity

If the error terms do not have constant variance, they are said to be heteroscedastic (Greene, 2002). This may due to measurement error, skewness of regressors such as wealth, education, etc. Heteroscedasticity causes the variances of regression coefficients to be under or overestimated. In such cases, the usual significance tests are misleading (Greene, 2002). A Breusch-Pagan was employed and tested the null hypothesis that the error variances are all equal versus the alternative that the error variances are a multiplicative function of one or more variables.

As indicated in section (3.7) the data set had inherent problem of heteroscedasticity meaning error terms are not independent of each other. The use of VCE (CLUSTER QUESTRNO) command addressed this problem by producing robust standard errors. The clustering option which is robust to assumptions about within-cluster correlation provided a way to fit a clustered Multinomial Probit model and obtained correct meaningful standard errors. Robust standard errors address the problem of errors that are not independent and identically distributed.

### d) Goodness of fit for MNP

A goodness-of-fit measure is a summary statistic indicating the accuracy with which a model approximates the observed data (Gujarati, 2005). Goodness of fit test for MNP include the likelihood ratio test and the Wald test. In the case where the dependent variables are qualitative, accuracy can be judged either in terms of fit between the calculated probabilities or in terms of

the model to forecast observed responses (Maddala, 1983). To measure the goodness-of-fit in qualitative response models, Greene (2003) suggests the use of the likelihood ratio index (LRI). The LRI also called McFadden R2 or pseudoR2 is equivalent to the R2 in a conventional regression. It is computed from the formula:

$$LRI = 1 - L/lnL0 \quad (3.6)$$

Where lnL is the log-likelihood function value for the model computed having all the independent variables and lnL0 is the log-likelihood function value of the model computed with only the constant term. A zero LRI indicates a perfect lack of fit; while an LRI of value one indicates perfect fit. Empirical evidence suggests that LRI usually lies between 0.2 and 0.4 (Jarvis, 1990)

The Wald test works by testing that the parameters of interest are simultaneously equal to zero. If they are, this strongly suggests that removing them from the model will not substantially reduce the fit of that model, since a predictor whose coefficient is very small relative to its standard error is generally not doing much to help predict the dependent variable. Based on the p-value the null hypothesis is rejected if this value is significantly different from zero (Greene, 2002).

### 3.4 Assessing marketing channel efficiency

While there are several methods for assessing channel efficiency, this study employed the Shepherd's index formula because of its simplicity in calculation and ease of interpretation. Shepherd (1965) suggests that the ratio of total value of goods sold in the market and the total marketing cost to be used as a measure for marketing efficiency. The greater the ratio the higher the efficiency and vice versa. Shepherd's formula for marketing efficiency is given as:

$$ME = \frac{V}{I} - I \quad (3.7)$$

where: - ME is the marketing efficiency index, V is the value of dairy goat sold and I is the total marketing costs.

In this study the value of the dairy goat was the same as the market price the dairy goat fetched. The marketing costs involved the computation of all transaction costs incurred by farmers in sourcing, transporting and negotiating for dairy goat sales in different marketing channels. The shepherds method has been widely used (Rangasamy and Dhaka, 2008; Parthasarathi et al., 2014; Chongela et al., 2013 and Fadipe et al., 2015)..

### 3.5 Research design

This study employed a quantitative research design under a deductive research approach. In quantitative research design, data analysis is usually statistical and mainly quantifies relationships between variables. Quantitative research is concerned with numbers, statistics, and the relationships between events/numbers.

### 3.6 Data needs & sources

#### 3.6.1 Data type

Both primary and secondary data was used in this study. The later comprised number of dairy goats kept and marketed their prices and main breed types. These data were collected from various published records of the Ministry of Agriculture, Livestock and Fisheries in Meru County office and from the Meru Goat Breeders Agency (MGBA) offices. The primary data were from purposively-selected respondents using semi-structured questionnaires. The

questionnaire captured data on the characteristics of respondents, dairy goats sold, marketing channels used and the farm as well as institutional factors and marketing constraints.

### 3.6.2 Sampling procedure

#### 3.6.2.1 Determination of sample size

A sampling frame of all dairy goat farmers in Meru Central sub-County was obtained from the sub-County Livestock Production Offices. This sub-County was purposively selected because of its high concentration of dairy goat farmers in Meru County as shown in Table 3.6.2

**Table 3.2 Meru County summaries for dairy goat population for year 2014/2015**

| **Meru** | **Sub-County & Livestock Enterprises** | **Dairy Goat Numbers** |
|---|---|---|
| 1 | Igembe Central | 250 |
| 2 | Igembe South | 600 |
| 3 | Igembe North | 650 |
| 4 | Tigania West | 1,200 |
| 5 | Tigania East | 1,200 |
| 6 | Imenti North | 2,500 |
| 7 | Buuri | 2,900 |
| 8 | Imenti South | 11,000 |
| 9 | Meru Central | 15,000 |
| | **Total Population Estimates 2013** | **35,300** |

Source: Meru County Ministry of agriculture and fisheries, 2015

The primary data was collected using semi-structured questionnaires through interviews with the help of enumerators. After an informal discussion of the objective of the study with the Sub-County livestock officers and MGBA officials, dairy goat producing wards were purposefully selected. Three wards namely Abuthuguchi Central, Abuthuguchi East and Miriga Mieru East

were purposively selected. The farmers were randomly selected regardless of the marketing channels in which they participated. A total of 201 households were covered. However, because of missing information on some questionnaires, the final sample size for analysis was reduced to 196 households. The Anderson et al., (2007) sample size formula was used to compute the sample size:

$$n = \frac{pqz^2}{E^2} \tag{3.8}$$

$$n = \left[\frac{(0.5)(0.5)(1.96)^2}{0.07^2}\right] = 196\ respodents \tag{3.9}$$

Where; *n*= sample size, *z*= confidence level (α=0.05), *p*= proportion of the population containing the variables of major interest, *q*= 1-E where E is the allowable error because the proportion of the population is not known. In this case; $p = 0.5, q = 1 - 0.5 = 0.5, Z = 1.96\ and\ E = 0.07$. This resulted in a sample of approximately 196 respondents.

### 3.6.2.2 Data Collection

Data were collected for three weeks by trained enumerators using a pre-tested questionnaire. Interviews were conducted orally with the household heads using the local language. The enumerators were recruited and trained by the author for two weeks. The respondents were purposively identified with the help of Ministry of Livestock and Fisheries Development and MGBA officials. The author conducted and supervised the data training and collection ensuring quality of the data.

### 3.7 Data capture and analysis

All the questionnaire data were captured in SPSS software. Descriptive statistics were computed including means, standard deviation, frequencies for categorical variables. The results were presented in tables and graphs. STATA version 13 software was used to fit equation 3.5 into the data.

Clustered data arises when the data from the study can be classified into a number of different groups, referred to as clusters. Each cluster contains multiple observations, giving the data a "nested" or "hierarchical" structure, with individual observations nested within the cluster. The key feature of clustered data is that observations within a cluster are "more alike" than observations from different clusters. In this study there were 196 households that sold 541 dairy goats. Therefore the numbers of dairy goats sold were nested within the different households. Due to clustering some households were over-represented in the sample, while others were under-represented. The VCE (CLUSTER QUESTRNO) command in Stata was used in analyzing the descriptives and in the MNP model to take care of the clusters.

### 3.8 Study Area

Meru County lies to the east of Mt. Kenya and it straddles the equator lying within $0^0$ 6' North and about $0^0$ 1' South, and latitudes $37^0$ West and $38^0$ East (MCIDP, 2013). The county has a total area of 6,936.2 km2 out of which 1,776.1 Km2 is gazetted forest (*ibid*.). It has nearly all of the agro ecological zones of Kenya. Rainfall is bimodal, falling between March and June (long rains) and October through December (short rains). The southeastern slopes of Mt. Kenya, where many of the farms lie, receive between 1250 and 2500 mm of rainfall per year (*ibid.*).

In 2012, the county had a population growth rate of 2.1 percent and human population of 1,443,555, comprising 713,801 males and 729,754 females (MCIDP, 2013). The population density is widely distributed among the nine constituencies, with the average density in the county being 282 persons per $km^2$. The average land size per household is 1.8 ha for small scale and 18.25 ha for large scale land owners (*ibid*.).

**Figure 3.2 Map of Meru County showing Meru Central sub-County**


**Source: Google**

# CHAPTER FOUR: RESULTS AND DISCUSSION

## 4.1 Dairy goat farmers' socio-economic characteristics

As shown in Table 4.1 most of the dairy goat farmers were males (63 percent). This may be as a result of the socio-cultural factors amongst the Meru community that favor men in income-generating activities relative to their female counterparts. There was statistical difference by gender of the number of respondents across the marketing channels ($\chi^2$=4.8; p<0.1). The average age of all respondents was 50.5 years. There was no significant difference in mean age across the three marketing channels (p>0.05).

The average years of experience in dairy goat rearing was 2.4 years indicating that farmers are well experienced in the enterprise. Farmers who preferred producer-MGBA market channel had relatively higher experience in dairy goat farming probably because of the high price offered by the channel. The mean years of dairy goat farming experience was significantly different between respondents who preferred MGBA and broker channels (p=0.00). In Contrast, the mean years of dairy goat farming experience between the broker channel and farmer channels was not statistically different (p>0.05). Assefa (2007) found that farmers in Dale District, Ethiopia time of involvement in goat husbandry had a mean was 9.7 years.

**Table 4.1 Summary of socioeconomic profiles of dairy goat farmers in Meru County**

| | **Farmer → Farmer n=77** | **Farmer → broker → farmer n=82** | **Producer → MGBA → County government/NGO → Farmer n=67** | **Pooled n=226** |
|---|---|---|---|---|
| **[Frequencies]** | | | | |
| Gender of household head | | | | |
| Male | 59.7% | 62.0% | 67.0% | 63.0% |
| Female | 40.3% | 38.0% | 33..0% | 37.0% |
| Wealth Category | | | | |
| Poor | 65.0% | 59.0% | 64.0% | 62.0% |
| Middle class | 23.0% | 26.0% | 15.0% | 22.0% |
| Rich | 12.0% | 15.0% | 21.0% | 16.0% |
| Membership in a group | 34.0%*** | 29.0%*** | 66.0%*** | 42,0% |
| Extension services | 17.0% | 7.0% | 36.0% | 19.0% |
| Credit Access | 8.0% | 17.0% | 21.0% | 15.0% |
| **[Means]** | | | | |
| Age (Years) | 51.5(14.8) | 50.8(18.0) | 49.3(14.9) | 50.5(16.1) |
| Years of formal schooling | 7.9(3.8)** | 6.2(3.5)**,*** | 8.4(3.6) *** | 7.4(3.8) |
| Experience in dairy goat rearing (years) | 2.4(1.4) | 2.2(1.2)*** | 2.7(1.2)*** | 2.4(1.3) |
| Own farm income (Kshs) | 85,987** | 86,773*** | 137,909**,*** | 103,381 |
| Land Size(Acres) | 3.3*** | 2.6*** | 2.8 | 2.9 |

[a]n=226 because some households chose more than one marketing channel

[b]Numbers in brackets represent standard errors.

**, ***Numbers with the same superscript are significantly different ($p < 0.05$).

Source: Survey data (2015)

The average years of formal education attained by the household head was 7.4. Farmers preferring the producer-MGBA channel had relatively higher education levels with a mean number of schooling years of 8.4 compared to those of 7.9 and 6.2 in producer-farmer and producer-broker channels respectively. The mean years of formal education of the household was statistically different between producer-farmer and producer-broker channel and producer-MGBA and producer-broker channel ($p=0.00$). The findings are consistent with the fact that education levels considerably affect market information interpretation and hence, market channel choice of farmers by helping them analyse and exploit the best marketing strategies at their disposal (Jari, 2009; Park, 2009).

Own farm income enables a farmer to finance his/her cash needs and also helps in targeting channels which offer high prices. Most of the dairy goat producers in Meru County are farmers and not involved in off farm income generating activities. The average annual own farm income was Kshs 85,987, 86,773,137,909 for producer- farmer, producer-broker and producer -MGBA channels respectively. The own farm income mean was statistically different between producer-farmer and producer-MGBA channel and producer-MGBA and producer-broker channel.

Ownership of large land provides a huge potential for expansion of dairy goat production as it avails more grazing land. This motivates farmers with a large herd size to prefer supplying dairy goats to channels that handle big volumes and pay revenues in lump sum (Tsourgiannis et al., 2008). The average land size for the dairy goat farmers was 2.9 acres per household. The mean land size was 3.3, 2.6, and 2.8 for the producer-farmer, producer- broker and producer-MGBA

channel respectively. The mean land size was statistically different between producer-farmer and producer-broker channel.

About 62 percent of all respondents were classified as “poor” using the results of PCA. Another 22 and 16 percent were “moderately wealthy” and “wealthy” respectively. The broker channel had the highest percentage classified as poor at 65 percent (Table 4.1) while the MGBA marketing channel had the highest percentage classified as rich at 21 percent. This finding suggested that the brokers are financial providers largely for the poor farmers who most of the times had urgency of raising money. However, the number of poor, moderately wealthy and wealthy respondents was not statistically different across the three marketing channels ($p > 0.05$).

## 4.2 Characteristics of dairy goat marketing channels in Meru County

### 4.2.1 Description of dairy goat marketing channels in Meru County

The respondents indicated that they sold their dairy goats through three dominant marketing channels (Table 4.2). The producer-farmer was the shortest marketing channel. In this channel, buyers purchased dairy goats at the farm-gate. Through this channel, 149 dairy goats were sold and the average price was Kshs. 7,354. The average price for a male dairy goat and a female dairy goat was Kshs. 6,346 and 7,567 respectively. The average age of dairy goats was 18 months. The average marketing cost was Kshs.90 and transactions mode of payment was on cash basis.

**Table 4.2 Dairy goat marketing channels in Meru County**

| Market Channel | Frequency | Percentage |
|---|---|---|
| Producer → Farmer | 65 | 33.2 |
| Producer → Broker → Farmer | 60 | 30.6 |
| Producer → MGBA → County government/NGO → Farmer | 71 | 36.2 |
| **Total** | 196 | 100 |

Source: Survey data (2015)

In the producer-broker-farmer marketing channel 214 dairy goats were sold specifically 84 male dairy goats and 130 female dairy goats. The average price per dairy goat offered by this channel was Kshs 5, 933. The average price for a male dairy goat and a female dairy goat was Kshs 4,950 and 6,569 respectively. The average age of dairy goats was 18 months. The average marketing cost was Kshs. 44 and transactions mode of payment was on cash basis.

The third channel comprised of producers, MGBA, county governments, farmer groups and non-governmental organizations (NGOs). This channel was used by NGOs and county governments whenever they had dairy goat projects in the country. MGBA provides marketing information and marketing services to farmer groups at a fee of Kshs. 2,000 per goat. The channel represented some form of vertical integration which improved the market channel coordination. Such an approach has been reported in Olufemi and Adeolu (2010) in the case of poultry processing in Nigeria.

During the year prior to the survey, dairy goats had been sold at a mean price of Kshs 12,000 per goat. The mean price offered by this channel was per dairy goat regardless of sex of the dairy goat. The average age of goats sold through this channel was 15 months. A total of 178 dairy goats were sold through this channel. The marketing cost was Kshs. 2,032 though the farmers were not in contract with MGBA. The farmers received cash for their dairy goat sales after two weeks.

**Table 4.3 Characteristics of dairy goats sold through various marketing channels in Meru County**

| **Characteristic** | **Farmer→Farmer n=65** | **Farmer→ broker → farmer n=60** | **Producer→MGBA →Counties/NGO → Farmer n=71** | **Pooled n=196** |
|---|---|---|---|---|
| Total number of goats sold | 149(28%) | 214 (37%) | 178(35%) | 541 |
| Number of bucks sold | 26 | 84 | 46 | 156 |
| Number of does sold | 123 | 130 | 132 | 385 |
| Mean price of a buck (Kshs) | 6,346 | 4,950 | 12,000 | 7,031 |
| Mean price of a doe (Kshs) | 7,567 | 6,569 | 12,000 | 8,144 |
| Mean price of all goats (Kshs) | 7,354(3,214) *** | 5,933(2,255) *** | 10,488(2,334) *** | 7823(3,231)*** |

Source: Survey data, 2015

### 4.2.2 Dairy goat breeds traded in Meru County

Table 4.4 shows the dairy goat breeds kept and sold in Meru County. A total of 387 Toggenburg dairy goat breeds and 154 crossbreeds were sold through the three channels. The breeds sold varied across the channels due to the goat specific characteristics, sex of the goat and the price offered by the channels. This finding indicated that there is a trend towards more preference of Toggenburg breeds as compared to the cross breeds due to their traits in reproduction. The survey showed that does significantly fetched higher prices than the bucks.

**Table 4.4 Dairy goat breeds traded in Meru County**

| Dairy Goat breed | Farmer → Farmer n=65 | Farmer → broker → farmer n=60 | Producer→ MGBA → County government/NGO → Farmer n=71 | Pooled n=196 |
|---|---|---|---|---|
| Toggenburg | 112 | 151 | 124 | 387 |
| Crossbreeds | 37 | 63 | 54 | 154 |
| Mean age of all goats (Months) | 18 | 178 | 159 | 463 |

Source: Survey data, 2015

### 4.2.3 Sources of market information among dairy goat farmers in Meru County

The dairy goat farmers had six sources of market information; friends and neighbors, buyers. Meru goat breeders association (MGBA), government extension officers, buyers, online sources and brokers. The price information was mainly obtained from friends and neighbors as reported by 37 percent of the respondents. About 25 percent of respondents depended on the buyer as their source of market information. This category of farmers incurred virtually no costs in looking for information as it waited for the buyer at the farm-gate. The MGBA comprised of

different farmer groups. Its role was to negotiate dairy goat prices on behalf of its members and also offer transport services. The price reached was then communicated to group members in their meetings who collectively sold to the MGBA. This category of farmers incurred costs of Kshs 2,032 on each dairy goat marketed through the MGBA. While the marketing cost was high, the negotiations enhanced trust between the MGBA and farmers.

### 4.2.4 Group Membership and access to services among dairy goat farmers in Meru County

Only 42 percent of the respondents were members of dairy goat marketing groups. The MGBA marketing channel had most of its respondents belonging to marketing groups at 51 percent. This is due to the fact that MGBA majorly bought from farmer groups due to economies of scale. The low enrolment in dairy goat marketing groups suggests low social capital of the dairy goat farmers in Meru County. From discussions with the respondents, many farmer groups were becoming inactive due to lack of better prices for their dairy goats.

Group membership is important in collective marketing where it increases farmers' bargaining power in addition to reducing transaction costs and information asymmetry (Kirsten et al., 2008). The finding of low membership in dairy goat marketing groups is not unique to Meru County. In the case of Makueni County, Muthini (2015) found that more than half of the farmers were not members of any mango marketing groups .In Meru County, Mburu et al. (2013) also found that 81 percent of respondents did not belong to group-based dairy goat breeding groups due to transaction costs.

Of the 196 respondents interviewed, only 15 percent had acquired credit. The main reason given for low credit access were lack of information, lack of credit designed for the dairy goat

enterprise and fear of risk of default. Kloeppinger-Todd and Sharma (2010) have observed that most rural households lack access to reliable and affordable agricultural finance due to limited availability of retail banking services and high production costs.

During the year 2014 preceding the survey, only 19 percent of the respondents had accessed extension services. Producer- MGBA marketing channel had the highest percentage of farmers who had received extension services at 55 percent. This can be attributed to the functions of MGBA which included providing market information and dairy goat production. It is expected that getting extension services will improve farmers' profits from the dairy goat enterprise.

Looking back at hypothesis one, the results support the rejection of the hypothesis that different market channels in Meru County have similar characteristics in terms of contractual arrangements, sales volumes and dairy goat prices. The marketing channels were found to be significantly different.

### 4.3 Efficiency of different dairy goat marketing channels in Meru County.

As indicated elsewhere in this thesis, marketing channel efficiency is an antecedent of channel choice (Devaraj et al., 2002). Table 4.5 shows the efficiencies of the marketing channels. The producer-broker-farmer channel was the most efficient with an index of 133.8. This is attributed to the low marketing costs incurred in this channel. The producer-farmer was the second most efficient channel with an index of 80.7. Ayieko et al. (2014) found lower marketing efficiency in marketing channels with higher marketing costs.

With an index of 4.1 the producer-MGBA-County government/NGO-Farmer channel had the lowest efficiency. This could be attributed to its high marketing costs of KShs 2,032 on average per goat. Comparatively, the other two channels had much lower marketing costs due to low intermediaries involved. This finding is consistent with that of Srinivas (2014) who reported lower marketing efficiency in marketing channels with higher marketing costs in Afghanistan. Based on these results the second hypothesis that the efficiency of various marketing channels is similar in Meru County was rejected.

**Table 4.5 Efficiency of different dairy goat marketing channels in Meru County**

| Item | Producer-Farmer | Farmer-broker | Producer-MGBA-Counties/NGOs-Farmer |
|---|---|---|---|
| Net price received by the farmer (Kshs) | 7,354 | 5,933 | 10,488 |
| Marketing cost (Kshs) | 90 | 44 | 2,032 |
| Marketing efficiency index | 80.7 | 133.8 | 4.1 |

Source: Survey data, 2015

## 4.4 Determinants of dairy farmers' choice of dairy goat marketing channels in Meru County

Table 4.6 shows the marginal effects of determinants of dairy farmers' choice of dairy goat market channels in Meru County. Marginal effects were computed at the means of all explanatory variables. The Pseudo $R^2$ of the clustered multinomial probit was indicating a good fit (Table 4.6). Out of sixteen variables for the producer-broker channel, six were significant. Of these, three were negative and three were positive. For the producer-MGBA channel, seven variables were significant, six were positive and one was negative.

**Table 4.6 Marginal effects of factors influencing dairy goat farmers' choice of marketing channels in Meru County**

| | Producer-broker channel | | | Producer-MGBA channel | | |
|---|---|---|---|---|---|---|
| **Variable** | **dy/dx** | **Std error** | **z** | **dy/dx** | **Std error** | **z** |
| AGEDM | -0.005 | 0.010 | -0.58 | -0.020 | 0.012 | -1.69 |
| GENDER | 0.124 | 0.294 | 0.42 | 0.214 | 0.341 | 0.53 |
| OWNFARMINCOME | 0.000 | 0.000 | **2.12**** | 0.000 | 0.000 | **1.72*** |
| EDUC | -0.110 | 0.049 | **-2.23**** | -.043 | 0.055 | -0.79 |
| EXPERIENCE | 0.051 | 0.126 | 0.41 | 0.073 | 0.128 | 0.57 |
| WEALTHCATEG | -0.023 | 0.187 | -0.12 | 0.196 | 0.202 | 0.97 |
| MARKETINFO | 0.696 | 0.914 | 0.75 | 0.544 | 0.68 | 0.80 |
| HERDSIZE | -.0981 | 0.039 | **-2.55**** | 0.040 | 0.031 | 1.31 |
| BREEDTYPE | 0.123 | 0.316 | 0.39 | -0.003 | 0.361 | -0.01 |
| AGEGOAT | -0.168 | 0.330 | -0.51 | 0.803 | 0.478 | **1.68*** |
| SEXGOAT | 0.899 | 0.275 | **3.27***** | 0.924 | 0.270 | **3.42***** |
| GOATPRICE | -0.000 | 0.000 | **-2.35**** | 0.000 | 0.000 | **3.88***** |
| LANDSIZE | -0.074 | 0.058 | -1.28 | -0.131 | 0.065 | **-2.01**** |
| CREDITACCESS | 0.904 | 0.455 | **1.99**** | 0.981 | 0.495 | **1.98*** |
| GROUPMEMBER | -0.285 | 0.348 | -0.82 | 0.836 | 0.345 | **2.42***** |
| EXTENSION | -0.616 | 1.046 | 2.59 | -0.096 | 0.410 | -0.23 |

*, **, *** denote significance level at 10, 5 and at 1 percent respectively

Psuedo-$R^2$=0.000; Wald chi2 (32) = 126.95; Log pseudolikelihood = -390.83043

N: B The producer-farmer channel was used as a reference

Source: Survey data, 2015

### 4.4.1 Producer-farmer and producer-broker channels

Household farm income was expected to have a positive and significant influence on channel choice. Own farm income increased the probability of a farmer selling to the producer-broker channel relative to producer-farmers channel. This is because of flexibility of the producer-broker channel in terms of bulk buying and cash provision whenever farmers were faced with financial challenges. The finding agrees with results by Barrett et al. (2006) where farmers with off farm employment and other farm enterprises sold their produce to the modern channels which could accommodate their bulky produce and in turn accord them a chance for other activities.

Contrary to expectation, the number of years of formal education attained by the household head was negatively related to the probability of a farmer choosing the producer-broker over producer-farmer channel. It is argued that farmers with higher education level have superior ability to access and understand information and technology therefore applying that information to venture into new opportunities than farmers with lower education (Elzo et al., 2010). The same variable had no effect on the probability of choosing producer-MGBA over producer-farmer channel.

This finding suggests that advancement in formal education enabled a farmer to acquire knowledge about the market dynamics and therefore dispensed with the brokers altogether. Thus, a one year increase in formal education of the household head would reduce the likelihood of choosing producer-broker over producer-farmer by 9.8 percent. Mutura et al. (2015) found a negative relationship between the level of education and choice of middlemen as compared to cooperatives on channel choice among smallholder dairy farmers in Lower Central Kenya.

Herd size increases farmers' participation in markets because of the possibility to produce surplus to market (Negassa and Jabbar, 2008). Contrary to the expectation, the number of goats owned is significantly associated with a negative influence to choosing producer-broker as compared to producer-farmer channel. An increase in number of dairy goats owned by a household would decrease the probability of choosing producer-broker channel by 9.8 percent. This is because the producer-broker channel offered the lowest prices per goat. This finding concurs with the results by Mutura et al., (2015) who found a negative relationship between the number of cows a household owned and choice of farm gate through middlemen market channels. (Tsourgiannis et al., 2014) reported herd size to be a significant determinant in market channel choice.

As per priori expectations, sex of the dairy goat is associated with an increased likelihood of a farmer selling to the producer-broker and the producer-MGBA relative to the producer-farmers marketing channel. A male dairy goat increased the probability of a farmer selling to the producer-broker and producer-MGBA by 89 and 92 percent respectively. This finding explains that the farmers have shortage of breeding bucks. Endeshaw (2007) found that farmers in Dale District Ethiopia mainly retained female goats in the flock for replacement purpose and removed male goats either by directly selling them or castrating and feeding them prior to selling. Srinivas et al. (2014) found no statistical effect of sex of the goat on the producers' choice of market place in Afghanistan. This implies that the farmers have shortage of breeding bucks.

Endeshaw (2007) found that farmers in Dale District Ethiopia mainly retained female goats in the flock for replacement purpose and removed male goats either by directly selling them or

castrating and feeding them prior to selling. Srinivas et al. (2014) found no statistical effect of sex of the goat on the producers' choice of market place in Afghanistan.

Contrary to the expectation, the price offered by a channel decreased the probability of a farmer selling to the producer-broker relative to producer-farmer channel by 0.02 percent. This is because the prices were significantly different among the channels and the producer-broker channel offered the least goat price. The results are also consistent with those of Martey et al., (2002); Nkwasibwe (2014); Muthini (2015) who found that majority of farmers preferred the marketing channels which offered highest prices.

As expected, access to credit services increased the probability of a farmer selling to the producer-broker relative to farmers by 90 percent. If the credit is invested in farm technology and other farm improvements, it trickles down to production of dairy goats enabling farmers to rear more. This increases farmers' flock size hence the choice of producer-broker channel due to flexibility in bulk buying. Matere (2009) found that access to credit facilities positively influenced farmers' decision to participate in marketing association.

### 4.4.2 Producer-farmer and producer-MGBA channels

Household farm income was expected to have a positive and significant influence on channel choice. Own farm income increased the probability of a farmer selling to the producer-MGBA channel relative to producer-farmers channel. This is because producer-MGBA bought goats in bulk. In Ethiopia and Greece, household income was found to positively affect livestock

marketing patterns as livestock sales increased with household income (Bellemare et al., 2004; Tsourgiannis et al., 2014)

As expected, age of the dairy goat is associated with an increased probability of a farmer selling to the producer-MGBA relative to the producer-farmer channel. A young dairy goat of the age between 3 and 24 months increased the probability of a farmer selling to the MGBA channel relative to the farmer's channel by up to 80 percent. This channel marketed young dairy goats for breeding purposes on behalf of farmer groups. The results concur with those of Srinivas et al. (2014) which showed age of the goat less than one year significantly influenced the goat producers' choice of market place in Afghanistan. Dairy goats reach sexual maturity at 4 to 5 months of age. To increase herd productivity, farmers freshen does over a time span and as well manage young does to have them ready for breeding at 7 months of age.

The price offered by a channel increased the probability of a farmer selling to the producer-MGBA relative to producer-farmer channel by 0.03 percent. This was because the prices were significantly different among the channels. The higher price offered in producer-MGBA channel was appreciated by most farmers and that the farmers were generally dissatisfied with low prices of the producer-broker channel. Moturi et al. (2015) observed that a one percent increase in the milk price would increase the probability of farmer participation in the traditional channel by relative to the other channels. The results also concur with those of Srinivas et al. (2014) who found out that the district markets were preferred by goat producers as they anticipated price increase on Saturdays.

Contrary to apriori expectations an increase in land size decreased the probability of choosing the producer-MGBA relative to the producer-farmer channel by 13 percent. This contrasting finding could be attributed to the fact that farmers in producer-farmer channel owned more land relatively to farmers in producer-MGBA channel. Tuner (2004) revealed that to be an important asset that supports production of livestock. Ismail et al. (2013) found that land holdings are the key determinant of participation in high value horticulture contract farming with supermarkets in Kenya.

As expected, access to credit services increased the probability of a farmer selling to the producer-MGBA relative to producer-farmer channel by 98 percent. This can be attributed to the fact that MGBA bought dairy goats from farmer groups. Some of the services that farmers mentioned that they accessed through groups include extension services, training, credit facilities, market, and market information. Muthini (2015) found that only about a quarter of mango farmers in Makueni County had been able to access credit among the different channels. Multiple studies find that households with access to credit have increased probability of investing in better farming practices, participating and transacting more in markets than those with no access to credit (Gebremedhin et al., 2015; Stephens and Barrett, 2006)

Membership to a dairy goat marketing group is significantly associated with a higher likelihood of a farmer selling to the producer-MGBA relative to the producer-farmer channel. The probability of choosing producer-MGBA relative to producer-farmer channel increases by 84 percent. This increase is due to access to marketing information, easy market access and benefits associated with being a member of these groups.

Farmers who sold to MGBA were in marketing groups and had the advantage of bulking hence gaining economies of scale. Membership to a marketing group is however negative and not significant for the producer-broker market channel as farmers selling to the brokers do not bulk their produce to reduce cost. The results agreed with those of Ayieko et al. (2014) that showed that being a member of traders' group leads to an increase in marketing efficiency. Moturi et al. (2015) found membership of the household head to a farmers' group had a positive effect upon farmer participation in private and cooperative channels. This was explained by the role of collective action in attaining greater bargaining power, greater economies of scale, as well as reducing transaction costs.

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# CHAPTER FIVE: SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

## 5.1 Summary

The main motivation of this study was to assess determinants of dairy goat farmers' choice of marketing channels in Meru County. The study intended to achieve the following specific objectives; to map and characterize the dairy goat market channels used by farmers in Meru County in terms of type, number of dairy goats' marketed, main actors & their gender, channel organization and constraints and opportunities in dairy goat marketing. Hypothesis one; that different market channels in Meru County are similar in terms of contractual arrangements, sales volumes and prices was tested.

The second specific objective to evaluate the efficiency of different dairy goat marketing channels in Meru County and hypothesis that the efficiency of various marketing channels is similar in Meru County was also tested. The third objective was to assess the factors influencing the choice of dairy goat marketing channels among dairy goat farmers in Meru County. The third hypothesis ;that socio-economic, farm-level, channel-specific and institutional factors as well as transaction costs taken singly have no influence on farmers' choice of alternative dairy goat marketing channels in Meru County was also tested.

Results revealed three major market channels in the dairy goat sub-sector; producer-broker, producer-farmer, and producer-Meru goat breeders association. Majority of farmers sell to brokers while farm-gate direct market account for the smallest percentage of farmers. The channels exhibit varying characteristics in terms of prices and interaction with farmers.

Producer-broker channel offer the lowest prices while farmers selling to producer-MGBA channel earn the highest prices. Other varying characteristics include price determination mechanisms where those selling to MGBA use the agency to negotiate prices and majority of those selling to brokers negotiate individually and in most cases the buyer single handedly determines the price.

A high preference for producer-MGBA marketing channel was noted, indicating it would be prudent to relook at the contract channel model to address the issues of disorganized dairy goat marketing channels and why it was not existing. The Meru goat breeders association (MGBA) had been able to improve market access for its members by marketing dairy goats locally in the country. MGBA however faces financial challenges due to the complex logistic issues involved in marketing and therefore venturing in exporting dairy goats remains a challenge. Inbreeding, lack of a dairy goat milk processing plant and corrupt leadership were some of the challenges that were cited as impediment to export by MGBA. Furthermore, MGBA was out of reach for many poor farmers due to the high marketing costs required to sell through this agency.

## 5.2 Conclusion and policy recommendations

The study found that the following factors had a significant influence on the likelihood of a farmer choosing any of the three dairy goat marketing channels, they include; own farm income, farmers education, number of dairy goats that a farmer had, age of the dairy goat, sex of the dairy goat price of the dairy goat, access to credit, and membership to dairy goat marketing group. Based on the results of the study, the following recommendations were made:

- **Strengthening the pricing and market information system**

The findings of the study revealed in Meru there is no government agency that monitors and provides market information. As goat producers have poor market information networks, network dummy had no significant influence on the market channel choice. Moreover, brokers dominate dairy goat marketing and farmers were not accessing high value markets such as export and contract markets. Farmers lack information on markets, and do not actively look for it either.

There is therefore the need for an integrated agricultural marketing information system which is linked to producers and traders in order to avoid exploitation at low prices and to enable dairy goat farmers fetch high revenue. Strong technology transfer and information provision exercises should ensure that small dairy goat producers are kept abreast of developments for improving their bargaining power. As noted by Omiti et al. (2009) and Shilpi and Umali-Deininger (2008) improving market infrastructure (e.g., provision of appropriate market information and contract opportunities) and enabling farmers to access the markets are important for enhanced commercialization, and would possibly improve their incomes and livelihoods.

- **Access to extension service and Credit facilities**

Majority of the respondents 82 percent had no access to extension services. A significant proportion of farmers, 85 percent in the study area did not acquire credit for dairy goat farming. The study therefore recommends strengthening access to extension service and credit service to assist farmers' link with organized marketing channels and use higher level marketing techniques to bolster their incomes. Training and extension services can easily be provided through the existing farmer groups.

- **Further research**

The study revealed that there is good scope for the dairy goat production sector to contribute more effectively to the Kenyan economy by improving marketing efficiency through better market intelligence system, and capacity building of goat producers in production as well as marketing. The study recommends that more research should be carried out regarding the structure and conduct of dairy goat markets and demand for breeding does and bucks in Kenya which were not covered in the current study. This will provide more information to the policy makers on the current condition of the dairy goat market in the country so as to make well-informed policies.

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**Appendix I: Factor score coefficients and summary statistics for variables used to construct the wealth status index (Wealth Category)**

| Asset | Factor Score Coefficient | Mean | Standard Deviation |
|---|---|---|---|
| Grade cows | 0.215 | 0.87 | 1.374 |
| Local cows | 0.521 | 0.06 | 0.434 |
| Crosses | 0.472 | 0.37 | 0.703 |
| Local bulls | 0.427 | 0.10 | 0.572 |
| Calves | 0. .243 | 0.37 | 0.649 |
| Indigenous goats | 0.193 | 0.22 | 0.650 |
| Sheep | 0.424 | 0.44 | 1.101 |
| Rabbits | 0.696 | 0.81 | 2.684 |
| Chicken | 0.251 | 12.61 | 14.877 |
| Pigs | 0.493 | 0.26 | 1.299 |
| Stone/iron House | 0.197 | 0.30 | 0.514 |
| Wood/iron House | 0.559 | 1.47 | 0.865 |
| Mud/iron House | 0.383 | 0.04 | 0.266 |
| Bicycle | 0.635 | 0.36 | 0.579 |
| Motorcycle | 0.374 | 0.19 | 0.416 |
| Wheelbarrow | 0.317 | 0.62 | 0.643 |
| Knapsack | 0.153 | 0.80 | 0.599 |
| Ox plough | 0.309 | 0.07 | 0.271 |
| Posho mill | 0.849 | 0.02 | 0.124 |
| Car | 0.443 | 0.02 | 0.142 |
| Pickup truck | 0.345 | 0.04 | 0.213 |
| Radio | 0.198 | 0.96 | 0.537 |
| TV | 0.286 | 0.44 | 0.548 |
| Mobile phones | 0.197 | 2.35 | 1.418 |
| Plastic Water tank | 0.359 | 0.51 | 0.638 |

| | | | |
|---|---|---|---|
| Water tank-stone | 0.310 | 0.05 | 0.222 |
| Granary store | 0.258 | 0.39 | 0.520 |
| Maize Sheller | 0.223 | 0.01 | 0.101 |
| Sewing machine | 0.431 | 0.09 | 0.308 |
| Computer/tablet | 0.436 | 0.03 | 0.189 |
| Solar panel | 0.372 | 0.56 | 0.610 |
| Generator | 0.566 | 0.03 | 0.159 |
| Greenhouse | 0.162 | 0.02 | 0.124 |
| Incubator | 0.442 | 0.01 | 0.072 |
| Land size | 0.224 | 2.51070 | 2.447687 |

**Appendix II: Variance inflation factors results for multi-collinearity test**

| Variable | VIF | 1/ VIF |
|---|---|---|
| Ageofdm | 1.57 | 0.636781 |
| Ktnggrpmbr | 1.41 | 0.709156 |
| Experience | 1.46 | 0.686100 |
| grssmargin15 | 1.59 | 0.628918 |
| pricecombi~d | 1.59 | 0.630255 |
| Breedcomined | 1.15 | 0.868777 |
| makrtinfos~e | 1.18 | 0.847938 |
| remittance~d | 1.13 | 0.882918 |
| Yearsinschl | 1.21 | 0.828176 |
| Genderofdm | 1.25 | 0.802810 |
| extensions~s | 1.25 | 0.800523 |
| wealthcate~y | 1.08 | 0.927041 |
| Excombined | 1.07 | 0.931758 |
| Yslfgon | 1.09 | 0.914225 |
| Agecombined | 1.12 | 0.894440 |

Mean VIF 1.27

## Appendix III: Pearson Product Moment Correlation Matrix

| | BUYER | AGEDM | GENDER | OWNFAR~E | EDUC | EXPERI~E | WEALTH~G |
|---|---|---|---|---|---|---|---|
| BUYER | 1.0000 | | | | | | |
| AGEDM | -0.0530 | 1.0000 | | | | | |
| GENDER | 0.0818 | 0.1002 | 1.0000 | | | | |
| OWNFARMINC~E | 0.1891 | -0.0465 | 0.0180 | 1.0000 | | | |
| EDUC | 0.0615 | -0.2582 | 0.1229 | 0.1301 | 1.0000 | | |
| EXPERIENCE | 0.0750 | 0.3278 | -0.0756 | 0.0590 | 0.0604 | 1.0000 | |
| WEALTHCATEG | 0.0385 | -0.0737 | 0.0962 | 0.1192 | 0.0133 | -0.1106 | 1.0000 |
| MARKETINFO | 0.0958 | 0.0723 | 0.0535 | -0.0471 | 0.1531 | -0.0121 | -0.0418 |
| HERDSIZE | 0.0590 | 0.0890 | 0.0835 | 0.2433 | 0.3144 | 0.2964 | 0.0697 |
| BREEDTYPE | -0.0462 | -0.0261 | -0.2198 | -0.0554 | -0.0914 | -0.0059 | -0.0868 |
| AGEGOAT | 0.0555 | 0.0213 | 0.0738 | 0.0720 | 0.0528 | -0.0828 | 0.0287 |
| SEXGOAT | 0.0612 | 0.0194 | 0.0044 | -0.0257 | -0.0148 | -0.1192 | 0.0427 |
| GOATPRICE | 0.4019 | -0.0072 | 0.0926 | 0.2287 | 0.2089 | 0.1890 | 0.0032 |
| LANDSIZE | -0.0585 | 0.1517 | 0.0623 | 0.4159 | 0.1659 | 0.0756 | -0.0663 |
| CREDITACCESS | 0.1585 | -0.0689 | 0.0353 | -0.0147 | 0.1864 | 0.1235 | -0.1253 |
| GROUPMEMBER | 0.2314 | 0.2417 | 0.0146 | 0.1419 | 0.0343 | 0.2288 | -0.0808 |
| EXTENSION | 0.1264 | 0.0048 | -0.0337 | 0.1118 | 0.1113 | 0.1321 | 0.0472 |

| | MARKET~O | HERDSIZE | BREEDT~E | AGEGOAT | SEXGOAT | GOATPR~E | LANDSIZE |
|---|---|---|---|---|---|---|---|
| MARKETINFO | 1.0000 | | | | | | |
| HERDSIZE | 0.0221 | 1.0000 | | | | | |
| BREEDTYPE | 0.1203 | -0.0365 | 1.0000 | | | | |
| AGEGOAT | 0.1012 | -0.0090 | 0.0443 | 1.0000 | | | |
| SEXGOAT | -0.0692 | -0.0805 | -0.1139 | 0.0289 | 1.0000 | | |
| GOATPRICE | 0.1884 | 0.0714 | 0.1100 | -0.0691 | -0.1563 | 1.0000 | |
| LANDSIZE | 0.0446 | 0.4484 | 0.0126 | 0.0529 | 0.0733 | -0.0462 | 1.0000 |
| CREDITACCESS | 0.0392 | 0.0176 | -0.1263 | -0.0485 | -0.0192 | 0.0902 | 0.0503 |
| GROUPMEMBER | 0.1621 | 0.0363 | -0.1218 | -0.0258 | 0.0234 | 0.3052 | 0.0470 |
| EXTENSION | 0.0352 | -0.0062 | -0.1360 | 0.0196 | 0.0669 | 0.1911 | -0.0545 |

| | CREDIT~S | GROUPM~R | EXTENS~N |
|---|---|---|---|
| CREDITACCESS | 1.0000 | | |
| GROUPMEMBER | 0.0723 | 1.0000 | |
| EXTENSION | 0.0866 | 0.2697 | 1.0000 |

.

**Appendix IV: Hausman tests of IIA assumption**

| | $\chi 2$ | $P > \chi 2$ |
|---|---|---|
| Channel 1 | 0 | 1 |
| Channel 2 | 0 | 1 |
| Channel 3 | 0 | 1 |

**Appendix IV: Survey questionnaire used for data collection**

**UNIVERSITY OF NAIROBI**

**DEPARTMENT OF AGRICULTURAL ECONOMICS**

**RESEARCH ON DETERMINANTS OF FARMERS' CHOICE OF DAIRY GOAT MARKETING CHANNELS IN MERU COUNTY**

**FARMERS' QUESTIONNAIRE**

***INTRODUCTORY NOTE***

*My name is_____.We are from the University of Nairobi. We are undertaking research on dairy goat farming in Meru County. This questionnaire is meant to collect data on dairy goat farmers' choice of marketing channels in Meru County. The information obtained is for academic purposes only and will be treated with utmost confidence. No names will appear in any report or publication arising from the use of information obtained.*

*Your assistance in answering our questions correctly and truthfully is highly appreciated. We trust that the information obtained from this research will go a long way to enhancing production and marketing of dairy goats in Meru County and the country at large.*

**Can I proceed?**

***GENERAL INFORMATION……QUESTIONNAIRE NO……....***

Name of enumerator…….....Interview date…….

Location …….Sub Location……

Checked by……..On date……

Name of Respondent…….

Phone number of the respondent…….

Village…….…….…….

1. **Does the household keep dairy goats _____** 1=Yes 2= No (*If No, kindly terminate the interview with a polite explanation)*
2. **Since you started keeping dairy goats have you sold any? _____** 1=Yes 2=No (*If No, kindly terminate the interview with a polite explanation)*

Name of household head _____

Respondent's relationship with the household head _____

1=Head 2=Spouse 3=Parent 4=Child 5=In law 6=Grandchild 7=Employee 8= Other(Specify)_____

***SECTION 1: HOUSEHOLD CHARACTERISTICS***

i. Who is the main decision maker on dairy goat farming? _____

1=Household head 2 =Spouse 3= Other (specify) _____

ii. What is the gender of the decision maker?_____

1 =Male 2= Female

iii. What is the age of the decision maker? _____

iv. What is his/her level of education? _____

1 =None 2= Primary 3 =Secondary 4 = College 5=University

v. What is the household's main source of income? _____

1=Farm Income, 2=Off-farm Income (specify)_____

vi. What is his/her main occupation? _____

1=Farming 2=Salaried employed 3= Business 4=Casual 5=None 6= Other (specify) _____

vii. How many members of your household work outside the family farm?_____

viii. Do you receive any remittances? _____ 1=Yes 2= No

ix. If yes, please give monthly estimate of remittances received from household members working outside your farm? Kshs_____

***SECTION 2: DAIRY GOAT PRODUCTION***

i. Which year did you start keeping dairy goats? _____

ii. What motivated you to venture into dairy goat rearing? _____

1= Monetary gain from sale of milk

2= To provide milk to my family

3= Monetary gain from sale of does (she-goats)

4= Monetary gain from sale of bucks (he-goats)

5=Monetary gain from sale of manure

6=As a form of Insurance

7=As a form of saving/investment

8=. Cultural purposes

9= I saw others keeping and therefore decided to keep also

10=I was persuaded by the NGO that was promoting dairy goats in this village

11= Other (specify)_____

iii. How many dairy goats do you have?

| **Breed** | **Adult males** | **Adult females** | **Weaner males** | **Weaner females** | **Male kids** | **Female kids** |
|---|---|---|---|---|---|---|
| Toggenburg | | | | | | |
| Saanen | | | | | | |
| German Alpine | | | | | | |
| Cross breeds | | | | | | |
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |

iv. How did you acquire your first dairy goat?

_____

_____

*[If the farmer says he/she bought the first goat, ask;]*

v. Where did you get the money to buy your first dairy goat?_____

1=Personal savings

2=Remittances

3=Loan from a friend/relative

4=Loan from a bank

5=Group membership contributions

6=Other (Specify) _____

vi. How many does are in lactation at the moment? _____

vii. How much milk does each produce per day ?_____ *[Ask in litres]*

***SECTION 3: MARKETING OF DAIRY GOATS***

i. Kindly provide the following information about your dairy goat sales in the last 2 years:

| **Year**<br><br>**2015** | **Sex** | **Age** | **Breed** | **Sale price** | **Where sold?** ***[Codes]*** | **Main reason for selling there** ***[Codes]*** | **Mode of payment** ***[Cash/ Credit]*** | **Main reason for selling** | **Final use of the goat** |
|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | |
| **2** | | | | | | | | | |
| **3** | | | | | | | | | |
| **4** | | | | | | | | | |
| **5** | | | | | | | | | |
| **6** | | | | | | | | | |
| **7** | | | | | | | | | |
| **8** | | | | | | | | | |
| **9** | | | | | | | | | |
| **10** | | | | | | | | | |

**Sex of dairy goat**: 1=Male 2 = Female

**Breed type:** 1=Toggenburg 2= Saanen 3=German Alpine 4= Crossbreed

**Where sold :**1=Another farmer 2=Broker 3=Dairy goat buying agent 4=County government 5=Exporter 6=Other (specify) )_____

**Reason for selling there**: 1= High price 2=Reliable (will always purchase) 3= Accessibility 4= Only buyer 5= Other (specify) _____

**Reason for selling**: 1= Culling 2= To meet urgent household cash needs 3=To manage herd size 4=Contract requirements 5=breeding 6=other (specify) _____

**Final dairy goat use:** 1=Breeding/rearing 2= Slaughter 3= Other(specify)_____

| **Year**<br><br>**2014** | **Sex** | **Age** | **Breed** | **Sale price** | **Where sold?** ***[Codes]*** | **Main reason for selling there** ***[Codes]*** | **Mode of payment** ***[Cash/ Credit]*** | **Main reason for selling** | **Final use of the goat** |
|---|---|---|---|---|---|---|---|---|---|
| **1** | | | | | | | | | |
| **2** | | | | | | | | | |
| **3** | | | | | | | | | |
| **4** | | | | | | | | | |
| **5** | | | | | | | | | |
| **6** | | | | | | | | | |
| **7** | | | | | | | | | |
| **8** | | | | | | | | | |
| **9** | | | | | | | | | |
| **10** | | | | | | | | | |

**Sex of dairy goat**: 1=Male 2 = Female

**Breed type:** 1=Toggenburg 2= Saanen 3=German Alpine 4= Crossbreed

**Where sold?**:1=Another farmer 2=Broker 3=Dairy goat buying agent 4=County government 5=Exporter 6=Other (specify) )_____

**Reason for selling there**: 1= High price 2=Reliable (will always purchase) 3= Accessibility 4= Only buyer 5= Other (specify) _____

**Reason for selling**: 1= Culling 2= To meet urgent household cash needs 3=To manage herd size 4=Contract requirements 5=breeding 6=other (specify) _____

**Final dairy goat use:** 1=Breeding/rearing 2= Slaughter 3=other(specify)_____

ii. Kindly provide the following information about your dairy goat revenue and costs in the last one month;

| **Item** | **Unit** | **Quantity** | **Unit price/cost** | **Total(Kshs)** |
|---|---|---|---|---|
| **A;REVENUE** | | | | |
| Sale of young Males | No. | | | |
| Sale of young Females | No. | | | |
| Sale of Adult Males | No. | | | |
| Sale of Adult Females | No. | | | |
| Sale of Milk | Litres | | | |
| Milk consumed at home | Litres | | | |

| | | | | |
|---|---|---|---|---|
| Sale of manure | | | | |
| **Total revenue** | | | | |
| **B;VARIABLE COSTS** | | | | |
| Drug | | | | |
| Labour & droving charges | | | | |
| Feeds and concentrates | | | | |
| Mineral supplements | | | | |
| Water | | | | |
| Breeding buck | | | | |
| Repair/maintenance of goat house | | | | |
| Veterinary service charges | | | | |
| *Negotiating prices* | | | | |
| Transport | | | | |
| Airtime | | | | |
| *Looking for market* | | | | |

| | | | | |
|---|---|---|---|---|
| Transport | | | | |
| Airtime | | | | |
| *Maintaining contract with buyer* | | | | |
| Time cost | | | | |
| Lawyer fee | | | | |
| Interest on loans/Credit | | | | |
| *Monitoring costs* | | | | |
| Time cost | | | | |
| Bribes | | | | |
| *Group membership* | | | | |
| Annual registration fee | | | | |
| Other fees | | | | |
| Other marketing costs | | | | |
| Droving | | | | |
| Loading | | | | |
| Off-loading | | | | |
| County council fees | | | | |
| Watering in the market | | | | |

| | | | | |
|---|---|---|---|---|
| Feeding | | | | |
| Labor (Guard) | | | | |

iii. What means do you use to arrive at the sale price with a buyer? _____

1=Individual negotiation 2= Group negotiation 3= Buyer sets price 4= I set price 5=Other (specify)_____

iv. Do you consider the price attained to be fair?_____1= Yes 2=No Explain_____

v. *[Particularly for contract farmers]* Are you satisfied with your current sale agreement? _____ *1* = Yes 2= No

vi. If No, which buyer would you rather sell to?_____

vii. What is the **main** constraint to targeting the preferred buyer?____

1=High transaction costs 2= Low price 3= Unreliable 4=Lack of information 5= Possible exploitation 6= Other (specify) _____

viii. What facilitation do you need to sell to your preferred buyer? ____

1= Transport 2= Market information 3=Other (specify) _____

ix. What services/incentives do you receive from your buyer?

1=Training 2= Market information 3=Credit 4=Inputs 5= Exchange trips 6= None

x. Have you been visited by extension workers to assist in dairy goat farming in the last 12 months?_____1= Yes 2= No

xi. If yes, which organization did they come from? _____

1=Government 2= NGO 3= Contractor(Agency) 4= Other (specify) _____

xii. If yes, when was the last visit? _____

xiii. What services did you receive from them?_____

1=Training on dairy goat management 2= Funding exchange trips 3= Looking for buyers 4=Giving market information 5= Organizing seminars/workshops 6= Credit 7= Transport 8=contracts 9= Other (specify) _____

xiv. Have you yourself gone to visit an extension worker? 1=Yes 2= No

xv. If yes, when was the last time you went? _____

xvi. What information were you seeking for? _____

xvii. From where do you get information on dairy goat markets?_____

1=Government extension 2= Buyer 3= Fellow farmer 4= Agency 5= I don't receive information on markets 6=Other(specify) _____

xviii. How often do you receive this information?

1= Daily 2=Weekly 3= Monthly 4=Once per year

xix. By what means do you get the information? _____

1=Visit buyer/market (word of mouth) 2=Mobile phone 3=Buyer visits farm (word of mouth) 4=Farmer to farmer (word of mouth) 5= Other (specify) _____

xx. On a scale of 1-5, 1 being lowest and 5 highest, how much do you trust information from these sources?

1= Government extension___ 2= Agency___3= Fellow farmer ___4= Group____

xxi. Are you a member of any dairy goat marketing group? _____ 1=Yes 2=No

| **Group Name** | **Duration (years) in the group** | **Joining fee/charges** | **Group services** | **Channel sold to via group** | **Other group terms** | **If left group, give reason** |
|---|---|---|---|---|---|---|
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

**Group services:** 1=Marketing 2=Training 3= Information 4= Educational trips 5= Bulk input sourcing 6= Other(specify)_____

**Reason for leaving group:** 1= Mismanagement 2=Favoritism 3= High cost 4= Other (specify) _____

xxii. *[If the respondent has never been a member]* why? _____

xxiii. Have you signed a contract with any buyer? _____ 1= Yes 2= Never 3=Left contract.

xxiv. If yes, what are the benefits of the contract? _____

1= High prices 2= Provision of inputs 3= Transport services 4=Market information 5= Other(specify) _____

xxv. *[If farmer left contract]* what was the reason for leaving? _____

1= Buyer violated contract 2= Group disintegrated 3=Could not meet terms 4= Other (specify) _____

xxvi. Have you applied for credit or loan in the last 1 year? _____ 1= yes 2=No

xxvii. If Yes, fill the table below:

| **Year Credit was sourced** | **Amount applied(Kshs)** | **Amount obtained(Kshs)** | **Source** | **Form (cash/inputs)** | **Purpose of loan** | **Activities carried out with the loan?** |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Source of credit**: 1= Banks 2=Rural microfinance 3=Sacco 4= Community revolving fund 5= Agency 6= Friend/relative 7=Other(Specify) _____

**Purpose of credit**: 1= School fees 2=Medical 3=Farm (non-dairy goat, specify) 4= Farm (dairy goat) 5= Other (Specify) _____

**Activity carried out**: 1= School fees 2= Medical 3=Farm (non-dairy goat, specify) 4= Farm (dairy goat) 5. Other (Specify) _____

xxviii. If not borrowed in question above, why did you not borrow? _____

1= No need 2=Fear of risk 3= High interest rate 4=Lack of collateral =.Other (specify)__ _____

xxix. What would say is the major impediment to the dairy goat sub-sector in Meru County?

_____

1=High cost of acquiring the desired dairy goat breeds 2= Pests and diseases 3= Lack of market 4= High cost of inputs 5= Lack of expertise/training 6= Other (specify)_____

xxx. What would be the best way to improve your access to market?_

_____

_____

_____

***HOUSEHOLD ASSETS OWNED***

a. Please give the number of the following household assets that you own

| **Livestock type** | **Number owned** | **Housing type** | **Number owned** | **Farm transport/Equipment** | **Number owned** | **Other assets** | **Number owned** |
|---|---|---|---|---|---|---|---|
| Grade Cows | | Stone/iron | | Bicycle | | Working radio | |
| Grade bulls | | Stone/tiles | | Motorcycle | | Working TV | |
| Crosses(cows) | | Wood/tin | | Tractor | | Mobile phone | |
| Crosses(bulls) | | Wood/iron | | Car | | Water tank (plastic) | |
| Local cows | | Mud/tin | | Pickup truck | | Water tank (metallic) | |
| Local bulls | | Mud/iron | | Ox/donkey cart | | Water tank (stone) | |
| Heifers | | Mud/mud | | Motorized water pump | | Granary/Store | |
| Calves | | | | Water pump(manual) | | Maize sheller | |
| Indigenous goats | | | | Knapsack sprayer | | Sewing machine | |
| Sheep | | | | Ox plough | | Computer/Tablet | |
| Rabbits | | | | Private well/borehole | | Solar panel | |
| Chicken | | | | Wheelbarrow | | Generator | |
| Pigs | | | | Posho mill | | Greenhouse | |

ii. What is the total size of your land in acres____?

*iii.* Apart from dairy goats, what are your other on-farm sources of income? (*Specify the items and income obtained from each per year)* Assist farmer to calculate**

| **Source** | **Cost** | **Income** |
|---|---|---|
| *Livestock* | | |
| Dairy cows | | |
| Chicken | | |
| Indigenous goats | | |
| Sheep | | |
| Pigs | | |
| *Food crops* | | |
| Maize | | |
| Beans | | |
| Bananas | | |
| *Other* | | |
| Trees/forest | | |

How do you use the income obtained from dairy goats? _____

i)……..

ii)……

iii)……

iv)……..

v)……

**THANK YOU VERY MUCH FOR YOUR TIME!**