# INFLUENCE OF SMALL RUMINANT REARING PROJECTS ON HOUSEHOLD FOOD SECURITY IN TINDERET DIVISION, NANDI SOUTH DISTRICT, KENYA

**By**

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## DECLARATION

This research project report is my original work and has never been presented for any award in any other university

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**L50/66032/ 2010**

This research project report has been presented for examination with our approval as University supervisors of the candidate.

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## DEDICATION

This work is dedicated to my husband Edwin Kibet, our Children Carlos Kipronoh and Alexa Mueni Kibet, parents Peter and Alice Matheka, the entire Matheka and Koske families for their understanding, support and encouragement throughout this study.

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## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| **ASALs** | Arid and Semi-Arid lands |
| **CSA** | Central Statistical Authority |
| **ECOWAS** | Economic Community of West African States |
| **FAO** | Food and Agricultural Organization |
| **FAOSTAT** | Food and Agricultural Organization statistics |
| **GDP** | Gross Domestic Product |
| **KNBS** | Kenya National Bureau of Statistics |
| **N.D** | Not Dated |
| **NSAP** | Nigerian Society for Animal Production |
| **OECD** | Organization for Economic Cooperation and Development |
| **SAPPLPP** | South Asia Pro-poor Livestock Policy program |
| **SWAC** | Sahel and West Africa Club |
| **T** | tonne |
| **USD** | United states dollar |
| **SPSS** | statistical package for social scientists |

## ABSTRACT

Achieving food security remains an elusive goal to many developing countries, with nearly all of the 929 million undernourished people coming from the developing countries, sub-Saharan Africa where Kenya lies contributes 25% of the world's malnourished population. The persistence of the hunger problem in Kenya calls for diversification from crop production in tackling the scourge. Small ruminants rearing has been shown in other areas to improve the food situation through increased income, increased food production, improved nutritional intake as well as empowering all genders to participate in tackling the food issue. The study sought to answer the following questions: To what extend do small ruminants rearing project influence household income in Tinderet division? How do small ruminants rearing projects influence food production in Tinderet division? How is the influence of small ruminants rearing projects to household nutritional intake in Tinderet division? How do small ruminants rearing projects influence household power dynamics in Tinderet division? The study delimited itself to Tinderet division and to a questionnaire as research tool. The study adopted a descriptive research design and a questionnaire was used as the data collection tool. The target population for this study was households in Tinderet division who had kept small ruminants for at least two years at the time of the data collection. Pilot testing was undertaken in Nandi Hills division which borders Tinderet and has nearly similar characteristics by administering Questionnaires to the household heads of the sampled households, analyzing the data, making improvements to the questionnaire and taking it back for re-testing until the tool was satisfactory. The questionnaire was reviewed and critiqued by professionals for content validation. A sample size of 367 households was arrived at using the Krejcie and Morgan (1970) Chart and was spread using the multi-stage sampling method. Collected data was cleaned and analyzed using descriptive statistics with an aid of SPSS and Microsoft excel. Findings from the study showed that household income from small ruminants for 153 (43.7%) was below KShs 6000, for 126 (36%) was KShs 6000-12000, for 58 (16.6%) was 12001- 24000, for 9(2.6%) and 4 (1.2%) earned KShs. 24001-36000 and above KShs. 36000 respectively. It further showed that organic manure was less utilized compared to inorganic manure, however, small ruminants were one of the major source of funds for purchase of fertilizers. About 30% of animal protein sources was from small ruminants' products hence the second contributor to improved nutritional intake. On gender issues in food security, the study reported that women were very much involved in small ruminants rearing but their involvement was limited to the manual work with no control over the income from the sale of the animals or their products. The study concluded that small ruminant rearing positively influences food security through increased household income, improved food production, heightened nutritional intake and gender issues were hindering the optimal utilization of their potential. The researcher recommends that the government to embark on sensitization on agribusiness coupled with high quality extension services to make farmers exposed on the financial potential in rearing small ruminants. Further, exposure to available market and gender mainstreaming will allow high participation in the small ruminants rearing. Broader studies need to be done to establish how small ruminants can improve food security especially in female headed households, the influence of cultural beliefs, attitudes and practices influence the ownership and disposal of small ruminants and the factors that can motivate farmers to take up small ruminant rearing.

# CHAPTER ONE

# 1.0 INTRODUCTION

## 1.1 Background of the study

Achieving food security is critical for building a healthy nation. According to FAO (2010), of the 925 million people who were undernourished worldwide in 2010 nearly all were from developing countries, with 25% (239 million) being from sub-Saharan Africa hence threatening the region's economic development. This situation is compounded by the growing human pressure on a finite land base ,water, and energy coupled with effects of climate change, hence the need to look for less land intensive activities like small ruminant (sheep and goats) rearing for optimal returns (Winrock ,1992). Approximately 775 million of the 809 million (96%) goats in the world come from developing countries and 86 percent of them are in low-income countries with a food deficit (FAO, 2005).

According to Kumba (2002) small ruminants rearing contributes to ensuring household food security through improving farm households' income (e.g. employment opportunities), enhancing food crop productivity (e.g. Manure) and as a source of essential proteins in many poor regions through meat and milk while the income relieves the meager income of poor farm households from being depleted by other non-food expenditures of households.

Sixty-five per cent of the global goat population is maintained in the developing countries of Asia with India contributing 20% while Africa has 29% of the total global goats population *(*Singh *et.al*, 2006), these statistics are a strong indication of the importance of goats in the livelihoods of people in developing and underdeveloped countries *(*Singh *et.al*, 2006) Overall India has 9.8% (182 million) of the total small ruminants of the world, comprising of 61 million sheep and 121 million of goat population (SAPPLPP, n.d). Despite the large numbers of the

small ruminants in India, its potential to boost rural income to reduce poverty is neither understood nor appreciated.

In Pakistan, livestock is the primary subsistent activity used to meet household food needs as well as Supplement farm incomes (Jamali, 2009). According to Ali (2006) Pakistan has a goats population of 62 million heads, with an annual growth rate of 4.5 percent, contributing 0.7 million tonnes of meat, 0.6 million tonnes of milk, 40 million skins and 0.07 million tonnes of hair to national livestock production per annum. Given that most goats are raised on marginal lands, the production is well-suited to landless, marginal and small farmers, providing income and employment to a predominantly poor population. The constant market demand of goats in the country ensures, they make a good cash supply to those farmers hence improved food security (Ali, 2006). The majority of farms own some livestock with the number of small ruminants (sheep and goat) standing at 3 per household with an annual household income of about C 100(Jamali, 2009).

Small ruminants rearing in the Unites States of America (USA) are owned by few large holder farmers and unlike in Africa and Asia where they are kept by small holder farmers. According to the United States department of Agriculture census publications (2007), there were about 2,601,669 goats kept in 123278 farms and 5,819,162 sheep kept in 83134 farms. The sheep industry in the US has a long and versatile history, despite this, its steady decline in the numbers since mid 1940sfrom a high of 56 million to 5.8 million in 2007 remains a dominant feature.

The decline has been attributed to confluence of forces and not a single reason (National research council 2008). Despite the decline in U.S. production, some good news to the farmers is that lamb consumption has grown slightly in the United States giving them an opportunity to further increase its demand. The goat industry is generally small but a 34% increase between 2002 and 2007 shows a promising industry. Sheep in the USA is mainly kept for lamb meat and

wool and pelts for textiles, but also other emerging sheep products including milk for sheep cheeses and yogurts, purebred sheep for shows, specialty wools, high-quality lighter-weight and younger lambs, and organic and natural lamb and wool products (National research Council, 2008) While goats in USA are mainly kept for meat and milk (US department of agriculture census, 2007).

In Europe, sheep and goats have yielded several products over the centuries; meat, wool, milk and skins being the main ones (Adalsteinsson, 1981). Goat breeding is strongly oriented towards milk production while sheep rearing is mainly for meat production. Europe owns only 3% of the world goat population but produce about 15% of the world's goat milk, which is mostly used for cheese production (Lejaouen and Toussaint, 1993).Sheep and goat production is very much considered a subsidiary enterprise throughout Europe and is kept in the less favored areas of the states, this is supported by Data drawn FAOSTAT (2008) which shows that for almost two thirds of farms owning sheep in Europe, less than 33% of their total agricultural production is from sheep and goats. Nevertheless, this varies depending on which part of Europe one is; for instance the United Kingdom has a much higher proportion of holdings with sheep and goats (46%) than the EU average but only 6% of these holdings gain more than75% of their income from this source, half the EU average.

In the Northeast Brazil, small ruminants are kept by low and middle income families to help supplement their income (Vidal et.al, n.d). Small ruminants meat especially goats have been integrated to the schools' feeding programs to deal with the issue of malnutrition and to provide a ready market to the animal keepers (Vidal *et.al*, n.d ) while in Bangladesh, Small ruminant population is around 38,094 with 4.9% annual growth which is highest among all livestock. Annually 33.5% Goats and 53.1% sheep are slaughtered to provide 0.14 million metric tonnes of mutton (FAOSTAT 2005). Although reared by marginal and landless farmers to provide food

security and sustain livelihoods, small ruminants are not adequately paid attention under National Livestock Development Policy of Bangladesh.

There are about 26.1 million and 21.7 million sheep and goats population heads in the Ethiopia respectively (CSA, 2008). As an important components of the livestock subsector, they are sources of cash income and play a vital role as sources of meat, milk and wool for smallholder keepers in the country (Gemeda, 2009) as well as sources of foreign currency Moreover, due to their high fertility, short generation interval, adaptation in harsh environment and their ability to produce in limited feed resource they are considered as investment and insurance (Asfaw, 1997; Tsedeke, 2007).Unlike the large potential of small ruminants in the country their productivity is low.

The Sahel and West Africa, in comparison with the entire sub-Saharan Africa region, contain 25% of the cattle, 33% of the sheep, and 40% of the goats (SWAC-OECD/ECOWAS, 2008).Livestock rearing plays a key role in the economies of West African countries providing, at times, 44% of agricultural GDP hence, with 160 million small ruminants, the Sahel and West Africa is an exceptional region for small ruminants rearing. Rearing small ruminants is one of the main economic activities on which the poorest populations depend for food, income and as an essential activity to insure against vulnerability and risk related to climatic conditions for populations highly dependent on rain-fed agriculture for their livelihoods (SWAC-OECD/ECOWAS, 2008).with all this potential the region's persistent great dependence on extra-African imports for some animal products such as meat proof that it is under-exploited.

In Kenya there are 44.9 million small ruminants, comprising of 17.2 million sheep and 27.7 million goats with Rift Valley contributing 53% and 42% respectively (CBS, 2009), this figures confirm that small ruminants large sector in Rift Valley and Kenya in general which can potentially impact on the economic welfare of the Kenyan citizens.

## 1.2 Statement of the Problem

Small ruminants are kept in most of the rural homes in developing countries as they are easy to acquire, rear and market. In developing countries, food insecurity is still a big challenge as FAO (2010) estimates that 925 million people were undernourished worldwide in 2010 with the prevalence of hunger in developing countries being 16 percent. This scenario has necessitated change of primarily focus from national/global food security to individuals and households' food security. This is guided by the realization that availability of food in the country or world does not guarantee its accessibility to individuals and households due to social and economic constraints facing the individuals.

In Asia, small ruminants have been shown to contribute to availability of food by producing animal proteins (meat and milk) as well as improving food crop production through fertilizing the farm by their dung and urine. For instance, in Pakistan the small ruminants are a source household food and supplementing farm incomes by producing 0.7 million tonnes of meat, 0.6 million tonnes of milk, 40 million skins and 0.07million tonnes of hair to the national livestock production per annum (Ali, 2006). The availability of the animal proteins in majority of the households will in turn reduce the malnutrition of the under-fives which stands at 25% as well generally improving the household nutritional intake.

Household income level determines the ability of the household to access food. Tinderet division is the second poorest division in Nandi south after Nandi hills with 57% of its residents categorized as absolutely poor(FAO, 2007), this coupled with a high unemployment rate and a large percentage of its employed residents being in agriculture. Maize, tea and sugarcane production have been for a long time the main economic activity in Tinderet division, however, the volatility of international tea market, poor pay in sugarcane sector and the fluctuating maize

prices due to maize imports, the said crops are failing to deal with the high levels of poverty and unemployment. The average household monthly income of KShs. 5605 (FAO, 2007) limits the household ability to access adequate food. Income generating projects are necessary to avert poverty and food crisis.

Household food production is an important factor in food security. Tinderet division is a deficit area producing 43 767 metric tonnes compared to a food demand of 96823 Metric tonnes. Among the main reasons for low food production is poor soil fertility due to a conglomerate of reasons including poor farming practices and dependency on inorganic manure from the government among others. Overtime the prices of inorganic fertilizers have skyrocketed similar to other essential farm inputs making them inaccessible to the common small scale farmer. A full or partial shift to a more sustainable soil fertilizing agent is essential if Tinderet division is to produce to its potential capacity and meet its internal demand and have a much needed surplus produce.

Household nutritional intake is an indicator of household food security. Six of the eight staple crops listed by FAO (2007) as produced in Tinderet division are carbohydrates with the rest being beans and vegetables. This leaves animal proteins to be the main source of proteins. Diminishing land sizes have limited the capacity of small holder farmers to keep cattle hence the prices of meat and milk have been facing a sharp incline limiting the ability of households to access enough proteins in their meals. The nutritional status on the under-fives in Tinderet is not impressive with 32 percent and 22.8 percent experiencing wasting and underweight respectively. An intervention to this situation is necessary, otherwise there will be negative consequences to the Tinderet division residents.

Household power dynamics determine the food status of the household members. Women are more vulnerable to food insecurity than men due to a combination of different factors from differences in physiological nutrients requirements to control of resources. In this regard, for a household to be secure, it matters who has the control of income as Habtemariam *et .al* (2003) found out that women had extremely limited access and control over property. Women efforts in agriculture and food security have recently gained some recognition though not yet proportional to the effort. To tackle the food security issue in Tinderet division, projects will require gender mainstreaming hence the balancing of the contribution and benefits across the gender as well as all age groups is an essential component to success.

A comparison of Nandi south district (where Tinderet is situated) 2007 statistics on cattle keeping (94, 900) versus sheep (22, 400) rearing, it is clear that small ruminants have been ignored in the area despite their many advantages over large ruminants (Ngategize, 1989). Although small ruminants have been shown to improve food security status in many other areas, such data from Tinderet division is limited and to gain support in implementing such projects will require local data. It is in this regard that we have set out to establish the effect of small ruminants rearing on food security in Tinderet division of Nandi south District.

### 1.3 Purpose of study

The purpose of the study is to examine the influence of small ruminant rearing projects on household food security in Tinderet Division.

## 1.4. Objectives of the Study

The study was guided by the following objectives:

1. To determine how small ruminants rearing projects influence household income in Tinderet division
2. To establish how small ruminants rearing projects influence household food production in Tinderet division
3. To establish how small ruminants rearing projects influence household nutritional intake in Tinderet division
4. To assess how small ruminants rearing projects influence the household power dynamics in Tinderet division

## 1.5.Research Questions

The study sought to answer the following research questions:

1. To what extend do small ruminants rearing project influence household income in Tinderet division?
2. How do small ruminants rearing projects influence food production in Tinderet division?
3. How is the influence of small ruminants rearing projects to household nutritional intake in Tinderet division?
4. How do small ruminants rearing projects influence household power dynamics in Tinderet division?

## 1.6 Significance of the study

It is hoped that the findings of this study will inform the local government on the influence the small ruminants can have on the household income, food production, household nutritional

intake and ultimately on the local economy. Food insecurity is a global issue and especially in sub-Saharan Africa where states are struggling to feed their citizens, availability of documented research findings on the clarity of the influence small ruminants have on food security may push the government policies on small ruminants and provision of enabling services like extension and financial assistance on farm inputs as well as provision of value addition services and a clear marketing strategy for the small ruminants' products.

This study might also lead to more intensified research in this sector which return will result to availability of latest information to small ruminant farmers. These potential impacts of the study made its undertaking a worthwhile and viable investment of time and other resources by the researcher.

### 1.7 Basic Assumptions of the study

The researcher is making the assumption that the respondents were truthful and answered the questions honestly and that the team was honest and maintained data integrity. The researcher is also assuming that the data collected is a true representation of actual situation.

### 1.8 Limitations of the study

The data was collected during a rainy season and Tinderet is hilly and the road networks were poor coupled with heavy rainfall during the period of data collection, this was a serious challenge to the research team. To overcome this, the researcher sought the services of experienced local motorcycle taxis drivers familiar with the research area topology to be able to reach the study participants and collect data safely.

Tinderet division covers a vast area, with rugged topography, to be able to collect data within the stipulated period, services of research assistants were employed to assist the researcher.

### 1.9 Delimitation of the study

Various types of small ruminants do exist; however, this study delimited itself to goats and sheep as they are the most common domesticated small ruminants in Tinderet constituency.
In terms of location the study was delimited to Tinderet division in Nandi south district. Tinderet division has been chosen for this study due to its unexpected food security status. Generally, it is assumed that if an area has adequate and reliable rainfall and reasonable population density, it should produce enough food for the community and at least minimum levels of poverty. Ironically, as FAO, 2007 found out in a study on food security district profiles, this is not the case as Tinderet with a population density of 162 persons/square kilometer, is a food deficit area (producing 43 767 metric tonnes and a food demand of 96823 Metric tonnes).The poverty levels in Nandi south district range from 46-59%, Tinderet division at 57% is the second after Nandi hills (59%) with the highest proportion of the poor in the district (FAO, 2007). This study specifically targeted small ruminant farmers who had owned small ruminants for 2 or more years at the time of data collection as they were considered to be able to assess how the small ruminants had influenced their food security.

To realize the objectives of the study a data collection tool that could collect data in a vast area with a limited time period was required. The researcher while appreciating other data collection tools delimited the study to the use of questionnaire as the data collection tool as it allowed the researcher to achieve the study objectives within the short timelines with minimal costs, tools and specialized skills.

### 1.10 Definition of significant terms used in the study

**Household food security** refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household. As the focus of concern this was measured by household income, household food production, household nutritional intake and household power dynamics.

**Small ruminants rearing** is whereby a household owns any number goats, sheep or both and For this study, the rearing has to be for the last two years as we need to measure influence of the rearing to food security.

**Household income** is the amount of money that is available and accessible for use to the members of the family. This was measured per month and was categorized as; below 3000, 3001-5000, 5001-10000 and above 10000

**Household nutritional intake** is the amount and variety of food the family members consume per day. This will be asked in terms of how many meals per day as well availability of proteins and vegetables or fruits in the meal.

**Household food production** is the amount of cereals, milk, meat, tubers or vegetables produced from household's own farm.

**Household power dynamics** is the categorization of the roles or duties played by each member of the family in terms of labor intensive roles and low in control of proceeds from small ruminants (non -technical roles) and skills intensive roles and high in control of the proceeds from small ruminants( Technical roles)

### 1.11 Organization of the study

The study is organized into five chapters starting with chapter one which is comprised of an introduction giving the background of the study, statement of the problem, purpose of the study, research objectives and research questions, significance of the study, limitation and delimitation, basic assumptions and the organization of the study.

Chapter two is comprised of the literature review, theoretical framework as well as conceptual framework, chapter three which is the research methodology comprises of the subtopics on introduction, research design, population, sampling procedure and sample size, instruments, validity and reliability, procedure for data collection and data analysis

Chapter four of this report presents introduction, themes on which data is presented, interpretation and discussion of data and finally, chapter five of the study presents a summary of findings, conclusions, recommendation, the study's contribution to knowledge and suggestions for further research.

# CHAPTER TWO

# 2.0. LITERATURE REVIEW

## 2.1. Introduction

This chapter reviews literature which is related to the study based on the following thematic areas: small ruminants and household income**,** small ruminants and household food production, small ruminants and nutrition, small ruminants and household power dynamics in labor and income. The chapter also presents the theoretical and conceptual frameworks on which this study was based as well as a summary of the literature reviewed.

## 2.2 The concept of small ruminant rearing and food security

Small ruminants are varied, however, goats and sheep are the only domesticated small ruminants and they were the first of the ruminants to be domesticated in southwestern Asia and distributed in various parts of the world. They are reared for various benefits which include but not limited to meat, milk, wool, skin, hides and manure. They are considered easy to rear and according to Devendra (2001) they form an important economic position especially in small scale farms, this due to their adaptation ability, easy to care for and efficient use of pasture coupled with readily available market. Despite all this benefits, it is worth noting that small ruminants in sub Saharan Africa are not as valued as they deserve if the availability of published research and development findings, is anything to go by and States' investment to improve their production.

Food security as a term has been evolving with time and the terms origin can be traced to World Food Conference 1974 in mid-1970s, where food security was looked at in terms of food supply and price stability. FAO (1983) defined food security as ensuring that all people at all

times have both physical and economic access to the basic food that they need. The term evolved as used in World Bank Report on Poverty and Hunger to focus on temporal dynamics of food insecurity bringing in the distinction between chronic food insecurity and transitory food (World Bank, 1986).

Food security is a multidimensional issue as demonstrated by World Food Summit (1996) definition which includes food access (sufficient resources to obtain appropriate foods for a nutritious diet), availability (sufficient quantities of food available on a consistent basis) and food use (appropriate use based on knowledge of basic nutrition and care, as well as adequate water and sanitation)

### 2.3 Small ruminants rearing and household income

The economic contribution of small ruminants to poor farm households and livelihood systems in terms of household income is much higher than is imagined. As Devendra (2001) noted, in Arid and semi-Arid areas (ASALs) goats and sheep provide the main means of survival and security as the sale of animals, milk and manure account for between 27.2 to 30.7%, 19.7% to 84.8%, and 1.0-4.5% of total farm income respectively while in Sub-humid and humid areas, Mixed farming is more common goats contributed between 17.1 to 58.0% of total farm income. These levels of income contribution are much lowers that reality as farmers lose 40-45% to middlemen due to lack of market access.

According Misra (2005) small ruminants contribute enormously towards promotion of livelihood security and as an insurance cover to cope with crop failures especially in Sub-humid and humid areas where mixed farming is more common and goats contributed between 17.1 to 58.0% of total farm income. A study done by Devendra (2001) on the Contribution to food security, poverty alleviation and opportunities for productivity enhancement in Asia concluded that the

levels of income reported is a proportion of the actual value of the small ruminants due to lack of market access resulting to farmers losing 40-45% total value of the animal to middlemen who exploited the situation. Nevertheless, small ruminants significantly contribute to household income of the rural poor especially due to their generation intervals, high prolificacy and are easily adaptable to a wide range of climatic conditions while requiring little capital to maintain. As a result, they constitute an important national and household level productive asset that generates a flow of income and employment throughout the year. These characteristics mean small ruminants are particularly important in the household economy of the poor, particularly in the developing nations of Africa and Asia.

In Indian context, the agricultural sector contributes25% of the national GDP, of which 23% are from livestock. Among the livestock, small ruminants contribute about 10% to the total value, approximated at Rs 24,000 million annually. Although small ruminants account for 14% of the meat, 4% of the milk output and 15% of hides and skin production in the country, it receives only about 2.5% of the public expenditure on livestock sector, evidently a much less proportion than the small ruminants contribution to the total livestock sector value(Birthal *et. al.* ,2003).

A study done in Egypt by Metawi (2009) on the contribution of small ruminants in alleviating poverty in arid regions of Egypt found out that small ruminants contribute 43.6% and 47.7 % of the average total income among the high income farmers and the low income farmers respectively. These figures indicate that small ruminants contribute slightly below half of the family gross income making them an important economic activity in Egypt.

In Ethiopia there are about 26.1 million and 21.7 million sheep and goats population heads respectively (CSA, 2008) which serve as an important source of income for agricultural community and major foreign exchange earner through exportation of live animals, meat and

skin. Additionally, farmers view them as living saving bank and an insurance or financial reserve for a period of economic distress and crop failure as well as a primary source of cash income (Sheferaw *et.al*, 2010)

In Kenya, small ruminants are kept for various reasons with regular cash income from animal, milk and meat sales being the most important , small ruminants are also seen as savings and insurance against emergencies( Kosgey et.al ,2006) making them vital food security tools for subsistence farmers faced with unstable crop harvest. Similar to other regions, small ruminants in the coastal province of Kenya are a means of obtaining quick cash and for cultural functions (Anon, 2004), contributing to income generation and food security in general. Comparatively, a survey conducted by Kosgey et.al (2006) on Small ruminant production in the tropics using a quantitative design and random clustering sampling method found that for majority (72%) of the smallholder and pastoral/extensive farmers, regular cash income and insurance against emergencies ranked first when asked to classify their reasons for keeping goats and sheep, this regular cash was used on basic needs (paying for education, food purchases, medical care,) with purchasing food occupying 22% of the annual goats and sheep sale.

### 2.4 Small ruminants rearing and household food production

The demand for food of animal origin in developing countries is expected to double by the year 2020 due to increases in urbanization, population and income growth (Delgado et al., 1999) there is no indication of similar growth in supply. Livestock rearing has more effect at farm level than at regional level, because intermediate products, such as manure and draught power are important benefits (Udo and Cornelissen, 1998) which play an important role in food security issues at household level.

Slingerland (2000) described the role of small ruminants as a buffer especially in areas with unreliable rainfall conditions where annual crop harvests fluctuate. In years of surpluses, farmers sell the grains to buy livestock while in years of cereal shortages; livestock is sold to buy grains for food. The sustainability of rural farmer systems seems to be strongly related to animal production through income generation (Guèye, 2000)

Sixty-five per cent of the global goat population is maintained in the developing countries of Asia with India contributing 20% of them and 9.8 % of the world's small ruminants making India a prime small ruminant's producer in the world (FAOSTAT, 2008). Even with India's obvious large goat and sheep population their potential and actual effect on food production and poverty is still not well understood or appreciated.

The importance of small ruminants in the tropical Africa in general is well recognized (Williamson and Payne, 1978). Small ruminants are reared for various functions but mainly for Meat, milk, skin, manure and wool. About one-sixth and about a third of the total world flock of sheep and goats, respectively is found in the African tropics (FAO, 1982) producing 1.3 million metric tonnes of meat (about 16% of the world total from sheep and goats). According to Otchere (1985) sheep and goats in Africa produced 8.6% and 18.2% respectively, of the world total amount of milk produced from these two species and the production from both accounted for 13.6% of milk collected from small ruminants in the world.

In many parts of South-east Asia, integration with perennial tree crops, such as coconuts and oil palm, reduces the cost of weeding, improves soil fertility, increases crop yields and productivity per hectare, and hence, socioeconomic benefits to small farmers. In the Philippines for example, the integration of goats and sheep with coconuts over three years increased the income of farmers by between USD127 and 229.

In some parts of India, shepherds maintain their stock by grazing on community lands by employing family labor with negligible economic inputs and marginal outputs (Chauhan and Moorti, 1999), farmers especially in the lower caste make use of tethering systems whereby while going out as a farm laborer the small ruminants are taken along.

In Kenya, sheep and goats formed the bulk of animals purchased for slaughter contributing over 60% of the total heads bought for slaughter resulting to an annual meat value of Kshs8.2 which is second to the beef annual value estimated at KShs 34.4 billion EPZA (2005). A study done by Kinyanjui *et.al* (2010) on the Socio-economic Effects of Dairy Goat Production in Kenya found out that 57% of the goat milk produced was for home consumption making goats milk an important source of proteins for the family. Further, the study observed that in places like Kiambu where land is inadequate to support cow rearing, goats are best alternatives to provide the family with milk especially for the old, children and sick.

**2.5 Small ruminants rearing and household nutritional intake**

Small ruminants are of a particular economic interest especially in the developing world where its production has become a useful strategy to tackle the problem of under nutrition especially among human infants. According to Haenlein's (2001, 2004) goat milk treats people with cow milk allergies and gastro-intestinal disorders and it has higher levels of six of the ten essential amino acids which are all known to benefit human health and tackle malnutrition. Knights and Garcia (1997) also agree that the composition of goats' milk raises it potential role in future human nutrition and medicine than cattle milk, this potential requires little capital to harness making small ruminants an attractive source of nutrition to the poor and marginalized.

While 60% of the world's goat population resides in Asia (FAO 2003), India accounts for 20% of this with the annual growth rate of 1.6% in spite of 38% annual slaughter rate and

approximately 15% mortality (Delgado, 1999). In India, small ruminants are major contributors of animal proteins for human consumption where the Per capita consumption of meat here is only 5.4 kg/year, as compared to 33kg/year in the developed countries (Delgado, 1999). Current availability of animal proteins (10.8gms/day/capita) is just half of the daily requirement (20 grams /day /capita) and the target is to achieve this by 2020. A 5.8% annual growth on meat production (including fish and poultry) is mandatory if this target is to be achieved (Jha and Chand 1999). This underlining the significant influence small Ruminants sector have not only on the nutritional intake but also on the livelihoods of small and marginal farmers rearing them in the coming decade**.**

In Bangladesh, based on sample surveys it is estimated that small ruminant particularly goats contribute 28% of the annual milk produced in the country (118,000 tonnes) and they contribute 19% (70,000 tonnes) of the country's total meat production per annum (Saadullah,1991) this data underlines the importance of small ruminants in the provision of proteins.

The Nigeria Livestock Industry contributes a merger 9 – 10 percent of the GDP and only 35.5 percent of the protein intake of Nigerians (NSAP, 2009), this is despite the great potential the sector has in nutritional and food supply. Thus, while FAO/WHO recommends a minimum animal protein intake of 35g per person per day only 10 grams has been achieved in Nigeria.

In Kenya, according to animal protein consumption improved from 14.5grm/person/day in 2002 to 16.4gms/person/day in 2008 (FAO, 2010), despite the increase it is still below the WHO recommendation. This gap can be bridged if milk production which according to Kinyanjui (2010) is the most consumed proteins in rural Kenya, could be increased.

## 2.6 Small ruminants rearing and Household Power Dynamics

The role of woman in the agricultural sector, especially as keepers of small livestock such as sheep and goats, greatly increases world food security by improving the health and livelihood of individual families. Studies by the Food and Agricultural Organization of the United Nations (FAO) confirm that while women are the mainstay of small-scale agriculture, farm labor force and day-to-day family subsistence, they have more difficulties than men in gaining access to resources such as land and credit and other productivity enhancing inputs and services (Women and Sustainable Food Security, 1996).Recent statistics also point to the fact that the percentage of women who experience poverty is greater than that of men. Hunger and malnutrition affect more than 780 million people in the developing world; 550 million rural women live below the poverty line in their respective countries.

Gender division in labor will vary depending on the agricultural systems of an area, division of labor between sexes and age in pastoral systems varies from agro pastoral systems and mixed crop-livestock farming systems (Tangka*et.al* 2000), in this study the literature reviewed was inclined to mixed crop-livestock system as it is the system in the target population.

A study done by Tulachan and Batsa (1994) on gender differences in livestock production management in the Chitwan District of Nepal, found out that Women's labor makes up more than 80% of the total labor spent in different livestock raising activities, they are involved in tasks like collecting of folder, milking, feeding and cleaning the animal sheds with occasional and limited assistance from men depending on the crop production season which takes away women time. In this region men are solely responsible for purchasing of manufactured feed (during the dry months), veterinary services and marketing of raw milk. In contrast, a review of existing literature on gender roles and child nutrition systems in developing countries done by Tangka et al (2000), revealed that women are hardly involved in agricultural

tasks; their small ruminant livestock production activities include cleaning of sheds, milking, preparing manure and butter while men do the rest of the duties which are done outside the homestead.

The prevalence of female-headed households is generally higher in sub-Saharan Africa than in other regions (FAO, 2011).According to a large volume of research that was carried out in developing countries (Lebbie, 2004; Shortall, 2000; Sinn, Ketzis, & Chen, 1999), women play a major role in small ruminant production, which is rarely if ever recognized due the structural position men hold in the societies in the continent. This leads to women's needs being ignored during design of educational or training programs about small ruminant production and their level of participation in rural areas are far from acceptable.

The situation is not different in Ethiopia as Habtemariam.*et.al (2003)* found out that women had extremely limited access to and control over property (goats, land) and earned income despite receiving credit to buy the goats. In most of the cases husbands make decisions on the sale of goats or sheep and the use of the revenues generated from the sale, what species, class, and number of animals to rear. Women can only decide on daily milk sale and the use of revenue generated there from, although the husband reserves the right to stop their decision. This limited freedom to make decisions on family property leaves women vulnerable to food insecurity. Similarly, a study done by oluka .*et.al*(2003) within the Teso community of Uganda onSmall stock and women in livestock production, found out that men control over benefit from goats in a male headed household was as high 42% as compared to the female counterparts in a similar household which was 9%. In a female headed household, the woman controlled 52 % of the benefits.

In Kenya, the position of women in terms of the control of small ruminants or livestock in general differs from community to community. In the mixed crop-livestock systems,

Maarse(1995) in her study of gender differentiated impacts of intensified dairy farming on socio-economic position of smallholders in five districts (Kiambu, Meru, Migori, Nandi and Vihiga) of Kenya found out that women contribute more labor(32%) than men (23%) of the total animal care labor. Hired workers handle 33.3% of the overall dairy farming activities while Children contribute 5% of the total dairy labor, assisting. This high labor contribution by women is in tandem with their traditional roles as agriculturalists and milkers in Kenya.

Among mobile pastoralists in northern Kenya, although women were found to have the right to sell milk, men were responsible for the overall herd and had the right to decide where the household would camp and where there was a conflict between what women wanted and men objectives of the herds, men used location to limit women's ability to market. In some societies like the Maasai community , women may 'own' some animals but have little say about selling or slaughtering and even when they sell milk they sales are given to the husband while among the Nandi community women may have a say in sales decisions even though they do not 'own' the animals (Kristiansen, 2010).

**2.7 Theoretical framework**

This study is inclined to the Economic constraint model which was propounded by William Heffernanin 1972 to explain the changing structure of farms in America due to farm crisis in 1950's through 1960's. This theory has also been used by Hooks et.al (1983) to explain the decisions by farmers to adopt new innovations as they are committed to their previous asset investments. This theory perceives farm households as decision makers who are guided by their goals and /or objectives and resource constraints of the individual farming household, are concerned with how much to devote to the cultivation of each crop or keeping of which

livestock, whether or not to use purchased inputs, which crops/ animals to grow/rear on which fields among others.

The economic constraint model makes various assumptions. The model assumes that the household acts as a unified unit of production and consumption that aims to maximize utility subject to its production function, income and total time constraint. Utility is described as the satisfaction an individual derives from a set of commodities (including leisure), which is attained from consumption. Use of a single decision maker is an essential attribute of the model with implicit assumption that no conflict exists within the household and that all members have the same utility function so that maximizing the household utility would yield similar results as maximizing individual functions. This proposition is based on the assumption that household members will sacrifice their individual preferences for the common good of the household. The usual practice is to adopt the utility function of the household head, usually the man, to represent the utility of the entire household. In return, the altruistic head will make decisions based on what is best for the household as a whole.

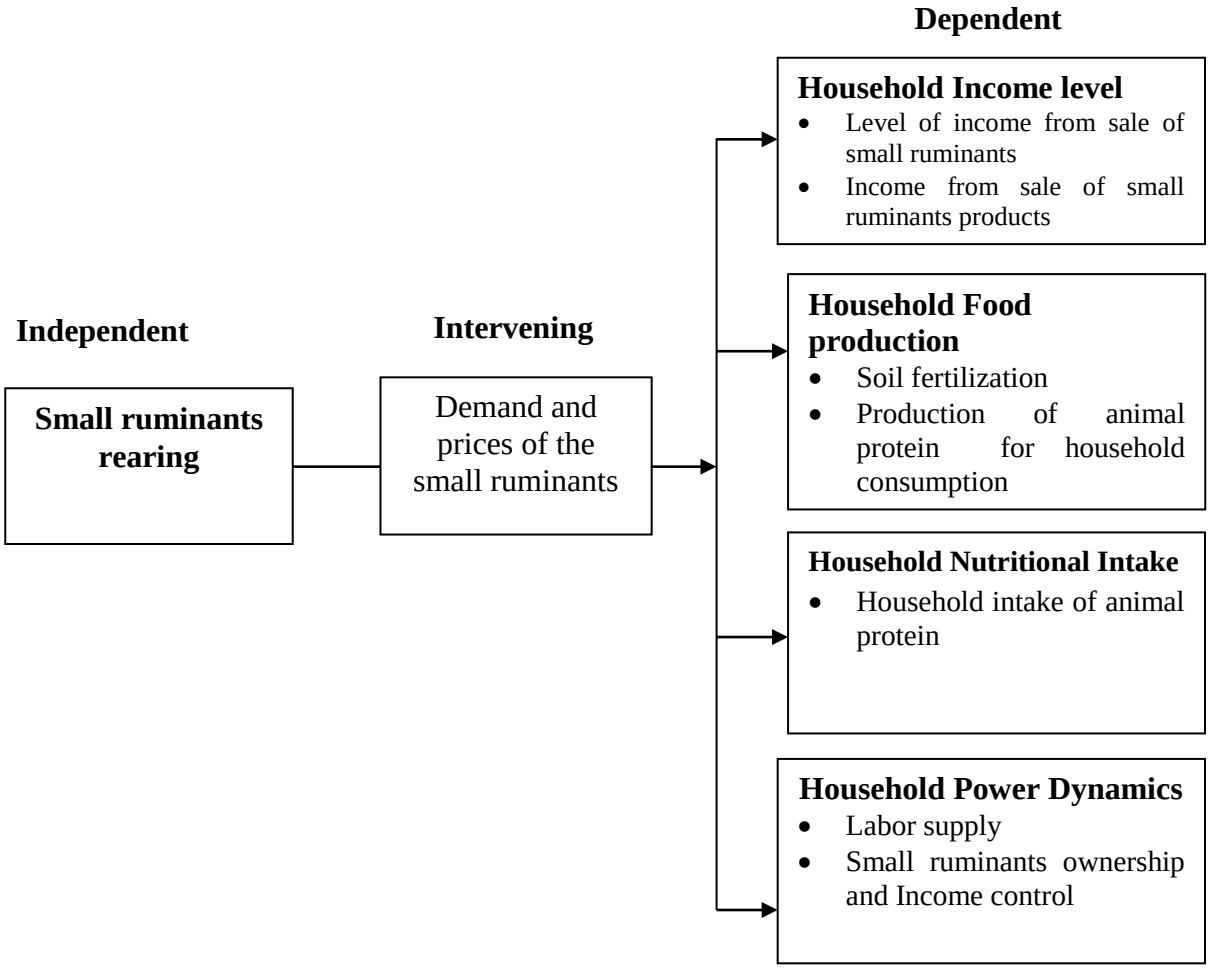
This theory is important in this study because it is sampling households and assuming the answers given by the household stands for the other family members. The study also wants to know who makes decisions regarding small ruminants rearing, selling and who controls the income and what the income is used for. This involves deciding how much of what crop to cultivate and how many of what animal to keep.

This theory has been criticized that household members have different tastes and preferences which cannot be left philanthropic behavior. The assumption of altruism in the household is in contrast with the presumed selfishness and competitiveness of individuals in a household. The comparative advantage by individual household members used in this approach

(Evans 1989), ignores real relations like non-market reasons for the division of resources and unequal power relations in decision-making that prevail in households (Ellis 1993). Empirically it has been shown that adults in a household will be interested to undertake separate activities or businesses to an individual incomes which they use individually or in the household (Koopman 1991), this personality and individual situations essentially rules out uniform predictable responses while gender relations shape labor obligations and resource distribution (Kabeer 1991; Whitehead 1985)

### 2.8 Conceptual Framework

The study was guided by the following conceptual framework



In this study, small ruminants rearing are the independent variable while household income, household food production, household nutritional intake and household power dynamics are indicators of food security which are the dependent variables. This study hypothesizes that if a household keeps small ruminants it benefits in several ways; increased income from sale of small ruminant's products like milk, skin, meat, wool, hides and manure and also through selling of the off springs. This increased income can either be used to purchase food if there is no food in the store or if there is food in the store, then the income is used to buy other non- food essential items, reducing the possibility of selling the food stock for such items.

The household also benefits from increased food production due to the use of the rich in nutrients manure, which is cheap to obtain as the small ruminants feed on food residues which have no more market value. The household additionally profits from increased nutrients intake particularly from milk and meat as most of the milk from small ruminants is spent at home. The household power dynamics in a family influence food security as it determines where the family spends their energy and time and most importantly who has control of family income. The prices and demand of small ruminants and their products affect to which extend small ruminants influence food security hence they are the intervening variables of the study.

### 2.9 Summary of Literature Reviewed

A thorough literature review revealed that small ruminants have a great effect on food security especially in the developing countries of Asia and Africa through increasing the household income, household food production, household nutritional intake and improving on the household power dynamics hence gender mainstreaming in development.

The literature exposed empirical evidence income from small ruminants has helped remove the burden of other household needs from the food crops hence allowing the household to keep

the available food crops for own consumption. Small ruminants have a lot of products that have ready market like wool, milk, skin, hides, manure and meat. It is also clear that if one has the income then they are better placed to acquire the required food staffs.

Small ruminants has been shown to improve the household food production by production of animal proteins like meat and milk in an easier and cheaper way for peasant farmers as well as fertilizing the soil for improved food crops harvests. It has also been shown that milk from small ruminants is good for people who have allergies to cow milk.

Household nutritional intake has been shown to be improved by the availability of small ruminant's products in terms of meat and milk. This is especially in small scale farmers who might not have the capacity to keep large ruminants like cattle and buffaloes. Availability of these animal proteins greatly influences the levels of protein intake not only for the children but also for the adults.

Literature reviewed gives mixed results depending on location and culture in terms of household roles and control of income from small ruminants. Nevertheless, many researchers agree that women contribute the majority of the labor in the care of small ruminants while men control the income in majority of the cases.

# CHAPTER THREE

## 3.0. RESEARCH METHODOLOGY

### 3.1 Introduction

This chapter discusses the research methodology which was employed to collect the data for answering the research questions as well as achieving the research objectives. This includes: research design, target research population, sample selection and sample size, research instrument, data analysis techniques and ethical consideration.

### 3.2 Research Design

This research employed descriptive survey design as it is the most predominant design employed in social sciences and can also be used to show correlation between variable (Kothari, 2004) as is the intention in this study. This design was appropriate for this study as it allowed the researcher to get information on and describe a population on a particular outcome within the limited resources while covering large study area. This design was further found to be fitting this study as it allows collecting of data about the population in a particular time point. This method is a fast and efficient way of obtaining data on many variables from a large number of respondents while avoiding the challenges of long term follow up. Since this study was involving a large area and relatively many households the researcher found this to be an appropriate method as compared to other methods like Case study and experimental designs.

### 3.3 Target Population

Tinderet division is one of five divisions of Nandi south district, Rift valley province, Kenya. The area is dominated by the Nandi and Kipsigis sub tribes of the Kalenjin tribe and receives an annual rainfall between 1,200mm and 2,000mm the main economic activity is agriculture sustaining nearly 90% of the economically active individuals while accounting for approximately 52% of the household earnings in the region.

Tinderet division has 13 locations and 26 sub-locations with a total population of 199,514 of which 49% are female and a population density of 162 persons per square kilometer (CBS, 2009). Among the 8602 households in Tinderet division, target population was 367 households who had owned small ruminants for at least 2 years at the time of the study.

### 3.4 Sample Size and Sample selection

This section describes the study sample size and how it has been arrived at.

#### 3.4.1 Sample size

For this study sampling is done to overcome the constraints in time and money to conduct a census. For this study Krejcie and Morgan (1970) sampling table was used. According to CBS (2009) Tinderet division has 8602 households whose recommended sample size is 367 households according to Krejcie and Morgan Table (see appendix II).

#### 3.4.2 Sampling Procedure

Sample selection was done using multi-stage random sampling method to sample households in Tinderet division. This method was chosen over others due to the fact that sampling the whole division would be extremely expensive and time consuming for the

researcher. According to Mugenda (2008), 30% sample size is sufficient to represent a population to be used in a social science research hence 30% of the total locations in Tinderet division gave us a total of 4 locations (30% of 13) to be involved in the study. The four locations were randomly selected through Microsoft excel, the selected locations were Ainapngetuny, Soba, Tachasis and Tinderet.

In the second stage of the sampling 30% of the sub-locations in each location were taken and where location was made up of only one sub-location. That sub-location was taken as the sampled sub-location. In ainapngetuny, had four sub locations (30% of 4 =1). Ainapngetunysub-location was picked randomly using ruffle method. Soba had two sub locations (30%*2= 1) Kapkitanysub location was randomly chosen. Tachasishas kaplamaiywo sub location only so it was sampled and lastly Tinderet location which has two (30%*2= 1) mbogovalle sub location was randomly picked.

Finally, distribution to the four sub-locations is done proportionately as follows

$$\frac{\text{Total households in a sub location}}{\text{Sum of households in the 4 selected sub-locations}} \times \text{sample size}$$

**Table 3.1: Tabulated sample selection**

| **Sampled location (** 30% of the location | **Sub location (**30% sub - locations in @ location**)** | **Households** | **Sample distribution** | **Households sampled** |
|---|---|---|---|---|
| Ainapngetuny | Ainapngetuny | 280 | (280/1048) × 367 | 98 |
| Soba | Kapkitany | 183 | (183/1048) × 367 | 64 |
| Tachasis | Kaplamaiywo | 254 | (254/1048) × 367 | 89 |
| Tinderet | Mbogovalle | 331 | (331/1048) × 367 | 116 |
| | 4 sub-locations | 1048 | | 367 |

The household head available was asked to answer the questionnaire. In cases where the household did not have small ruminants it was skipped and the next household was picked. To decide which sub-location to start with, one was picked at random and to decide the first household to go into, the researcher went to the center of the sub-location and chose randomly for the subsequent ones households, systematic random sampling was employed whereby every 3rd household were sampled until the required households in that sub-location were interviewed.

### 3.5 Research Instrument:

The study used a closed ended questionnaire which was administered to the household head once and collected by the research assistants. The questionnaire is divided in to 5 sections as follows: Section I: Socio-demographic factors to establish the characteristics of the study respondents, Section II: small ruminants rearing and household income; this was seeking to get information on how much the family makes in a year, what proportion of this income is from small ruminants, how the income from small ruminants is spent as well as their main sources of

income other than rearing of small ruminants. Section III; small ruminants rearing and food production, this solicited for information on how the farmers improve their soil fertility and if it is from own or purchased source as well as the source of income to acquire the fertilizers/manures. Section IV; small ruminants rearing and household nutritional intake; this section looked at the number of meals and their animal protein content and their sources. Section V; Household power dynamics in small ruminants rearing; its required data in regards to who is doing what in the small ruminants rearing.

### 3.5.1 Pilot Testing

Pilot testing was undertaken to test the data collection tool for understandability and acceptability by the participants .It is required that the pilot should be based on subjects from a similar population to that being examined in the survey but not in the same target population. For this study, the pilot study was undertaken in 10 households from Nandi Hills division which is neighboring division. To undertake the pilot study, one research assistant was trained on how to administer the questionnaire, ethics and data confidentiality. The questionnaires were then administered by the trained research assistant and collected for review before data entry and analysis. Any inconsistencies, blank spaces or any other weak areas were corrected. The analyzed data was used to further improve the questionnaires as appropriate. Once the amended questionnaires were ready they were taken back for re-administration to the same households to be sure the instruments are effective in collecting the intended data. The chosen participants were explained to that the data is only for pilot testing. This process helped to fine tune the research tools by giving feedback on their efficiency.

### 3.5.2 Validity of the Instrument

Validity refers to the degree in which our tools, tests or other measuring device are truly measuring what we intended it to measure (Kothari, 2004). To uphold content validity, the study subjected its instruments to discussions with the supervisors who are professionals to ensure the instruments capture the relevant data to achieve the research objectives as well as answer the research question in this study. To avoid instrumentation as a threat to internal validity, the same research team was retained from pilot testing through the life of the study to ensure uniform and consistent administration of questions. The instruments were also being taken through pilot testing to improve on the efficiency of the research instruments

### 3.5.3. Reliability of the instrument

According to Mugenda (2008), reliability measures the degree to which a research instrument would yield the same result or data after repeated trials, it's influenced by random errors that may arise from coding, ambiguous instructions, to interviewer and interviewee fatigue, bias among others. In this study, reliability testing was done by using test-retest method. The questionnaires were administered to selected 10 households from Nandi Hills division which is neighboring division. The questionnaire were administered to the same set of households after 2 weeks. Correlation between the test and the retest statistically determined using statistical package for Social sciences (SPSS). According to Kathuri and Pals (1993) the acceptable correlation coefficient range is 0.70-0.90, in this study a Karl Pearson's correlation coefficient of 0.85 was obtained and this fell within the acceptable range. The Karl Pearson's formula for correlation was used:

$$r = \frac{\sum (y-\mathbf{Y})(x-\mathbf{X})}{\sqrt{\sum ((y-\mathbf{Y})^2 \sum (x-\mathbf{X})^2}}$$

r=Karl Pearson's coefficient of correlation

y=Values of the first test

x=Values of the retest

**Y=**Mean of the first test

**X=**Mean of the retest

### 3.6 Data collection procedures

After the proposal was approved for implementation, the researcher obtained a research permit from the National council of science and technology in the ministry of education in Kenya to collect data. A rigorous training was then conducted for the research assistants involving informed consent process, how to conduct the interviews, data confidentiality and research ethics. Thereafter, an introductory visit to the gatekeepers that is the District Officers, chief and assistant chiefs as well as extension officers in the division was made. Data collection was done using assisted questionnaires; the research assistants administered the questionnaire and collected it for surrendering daily to the team leader. Data collection activity took 8 days as the area is not very accessible by road.

### 3.7 Data analysis techniques

According to Kothari (2009) data analysis involves closely related operations which are performed with the purpose of summarizing collected data and organizing them in a manner that they answer research questions. This study made use of descriptive methods of analysis to

analyze the data. After data collection, the questionnaires were checked for completeness, cleaned, organized, coded then entered into excel and SPSS for analysis. Descriptive statistics in the form of frequency distribution, percentages and averages were produced using statistical package for social scientists (SPSS) while tables were generated using MS- Excel. Data was presented using frequency and percentage tables.

### 3.8 Ethical considerations

The researcher is aware that personal information should be kept confidential and hence the participants were allowed their privacy if they so wished. To ensure confidentiality of data collected from the households, anonymous questionnaires were used while the participants were given a chance to choose if to participate or not. Further, Permit to conduct the study was obtained from the National Council of Science and Technology

# CHAPTER FOUR

## 4.0. DATA ANALYSIS, PRESENTATION, INTERPRATATION AND DISCUSSION

### 4.1. Introduction

This chapter presents the study findings questionnaire response rate, results on socio demographic characteristics of respondents, socio-economic determinants of the respondents, education and knowledge of respondents and the . The chapter looks at how these characteristics and practices influences food security in Tinderet division of Nandi South district, Kenya

### 4.2 Questionnaire Response Rate

A total of 367 questionnaires were distributed for administration and 350 questionnaires were returned for analysis yielding a response rate of 95.3%. According to Mugenda and Mugenda (2003), a 60% response rate is graded as good while 70% and over response rate graded as very good, hence the study's response rate of 95.3% was commendable and acceptable to the researcher.

This response rate was achieved as a result of an elaborate mobilization strategy which included discussions with the provincial administrative officers in all the four sampled sub-locations as well as the religious opinion leaders. This adequately worked in explaining the purpose of the study to the community coupled with a proper training and coordination with the research assistants who did a door to door administration of questionnaires. In addition the research assistants administered the questionnaire and waited for it to be answered hence reducing the chances of misplaced or non-responded to questionnaires.

### 4.3. Demographic characteristics of respondents

The researcher set out to understand the demographic characteristics of the respondents by asking about their age, gender, and marital status, number of members in a household, education levels and religious affiliations. Those demographic characteristics are discussed in the sub-topics in order to appreciate the study participants.

#### 4.3.1. Distribution of respondents by age and gender

The study sought to establish the gender and ages of study participants. This was particularly seen as important as it could give information on who is interested in small ruminants farming and hence allow for effective and tailor -made intervention to increase small ruminants rearing in the area. Respondents were therefore asked to state their age and gender and the findings are as presented in table 4.1

Table 4.1

*Distribution of respondents by gender and age*

| | **GENDER** | | | | | |
|---|---|---|---|---|---|---|
| | **Male** | | **Female** | | **Total** | |
| **Age category** | **Freq** | **percent (%)** | **Freq** | **percent (%)** | **Freq** | **Percent (%)** |
| Below 25 | 21 | 7.5 | 2 | 2.9 | 23 | 6.5 |
| 25 to 35 | 68 | 24.3 | 19 | 27.1 | 87 | 24.9 |
| 36 to 50 | 94 | 33.6 | 24 | 34.3 | 118 | 33.7 |
| Above 50 | 97 | 34.6 | 25 | 35.7 | 122 | 34.9 |
| **Total** | **280** | **100** | **70** | **100** | **350** | **100** |

Table 4.1 shows that, out of the 350 household heads who participated in the study, 280(80%) were male. Among them, 21 (7.5%) were below 25 years, 68 (24.3%) were aged between 25 -35. 94 (33.6%) were within the age range of 36-50 and 97 (34.6%) were above 50.

From the study findings, majority of the male respondents (68. 2%) were above the age of 35 years. This is the age males generally have settled into family life and farming in general.

On the other hand, of the 350 study respondents, 70 (20%) were female. The female responded ages were spread in a manner similar to the male with only 2(2.9%) below age 25, 19 (27.1%) were aged between 25 and 35, 24(34.3%) were within the 36-50 age category while 25 (35.7%) were above 50 years of age.

In view of these two statistics displayed respondents of both genders, it shows that the study respondents and hence the small ruminant Keepers in Tinderet Division are of middle age with a mean age of 44. 5 years with a standard deviation of 13.7. These results are similar with a study by Ruto *et.al*(2013) on the determinants of market participation decisions in small ruminants' market conducted in Kenya using systematic random sampling methods found that the average age of small ruminant farmer is 46.7 years with a standard deviation of 13.

Members within this age range are self-motivated to undertake small ruminant projects hence if intervention on better small ruminant rearing methods or new technology, they form the best entry point.

### 4. 3.2 Distribution of respondents by marital status

The study also sought to establish the marital status of various respondents who took part in the study. The researcher considered this vital in finding out if marital status influenced small ruminants rearing and their contribution to food security among keepers. Respondents were thus asked to state their marital status and the findings were as illustrated in table 4.2.

Table 4.2

*Distribution of respondents by marital status*

| Marital status | Freq | % |
|---|---|---|
| Single | 49 | 14.0 |
| Married | 255 | 72.9 |
| Divorced/Separated | 14 | 4.0 |
| Widowed | 32 | 9.1 |
| **Total** | **350** | **100.0** |

The study findings regarding marital status of the respondents were 255 (72.9%) were married; 49 (14.0%) were single, 14 (4.0%) were separated or divorced and 32 (9.1%) were widowed. Based on these study findings, Majority of the small ruminants keepers who participated in this study are married 255 (72.9%) and the rest fairly distributed in the other categories. This finding are comparable to results of a study done in Nigeria by Familade *et.al* (2011) using stratified random technique for sampling on the characterization of Small Ruminant Farmers which found out that 82.2% of the respondents were married. Similar results are also reported in an article by Oluwatayo I. B. and Oluwatayo T. B. (2012) titled Small Ruminants as a Source of Financial Security: A Case Study of Women in Rural Southwest Nigeria which found out that only about 22.9 percent of the respondents were single with the rest being married, divorced or widowed. These findings can be attributed to the availability of labor in form of a spouse and the children as well as the need to supplement the household income due to increased responsibilities after marriage

### 4. 3.3 Distribution of respondents by level of education

The study sought to establish the level of education of the respondents. To solicit for this information, the respondent was asked to state their highest level of education. The data on the level of education of the respondents was appropriate for the study as it would enable the researcher to establish whether the level of education had an influence on small ruminants rearing and their influence to food security. The results are presented in table 4.3.

Table 4.3

*Education level of the household Heads*

| **Education level of the Household Head** | **Frequency** | **Percent** |
|---|---|---|
| None | 37 | 10.6 |
| Primary | 152 | 43.4 |
| Secondary | 111 | 31.7 |
| College | 50 | 14.3 |
| **Total** | **350** | **100** |

Table 4.3 shows that, 152 (43.4%) household heads have either primary education, 111(31.7%) secondary education, 50 (14.3%) had college education while 37 (10.6%) of the respondents had no formal education. This education level of the household negates the findings of a study conducted by Ruto *et. al*(2013) in Marsabit and Isiolo, Kenya using systematic random sampling which found that more that 64.4% of the household heads had not attained any level of education compared to 10.6% in the study area. This difference can be attributed to the farming systems in the two study regions. In Northern Kenya where largely pastoralism is practiced, low literacy level were reported whereas in Tinderet in Nandi where sedentary farming system is practiced a higher level of literacy was recorded. The constant movement of pastoralist hinders access to education unlike the sedentary farming system which allows the population to

attend school. The poor development of the Northern part of Kenya can also be a causal factor as the educational facilities are few and inadequately equipped as compared to the moderately enhanced access in the Rift Valley region. Education level is a major factor in technological adoption, market participation, as well as environmental management among other things (Lanyasunya *et. al.*, 2001) hence a fairly educated population would improve small ruminants production as well as its influence to food security in the study area.

### 4. 3.4. Distribution of respondents by level of education and Gender

The researcher further sought to analyze the data on education segregated by gender as presented in table 4.4

Table 4.4

*Distribution of respondents by level of education and gender*

| | GENDER | | |
|---|---|---|---|
| **Level of Education** | **FEMALE** | **MALE** | **Total** |
| None | 5(7.1%) | 32 (11.4%) | 37 (10.6%) |
| Primary level | 35(50%) | 117 (41.8%) | 152 (43.4%) |
| Secondary level | 24(34.3%) | 87 (31.1%) | 111 (31.7%) |
| College/university level | 6 (8.6%) | 44 (15.7%) | 50 (14.3%) |
| **Total** | **70 (100%)** | **280 (100%)** | **350 (100%)** |

Table 4.4 shows that among the male respondents 32 (11.4%) had no formal education, 117(41.8%) had primary level education, 87(31.1%) had secondary while 44 (15.7%) had college/university education. Majority of male respondents therefore had attained basic education. Among the 70 Female respondents, Half had attained primary education, 24 (34.3%) had secondary education and 6 (8.6%) had college education while 5 (7.1%) had not attended any formal education.

From the study findings, less than half (42.9 %) of females and (46.8%) of males had had at least secondary education while the rest had at most eight years of education. OECD (2000) scale dictates that those who have attained up to nine years of schooling are likely to relapse into illiteracy if they are not active readers. Similar results were reported in Isiolo and Marsabit, Kenya by Rutto *et.al* (2013) who found out that on average small ruminant keepers had less than eight years of education.

There was a slight difference between females and males (7.1% and 11.4%respectively) with formal education which was contrary to study carried in Zimbabwe by Gundu (2009) which found out those females dropped out of school earlier than their spouses. From these findings, there is a tendency of the highly educated population to engage in income generating activities like small ruminant rearing, this can be attributed to increased access to information and knowledge on agro- business and how to implement agricultural projects for the purposes of improvement of their food security situation.

### 4.4. Small ruminants and Household Income level

This thematic area provides the reader with the data on the first objective of the study which was to determine how small ruminants rearing projects influence household income in Tinderet Division. Rearing of Small ruminants has been shown to influence positively on the household income. It has been noted anticipation of increased income influenced the decision to keep small ruminants, therefore the respondents were asked questions to ascertain their level of income per year and how they spent it and other economic indicators like types of roofing materials. Their responses have been addressed in the following sub themes

### 4.4.1 Household total income per year

Household income generally recognised as an indicator of a household food security situation as it represents how much a household can purchase. The researcher sought to find out how much income the small ruminants keeping households made per year. The findings are presented in table 4.5

Table 4.5

*Household total income per year*

| **Responses in KSHs** | **Frequency** | **Percent** |
|---|---|---|
| below 36000 | 75 | 21.4 |
| 36001-60000 | 109 | 31.1 |
| 60001-120000 | 73 | 20.9 |
| Above 120000 | 93 | 26.6 |
| **Total** | **350** | **100.0** |

From the findings in table 4.5, 75 (21.4%) hold income below KShs.36000, 109 (31.1%) household income was KShs.36001-60000, 73 (20.9%) household income ranged between KShs.60001and 120000 while 93(26.6%) household income was above KShs.120000. This results show that more than 50% of the households surveyed have an annual income of sixty thousands and below comparatively lower income than the results of a study done by Suri *et.al* (2009) in the same region which reported an average household income of KShs. 71573. This low income levels has an influence to the quantity and quality of small ruminants kept in the households which in turn influences the household food security. A higher income level would enable the respondents to acquire quality farm inputs and animals hence better farm produce leading to better income to the household.

### 4.4.2 Household income from small ruminants

Household keeping small ruminants are seen to have an extra income other than other sources of income. The researcher set out to quantify the extra income that the small ruminants contributed to the total household income. Therefore, the respondents were asked how much they had made from the sale of small ruminants and / or their products. The results are presented in table 4.6.

Table 4.6

*Household small ruminants' income*

| Household income from small ruminants | Frequency | **Percent** |
|---|---|---|
| Below 6000 | 153 | 43.7 |
| 6000-12000 | 126 | 36.0 |
| 12001-24000 | 58 | 16.6 |
| 24001-36000 | 9 | 2.6 |
| 36001-48000 | 3 | .9 |
| Above 48000 | 1 | .3 |
| Total | 350 | **100.0** |

From the table 4.6, out of the 350 respondents who took part in the study, 153 (43.7%) reported that their annual income from small ruminants was below KShs 6000, 126 (36%) reported KShs 6000-12000, 58 (16.6%) had their income from goats and sheep between 12001 and 24000, 9(2.6%) had KShs. 24001-36000, above KShs. 36000 were 4 households with only one reporting above KShs.48000. The average annual income from small ruminants was KShs. 8415 with a standard deviation of 7.75.These results indicate that keeping small ruminants

contributes positively to household income and consequently food security although this contribution is non-optimal. The low annual income from small ruminants negatively influences their attractiveness to farmers, hence low uptake of their rearing projects. This makes the farmers to miss out on the potential benefits of small ruminant rearing on their household income and food security in general.

### 4.4.3 Priority spending areas for income from small ruminants

In order to understand the contribution of small ruminants to household food security, the researcher sought to know which priority areas were incomes from small ruminants spent on or what were the reasons for selling the small ruminants. The respondents were asked to rank the priority areas, with first being the area income most spent. The results of the first in rank are presented in table 4.7

Table 4.7

*Priority spending areas for income from small ruminants*

| **Priority spending areas for income from small ruminants** | Frequency | **Percent** |
|---|---|---|
| Clothing | 14 | **4.0** |
| Education | 207 | **59.1** |
| Food | 89 | **25.4** |
| Health Care | 3 | **0.9** |
| Farm Input | 37 | **10.6** |
| Total | 350 | **100.0** |

Table 4.7 shows that, 207 (59.1%) of the respondents used their income from small ruminants majorly on education, 89 (25.4%) and 37 (10.6%) had food and Farm inputs

respectively as their first priority expenditure areas. Those whose first priority was clothing and Health care accounted for less than 5%. This results show that income from small ruminants is primarily used to meet the basic human needs, the improvement in food purchasing power through the small ruminants income is a welcome contribution to the food situation while the role they play in educating the population and the availability of farm inputs are vital tools in fighting food insecurity. This indication of a positive influence on food security was reported by Kosgey Et.al (2006) in a study conducted in western and central Kenya using personal interviews with farmers which reported that the income from small ruminants was spent on school fees (32%), purchase of food (22%), farm investment (18%) and medical expenses (10%). This shows a similar spending pattern and priorities on the income from small ruminants.

Further analysis was done using cross tabulation to establish how gender influences the spending priorities. This is illustrated using table 4.8

Table 4.8

*Priority small ruminant income expenditure areas- gender segregated*

| | **Gender** | | | | | |
|---|---|---|---|---|---|---|
| **Small Ruminants Income** | **Male** | | **Female** | | **Total** | |
| **Mostly spent on** | **Freq** | **%** | **Freq** | **%** | **Freq** | **%** |
| Clothing | 12 | 4.3 | 2 | 2.9 | 14 | 4.0 |
| Education | 178 | 63.6 | 29 | 41.4 | 207 | 59.1 |
| Food | 68 | 24.3 | 21 | 30.0 | 89 | 25.4 |
| Health Care | 2 | 0.7 | 1 | 1.4 | 3 | 0.9 |
| Farm Input | 20 | 7.1 | 17 | 24.3 | 37 | 10.6 |
| **Total** | **280** | **100** | **70** | **100** | **350** | **100** |

As presented in the table 4.8, of the male headed households, 178(63.6%) first priority was on education, 68 (24.3%) was on food, 20 (7.1%) was on Farm input, 12 (4.3%) was on clothing and healthcare was prioritised by 2 (.7%) of the male headed households. Among the female headed households, 29 (41.4%) prioritised education, 21 (30%) gave food the most weight, with

Farm Input being prioritised by 17 (24.3%), while clothing and healthcare given first priority by 2 (2.9%) and 1 (1.4%) female headed household.

From these findings, a bigger proportion of female headed households (30%) spent their income on purchasing of food as compared to the proportion of male headed households (24.3%); similarly smaller proportion of male headed households (7%) prioritised buying of farm inputs as compared to female headed (24.3%). In addition, male headed households (63.6%) prioritised education when spending their small ruminants' income as compared to the percentage of women (41.4%) on the same. The fact that, most female headed household prioritised buying of food and farm input shows that they are more concerned in the immediate food needs rather than the future food security when compared to male headed household who largely prioritised education. This points to the possibility that female headed household are more exposed to food security threats than the male headed household in the study area. This therefore implies that in the female headed households would be a good entry point for an intervention project on food security improvement as they have an inherent pressing need to become food secure.

### 4.4.4 Alternative Source of Household income

A small ruminant farming is not the main economic activity in Tinderet Division as the community practices mixed farming. In this regard, other sources of income were investigated as the researcher was interested to know if they influenced the household food security situation .Therefore, the respondents were asked to state their other main source of income and the findings are as presented in the table 4.9

**Table 4. 9**

***Other sources of Household Income***

| | Frequency | Percent |
|---|---|---|
| Food crops | 121 | 34.6 |
| Cash crops | 98 | 28.0 |
| Business | 68 | 19.4 |
| Formal employment | 36 | 10.3 |
| Informal employment | 27 | 7.7 |
| Total | 350 | **100.0** |

As presented in table 4.9, majority of households depend on alternative income from sale of food stuffs 121(34.6%), followed by cash crops 98 (28%), business was a source of alternate income for 68 (19.4%), formal and informal employment accounted for 36(10.3%) and 27(7.7%) respectively. Clearly many of the households (34.6%) were selling food stuffs as a source of income which was a threat to food security in an area which is originally food deficit. These findings are similar to that of a study done by Kosgey et.al (2006) on Small ruminant production in the tropics using a quantitative design and random clustering sampling method in eastern and western parts of Kenya which reported that approximately 35% of small ruminants farmers considered selling of food crops to be the most important source of income

#### 4.4.4.1 Alternative Source of Household income and gender

The data on alternative source of household incomes was further segregated based on gender as presented in table 4.10

Table 4.10

*Other sources of Household income*

| Other sources of Household income | Household Head gender | | |
|---|---|---|---|
| | **Male** | **Female** | **Total** |
| Food crops | 94 (33.6%) | 27 (38.6%) | 121 (34.6%) |
| Cash crops | 79 (28.2%) | 19 (27.1%) | 98 (28.0%) |
| Business | 53 (18.9%) | 15 (21.4%) | 68 (19.4%) |
| Formal employment | 31 (11.1%) | 5 (7.1%) | 36 (10.3%) |
| Informal employment | 23 (8.2%) | 4 (5.7%) | 27 (7.7%) |
| **Total** | **280(100.0%)** | **70(100.0%)** | **350(100.0%)** |

As presented in table 4.10, a bigger percentage of the female headed households 27(38.6%) sold food crops for alternative source compared to the proportion of male headed household 94(33.6%). Similarly, a higher proportion of female headed households reported business income 15 (21.4%) this can be explained by ownership of small scale food kiosks which more females than men were engaged in. Among the male headed households 31 (11.1%) had income from formal employment while 5(7.1%) of the female headed households reported on the same. These findings indicate for both female and male headed households, food crops are the most explored source of income may be due to availability of middle men who buy the food crops, this negatively influences the household's food status since the middle men exploit the small scale farmers as there are no organized marketing strategies. Similar issue was reported by Abdi (2004) who reported that due to high transportation costs due to poor infrastructure farmers preferred to sell to middlemen who always gave them a lower price than selling directly to the market. Based on this findings, in order to handle food insecurity in the study area, the

government need to encourage production of small ruminants as an alternative source of income helping preserve the food crops for the household consumption as well as improving the market access through improved infrastructure.

### 4.5. Small Ruminants and food production

To discuss the second objective of the study, the study sought data on the influence of small ruminants rearing projects on household food production. Household food production level is a proxy measure of food security. Availability of food products in a household not only improves the quantities of the food but also has been shown to improve the nutritive value of the food taken. The researcher was interested to know if small ruminants contributed in any way to food production levels. To solicit this information, the respondents were asked questions on the soil improvement methods, sources of their soil improvement methods for both organic manures and inorganic manure as well as the amount of milk gotten from the reared small ruminants.

#### 4.5.1 Soil improvement method

Soil fertility has a direct impact on the amount and quality of food produced in household. With the shrinking farm sizes, human pressure on the available land coupled with poor farming practices has resulted to depletion of soil nutrient composition. Unlike in the past, to expect a good harvest farmers have to improve the soil fertility of their farms. Based on this, the respondents were asked their soil improvement strategy and the responses are as presented in table 4.11

Table 4.11

***Soil Improvement Method Used***

| | Gender | | |
|---|---|---|---|
| **soil improvement method used** | Male | Female | Total |
| Chemical Fertilizer | 201**(71.8%)** | 25 **(35.7%)** | 226 **(64.6%)** |
| Organic Manure | 64 **(22.9%)** | 16 **(22.9%)** | 80 **(22.9%)** |
| None | 6 **(2.1%)** | 14 **(20.0%)** | 20**(5.7%)** |
| Chemical Fertilizer &Organic Manure | 9 **(3.2%)** | 15 **(21.4%)** | 24 **(6.9%)** |
| Total | 280 **(100%)** | 70 **(100%)** | 350 **(100%)** |

Out of the 350 respondents, 226 (64.6%) of the respondents used chemical fertilizers, 80 (22.9%) used organic manure, 24(6.9%) used both Chemical Fertilizer &Organic Manure while 20 (5.7%) did not improve their soil fertility at all. Similar results of low use of organic manure have been reported in a study done in Ghana by Stewart (2002) which found out that only 20% of the farmer used organic manure in their farms. This findings indicate a low contribution of small ruminants to food production as organic manure is not being highly utilized but there is a high potential for improvement with the right extension services.

Notably, among the female headed households only 35.7% of them used chemical fertilizer, 21.4% used both Chemical Fertilizer &Organic Manure this can be explained by the fact that chemical fertilizers are expensive and the perceptions that the women have on the chemical fertilizers.

Moreover, 20% of the female headed households did not use any soil fertility method as compared to 2.1% of the male headed households. Chemical fertilizer usage was high in male

headed households (71.8%) while only 22.9% of the male headed households were using organic manure. Generally, there was a low use of organic manure in the study area which contrasts with findings of a study done in central Kenya by Mbure et .al (2012) which reported that majority(89%) of the respondents use organic manure in their farms with more than half (55%) of the farmers preferring a combination of organic manure and fertilizer. This difference in practice can be attributed to limited knowledge to the advantages of organic manure and sustainable farming practices or little availability of the manure due poor farming practices in the study area. This shows a need for extension services in modernizing small ruminant rearing methods to collect more manures and sustainable farm practices 4.5.2. Sources of fertilizer

After it was established that the respondents were using Chemical fertilizers, the researcher was interested on how the respondents financed the purchase of the same. This was deemed important as it would explain how increase or decrease of small ruminants would influence the food security of the households.

**Table 4.12**

*Sources of fertilizer and household head gender*

| **Source of fertilizer** | **Household Head gender** | | **Total** |
|---|---|---|---|
| | **Male** | **Female** | |
| Sell food crops | 74 (28.6%) | 12 (30.0%) | 86 (34.4%) |
| Sell cash crops | 56 (26.7%) | 9 (22.5%) | 77 (30.8%) |
| Sell of sheep and goats | 54 (25.7%) | 10 (25.0%) | 64 (25.6%) |
| Salary from employment | 26 (12.4%) | 9 (22.5%) | 35 (14.0%) |
| **Total** | **210 (100%)** | **40 (100%)** | **250 (100%)** |

Based on this data in table 4.12, among the 250 respondents who said they used Fertilizers86 (34.4%) of the respondents sold food crops to purchase it, 77 (30.8%) used cash crop income, 64 (25.6%) sold small ruminants while 35 (14%) used salaries/wages. This findings indicate a double relation between food availability and small ruminants, in that if small ruminants income could increase it would substitute food crop income in purchasing the Chemical fertilizers while at the same time the contributing to increased production of the food. This results cement the findings of Inoni et. al (2007) which was conducted using multistage sampling technique in Nigeria implying that access to food, a proxy of ratio of livestock income to annual income is a statistically significant determinant of household food security because income from sale of livestock products provided purchasing power, and thus guarantee access to food.

### 4.5.3. Sources of Organic Manure

Organic manure has been shown to be a more sustainable management of soil fertility than use of chemical fertilizers. A study in West Africa by Mando (2001)3, 259-266.due to the important fact animal manure plays in food production, it was deemed necessary to investigate its source among the households. To solicit this data the researcher asked the respondents what were the sources of the organic manures and the findings are as presented in table 4.13.

Table 4.13: *Source of Manure for Soil improvement*

| **Source of Manure for Soil improvement** | **Household Head Gender** | | **Total** |
|---|---|---|---|
| | **Male** | **Female** | |
| Goats &sheep | 62 (78.5%) | 20 (66.7%) | 82 (75.2%) |
| Cattle | 13 (16.5% | 7 (23.3%) | 20 (18.3%) |
| Chicken | 4 (5.1%) | 3 (10.0%) | 7 (6.4%) |
| **Total** | **79 (100%** | **30(100%)** | **109 (100%)** |

Out of 350 respondents who took part in the study, 109 respondents used manure in their crop farms. Among those who used manure in their farms, 82 (75.2%) reported their source to be small ruminants, 20 (18.3%) and 7 (6.4%) said cattle and chicken manure respectively. It must be noted however that use of animal manure was in a limited scale and mostly in the kitchen gardens or farms in close proximity to the household. This pattern of organic manure usage was as well reported by Stewart (2002) in a study on Contribution of Small Ruminants to Soil Fertility Management in Ghana where he found that due to the bulkiness and difficult to transport of organic manures, their use is limited to areas in close proximity to their original source. This means that small ruminants manure were the biggest source of organic manure in the area hence contributing to higher food production.

### 4.5.4. Milk in litres per day

Milk is an important food element especially in children under five years. It is a termed as whole food due to its richness nutritional value. Nandi district has been shown to have very limited sources of plant protein, that leaves animal protein and in particular milk to be an integral part of a balanced meal. Cattle milk has been popular among the households for a long time, however with the diminishing land sizes and given the free range method of grazing that is practiced in Nandi, cattle heads have drastically reduced leaving households limited on sources of milk. The study was interested to know among the respondents how many were getting milk from their small ruminants and in what quantities. In this regard, the respondents were asked how much was the household milk production from small ruminants per day in litres and the results are as presented in table 4.14.

Table 4.14

*Household Milk production per day in litres*

| Household Milk production per day in litres | Frequency | Percent |
|---|---|---|
| Not milking | 103 | 29.4 |
| Below 1 litres | 11 | 3.1 |
| 1-3Litres | 198 | 56.6 |
| Above 3-5 Litres | 31 | 8.9 |
| Above 5 litres | 7 | 2.0 |
| **Total** | **350** | **100.0** |

From the results presented in table 4.14, Majority of the respondents198 (56.6%) were getting between One and three litres of milk per day, 31 (8.9%) were getting between three to five litres in a day, 7 (2%) were producing above five litres in a day, 11(3.1%) were getting less a litre per day while 103(29.4%) of the respondents were not milking their small ruminants. It is important to note that only goats were being milked among this community. The average milk production among the households was1.65litreswith a standard deviation of 1.6. Milk production from small ruminants was found to be a big contributor to household food security through an improved nutritional intake and increased household income where the milk was sold thus small ruminants' milk production was found to improve not only the quantity but also the nutritive quality of household food available.

### 4.6. Small ruminants and Household nutritional intake

In order to assess the third study objective, data was sought on the influence of small ruminants rearing on the household nutritional intake. Malnutrition in rural areas is a major concern to the health sector especially when talking about the vulnerable groups- the children

under- five, the aged and those who are immune suppressed for various reasons. An assessment of the Nutritional status of the children under- five in Tinderet Division by FAO Kenya (2007)indicated that 32%, 6.8% and 22.8%of children under the age of five years of age suffered from wasting stunting and underweight respectively. This background prompted the researcher to investigate the role played by small ruminants in the nutritional status of the respondents. The results are discussed in the subsequent subtopics.

### 4.6.1: Sources of animal proteins

Armed with the information that animal proteins were the main source of this nutrient in Tinderet by the households so as to establish the extent small Ruminants are of help to the community. Therefore the researcher asked the respondents to state their source of animal proteins and their responses are tabulated in table 4.15

Table 4.15

*Household Main Source of Animal proteins*

| **Household Main Source of Animal proteins** | **Household Head gender** | | |
|---|---|---|---|
| | **Male** | **Female** | **Total** |
| Cow milk | 170 (60.7%) | 31 (44.3%) | 201 (57.4%) |
| Goat milk | 41 (14.6%) | 22 (31.4%) | 63 (18.0%) |
| Cattle meat | 22 (7.9%) | 0 (.0%) | 22 (6.3%) |
| Goat/ Sheep meat | 34 (12.1%) | 5 (7.1%) | 39 (11.1%) |
| Poultry meat/ products | 13 (4.6%) | 12 (17.1%) | 25 (7.1%) |
| **Total** | **280(100%)** | **70 (100%)** | **350 (100%)** |

Out of the 350 respondents who participated in the study, milk contributes the majority of animal proteins with cow milk and Goat milk being stated as main sources by 201 (57.4%) and

63 (18.0%) respectively, Goat /sheep meat was stated by 39 (11.1%) households, 25 (7.1%) said poultry meat/products, while 22 (6.3%) stated cattle meat. Cow Milk was popular in this community , however due to the change in land sizes, households are finding themselves unable to continue keeping large herds of cattle on the free range systems hence small ruminants coming in as their pasture requirements are minimal hence easy to maintain on small parcels of land. Cow meat is not easily available in the village set up due to demand given that meat is perishable the businessmen reduce risk by slaughtering smaller animals like sheep or goat which can be sold off within two days.

Among the male headed households cattle products lead as a main source of proteins with 68.6% of those households reporting them as main source of proteins, 44.3%the female headed households stated cattle milk as the main source but interestingly none stated cattle meat this can be due to unavailability of cattle meat with a walking distance. Goat/sheep milk was twice as popular on female headed households compared to male headed households which can be attributed to household purchasing power as men are generally able to get other products outside the household own production.

### 4.7. Small ruminants and Household Power Dynamics

The fourth objective of the study required that the researcher look at the power dynamics in the households in terms of assess and control of the income from small ruminants as well as the amount of time and energy the different members (male and female) of the family were investing in these projects. Food security has a gender dynamic in that it always influences women and children more than men partly due to ability of men to stay away from homes while working hence exposure to more opportunities as well as due to control of resources in the household. It was deemed important to understand who controls what in the small ruminant

projects hence the researcher asked every responded to state who undertook or made decisions on a selected eight main activities in these projects namely; purchasing, feeding, cleaning the stay, milking, mating, medical care which was asked in terms of vaccination, selling of the small ruminant products and finally selling of the small ruminants. For the purpose of analysis, these activities were grouped in to two categories based on the level of control over the income from the small ruminants as well as the skills required to undertake those tasks. Purchasing, vaccination, selling of the small ruminant products and selling of the small ruminants were categorised Technical roles were categorised as those roles that required a special skill rather than labour or involved exchange of money or both (Technical roles) while feeding, cleaning the stay, milking and mating were grouped as those requiring low technical skills as well as having lower level of control of the income from the small ruminants (Non-technical roles). To be able to understand the household power dynamics, the analysis only considered those who were married at the time of study.

### 4.7.1 Household Power Dynamics in Technical roles in small ruminants rearing

Technical roles were categorised as those roles that required a special skill rather than labour or involved exchange of money or both. Buying of small ruminants, vaccination, selling small ruminants products and disposing of the animals were put in this category. The respondents were then interviewed on who takes up this roles and the results are as presented in the table 4.16

Table 4.16

*Assignment of Technical roles*

| **Role assigned to** | **Buying SR** | **Vaccinating** | **Selling of SR products** | **Disposing SR** |
|---|---|---|---|---|
| Man | 146 (57.3%) | 63 (24.7%) | 85 (33.3%) | 143 (56.1%) |
| Women | 56 (22.0%) | 60 (23.5%) | 131 (51.4%) | 68 (26.7%) |
| Woman &man | 50 (19.6%) | 24 (9.4%) | 34 (13.3%) | 41 (16.1%) |
| Female child | Nil | 2 (.8%) | 1 (.4%) | Nil |
| Male child | 3 (1.2%) | 14 (5.5%) | 1 (.4%) | 1 (.4%) |
| Hired Labor | Nil | 10 (3.9%) | 1 (.4%) | 1 (.4%) |
| Veterinary officer | Nil | 79 (31.0%) | Nil | Nil |
| Male & female children | Nil | 2 (.8%) | 2 (.8%) | 1 (.4%) |
| Activity not done | Nil | 1 (.4%) | Nil | Nil |
| **Total** | **255 (100%)** | **255 (100%** | **255 (100%)** | **255 (100%)** |

Among the 255 households who were in a marriage set up, buying and selling was majorly controlled by the man 57.3% and 56.1% respectively. Man and wife made the decision together in 50 (19.6%) households on buying and 41 (16.1%) households on selling, while in 56 (22%) and 68 (26.7%) households buying and selling was mandated to the wives. The male child was stated as having bought albeit rarely in 3(1.2%) households while in 1 (.4%) household he could sell while the female child had no such mandate. This can be attributed to the control of the family income by the man since he can decide to buy and sell the animals.

Selling of small ruminants products was a role of the women in 131 (51.4%) of households, in 34 (13.3%) households it was done by the husband and wife, in 85 (33.3%) it was done by men.

Vaccination of the animals was fairly distributed among the spouses (Men-24.5% and women-23.7%) but about a third (31%) of the households engaged a veterinary officer for medical requirements of their small ruminants.

### 4.7.2 Household Power Dynamics in Non-Technical roles in small ruminants rearing

Feeding the small ruminants, cleaning their stay, mating and milking were grouped as roles that were requiring labour but not technical for the purpose of this analysis. The roles also did not allow the worker to interact with money. The investigator was interested to know who in the family was undertaking those roles and the data was solicited by posing the question ‘who performs this duties in the family’ to the respondents. The results are as presented in the table 4.17

Table 4.17

*Non -Technical Roles assignment*

| **Responsible person** | **Feeding SR** | **Cleaning Stay** | **Mating** | **Milking** |
|---|---|---|---|---|
| Man | 28 (11.0%) | 15 (5.9%) | 70 (27.5%) | 2 (.8%) |
| Women | 128(50.2%) | 145 (56.9%) | 96 (37.6%) | 130 (51.0%) |
| Woman &man | 37 (14.5%) | 11 (4.3%) | 37 (14.5%) | 4 (1.6%) |
| Female child | 2 (8%) | 15 (5.9%). | 8 (3.1%) | 38 (14.9%) |
| Male child | 19 (7.5%) | 26 (10.2%) | 25 (9.8%) | Nil |
| Hired Labor | 27 (10.6%) | 24 (9.4%) | 10 (3.9%) | 6 (2.4%) |
| Veterinary officer | Nil | Nil | 2 (.8%) | Nil |
| Male / female child | 14 (5.5%) | 19 (7.5%) | 7 (2.7%) | 4 (1.6%) |
| Activity not done | Nil | Nil | Nil | 71 (27.8% |
| Total | 255 (100%) | 255 (100%) | 255 (100%) | 255 (100%) |

Based on the findings on this study, feeding of small ruminants is dominated by women with 128(50.2%) households stating that feeding is the sole duty of the women, 37 (14.5%) stating both woman and man, 28 (11.0%) stating it is a man's responsibility. Male child was stated by19 (7.5%), both male and female child14 (5.5%), the female child alone was stated by only 2 households, while hired labor was 27 (10.6%). Cleaning the small ruminants stay was similarly done majorly by women 145 (56.9%), men were indicated by 15 (5.9%), a combine man and woman duty was stated by 11 (4.3%) households, hired labor undertook this task in 24

(9.4%). Children were charged to clean stay in 60 (23.5%). The role of milking in this Division was done by women in 130 (51.0%), by man and woman 4 (1.6%) and female child 38 (14.9%), hired labor 6 (2.4%) with only 2(.8%) households reporting male and none reporting the male child. Mating of small ruminants is fairly distributed among male and women but still skewed towards the woman with 96 (37.6%) households, the man 70 (27.5%) while man and woman accrued 37 (14.5%), hired labor 10 (3.9%), male child undertook this task in 25 (9.8%), male and female child 7 (2.7%) female child was 8 (3.1%) while the veterinary officer helped in mating for 2 (.8%) households.

These results indicates that the woman is mostly responsible for non-technical roles as stated in majority of the households while the man's contribution is very limited with a little improvement in mating which still the woman dominates. The contribution of children in this roles is notably low which can be attributed to the free basic education which keeps them away from home hence limiting their contribution, shifting it to the woman and probably in small proportions to hired labor. This findings are similar to results of other areas where universal primary education has been implemented in sub Saharan Africa as found by a study done in Nigeria by Oji and Ekumankama (2002) where73 of the women were involved in goat, and sheep production and their main activities were pen cleaning (89 %) and feeding (83 %) .Additionally, comparable results were found in a study in Turkey by Budak *et.al (2005)* where it was found that labor allocation in farming mainly originated from the family members and 94.0% of the farms reporting the women and female children as responsible for milking while cleaning the sheep and goat barns was also an important task for women (52.0%) and girls (19.0%).

# CHAPTER FIVE

## 5.0. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

### 5.1 Introduction

This chapter summarizes the study findings, conclusions, recommendations of the study, contributions to knowledge and suggestion for future research.

### 5.2. Summary of findings

From the data analysis, interpretation and discussion in chapter four, the study came up with findings as per the objectives of this study, which were ; to determine the influence of small ruminants rearing projects on household income in Tinderet division, to establish how small ruminants rearing projects influence household food production in Tinderet division, to establish the influence of small ruminants rearing projects on household nutritional intake in Tinderet division and lastly to investigate the influence of small ruminants rearing projects on household power dynamics as a component of food security in Tinderet division. These findings are discussed thematically as presented in chapter four.

For the first objective which was to determine how small ruminants rearing projects influence household income in Tinderet division. Forty three point seven percent (43.7%) reported that their annual income from small ruminants was below KShs 6000, 126 (36%) reported income of KShs 6000-12000, 58 (16.6%) had their income from goats and sheep between 12001 and 24000, 9(2.6%) had KShs. 24001-36000, above KShs. 36000 were 4 households with only one reporting above KShs.48000. The average income from the Small ruminants was KShs.8415which shows small ruminants have a positive influence on the household income hence contributes to a more food secure households.

For the second objective that was aimed to establish how small ruminants rearing projects influence household food production in Tinderet division. It was found that fewer small ruminants keepers used organic manures 80 (22.9%) as compared to those were using inorganic fertilizers 226 (64.6%) to improve their crop yield. However, in both groups, the role played by small ruminants was substantial with 75.2% of organic manure users reporting small ruminants as their source while 25.6% of inorganic fertilizer users reporting their source of funds to be sell of small ruminants.

On objective three which was to establish how small ruminants rearing projects influence household nutritional intake in Tinderet division. The study found out that cow milk was the leading source of animal proteins (57%), followed by goat milk (18%) and sheep /goat meat (11.1%), cattle meat was the least reported (6.3%) after poultry products (7.1%). It is important to note that slightly above two thirds of the male headed households depended on cow milk as compared to the 14.6% who depended on goat milk. On the female headed households about a third of them depended on goat milk for supply of the animal proteins while 44% depended on cow milk. Cattle meat was stated by a mere 6.3% of the sampled population and only reported by the male headed households.

On the fourth of the study which was to assess the influence of small ruminants rearing projects on household power dynamics as a component of food security in Tinderet division. The study found that among the duties classified as technical (buying, vaccinating, selling of their products and disposal of the small ruminants), men controlled the activities that involved making serious decisions and involved considerable amount of money like buying (57.5%) and selling (56.1%) of small ruminants. It was clear that women controlled selling of small ruminants products with 51.4%, however, vaccination was dispersed among the family members but majorly handled by

man and/ or woman. On the activities labelled as non-technical (mating, feeding, cleaning stay and milking)

### 5.3 Conclusions

For the first objective which was to determine how small ruminants rearing projects influence household income in Tinderet division. The study concludes that small ruminants keeping positively influences the level of household income and food security situation directly and indirectly. Although the direct income was not optimal, when consideration was made on the indirect ways, it showed that small ruminants contributed to food security by ensuring lower food crop sales, as well as higher food crop yields when manure was used to fertilize the soil.

For the second objective that was aimed to establish how small ruminants rearing projects influence household food production in Tinderet division. The study concludes that there is a very low influence of small ruminants on food production as very few farmers used organic manure and less so from the small ruminants.

On objective three which was to establish how small ruminants rearing projects influence household nutritional intake in Tinderet division. The study concluded that small ruminants rearing projects positively influence household nutritional intake as small ruminants' products (milk and meat) were an important source of animal proteins second only to cow milk. Small ruminant meat and goat milk were found to be a major source of proteins due to their availability as well as due to the perishable nature of meat, it was easier for the butcheries to sell goat meat than beef.

On the fourth of the study which was to assess the influence of small ruminants rearing projects on household power dynamics as a component of food security in Tinderet division. The study concluded that both male and female are involved in small ruminants rearing albeit in

different activities. Men are more involved in the activities that require technical skills or involve control of income while female are involved in the labor intensive and less technical activities. An improved involvement of both genders at an empowered level can increase the positive influence on food security.

### 5.4. Recommendations

The following recommendations should be implemented with a view of improving small ruminants rearing practices and food security in general.

1. The less than optimal contribution to the household income calls for an aggressive agribusiness sensitization on the professional ways to rear small ruminants. This will make the farmers realize the financial potential in small ruminants keeping.
2. The extension services to focus on sensitization and training on how to improve the use of organic manure in the area as this is more environmentally and economically sustainable than the inorganic manure.
3. The local government to search for markets for the small ruminants which increase the selling price for the farmer to avoid middle men taking advantage of the lack of ready market to exploit
4. Efforts to be made on mainstreaming gender to allow women of this community to interact with the small ruminants on the activities that are economic in nature. This will improve their participation in the sector.

### 5.5. Contribution to Knowledge

Table 5.1 *Study's Contribution to Knowledge*

| Objective | Contribution to body of knowledge |
|---|---|
| For the first objective which was to determine how small ruminants rearing projects influence household income in Tinderet division | The study established that although small ruminants contributed positively to the household income in Tinderet division, the contribution was less than optimal |
| For the second objective that was aimed to establish how small ruminants rearing projects influence household food production in Tinderet division | Inorganic manure was more utilized than organic manure in improving the crop production in the study area and small ruminants played a major contributor role in both cases. |
| For the third objective that was to establish how small ruminants rearing projects influence household nutritional intake in Tinderet division | Cow milk and small ruminants' meat are the main source of proteins in this study area. Small ruminants' milk is rarely used especially in male headed households and cow meat is not popular in this area. |
| For the second objective which was to establish how small ruminants rearing projects influence household nutritional intake in Tinderet division | The study found out that women were very much involved in rearing small ruminants but their involvement included the menial work and they had little or no control over them especially if they are in marriage. |

### 5.6. Suggestions for further research

The study established influence of small ruminant rearing projects on household food security. Small ruminants rearing have an influence on household food security**.** Further studies therefore need to be done to better explain the relationship between food security and small ruminant keeping. The researcher therefore suggests that research be done on the following areas:

1. A comparative research which is broader and more qualitative covering a broad area to help understand the influence of small ruminants on household food security especially among female headed households.
2. Future studies should include questions about cultural practices, attitudes and beliefs towards ownership and disposal of small ruminants.
3. Factors that can motivate farmers to rear small ruminants professionally should also be studied as this would improve knowledge and ultimately productivity

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## APPENDICES

**Appendix I: General population of Tinderet division**

| Location | Sub location | Male | Female | Total | Households |
|---|---|---|---|---|---|
| | Ainapngetuny | 724 | 731 | 1455 | 280 |
| Ainapngetuny | Kisoga | 477 | 486 | 963 | 187 |
| | Chebagang | 816 | 729 | 1545 | 376 |
| | Chemamul | 1302 | 1143 | 2445 | 667 |
| Chemamul | Kipyaor | 792 | 814 | 1606 | 365 |
| | Chepkemel | 892 | 862 | 1754 | 288 |
| | Kabikwen | 443 | 437 | 880 | 175 |
| Chepkemel | Kipsiwo | 459 | 434 | 893 | 157 |
| | Cherondo | 1674 | 1609 | 3283 | 597 |
| Kabirer | Kabirer | 1373 | 1416 | 2789 | 514 |
| | Kibukwo | 1567 | 1499 | 3066 | 524 |
| Kabolebo | Kabolebo | 1236 | 1302 | 2538 | 496 |
| | Kaplelach | 388 | 385 | 773 | 185 |
| Kabutiei | Kabutiei | 467 | 415 | 882 | 157 |
| | Matambach | 622 | 583 | 1205 | 194 |
| Kamelil | Kamelil | 1235 | 1217 | 2452 | 444 |
| | Kapsoen | 1426 | 1233 | 2659 | 479 |
| Kamelilo | Got nelel | 963 | 918 | 1881 | 343 |
| Kapkitony | Cheptonon | 1234 | 1144 | 2378 | 425 |
| Kapkoros | Kapkoros | 1022 | 982 | 2004 | 395 |
| | Kapsokio | 550 | 596 | 1146 | 199 |
| Soba | Kamilet | 478 | 483 | 961 | 203 |
| | Kapkitany | 495 | 458 | 953 | 183 |
| Tachasis | Kaplamaiywo | 865 | 784 | 1649 | 254 |
| Tinderet | Kimatkei | 551 | 529 | 1080 | 184 |
| | Mbogovalle | 878 | 833 | 1711 | 331 |
| 13 | 26 | 22929 | 22022 | 44951 | 8602 |

**Source: Population and housing census report (KNBS, 2009)**

**Appendix II: Krejcie and Morgan: Sample Size Determination chart (1970)**

| N | S | N | S | N | S |
|---|---|---|---|---|---|
| 10 | 10 | 220 | 140 | 1200 | 291 |
| 15 | 14 | 230 | 144 | 1300 | 297 |
| 20 | 19 | 240 | 148 | 1400 | 302 |
| 25 | 24 | 250 | 152 | 1500 | 306 |
| 30 | 28 | 260 | 155 | 1600 | 310 |
| 35 | 32 | 270 | 159 | 1700 | 313 |
| 40 | 36 | 280 | 162 | 1800 | 317 |
| 45 | 40 | 290 | 165 | 1900 | 320 |
| 50 | 44 | 300 | 169 | 2000 | 322 |
| 55 | 48 | 320 | 175 | 2200 | 327 |
| 60 | 52 | 340 | 181 | 2400 | 331 |
| 65 | 56 | 360 | 186 | 2600 | 335 |
| 70 | 69 | 380 | 191 | 2800 | 338 |
| 75 | 58 | 400 | 196 | 3000 | 341 |
| 80 | 66 | 420 | 201 | 3500 | 346 |
| 85 | 70 | 440 | 205 | 4000 | 351 |
| 90 | 73 | 460 | 210 | 4500 | 354 |
| 95 | 76 | 480 | 214 | 5000 | 357 |
| 100 | 80 | 550 | 226 | 7000 | 364 |
| 120 | 92 | 600 | 234 | 8000 | 367 |
| 130 | 97 | 650 | 242 | 9000 | 368 |
| 140 | 103 | 700 | 248 | 10000 | 370 |
| 150 | 103 | 750 | 254 | 15000 | 375 |
| 160 | 113 | 800 | 260 | 20000 | 377 |
| 170 | 118 | 850 | 265 | 30000 | 379 |
| 180 | 123 | 900 | 269 | 40000 | 380 |
| 190 | 127 | 950 | 274 | 50000 | 381 |
| 200 | 132 | 1000 | 278 | 75000 | 382 |
| 210 | 136 | 1100 | 285 | 100000 | 384 |

**Appendix III: Letter of Transmittal**

Hyrine Matheka
P.O.BOX 1578- 40100, Kisumu
Email:hmueni@gmail.com
Cell phone no. 0733930630
Dear respondent,

**RE: Request for your participation in an academic research**

I am a masters of Arts student at the University of Nairobi. As part of the requirements of the Masters Degree in Project Planning and management, I am conducting research for my project on the above mentioned. This research may lead to improved understanding of the effect of small ruminants on food security and better policies on the same.

To be able to this collect data, you have been selected as one of the participants of the study. Kindly complete the questionnaire attached and ask for assistance from the person administering if need be. This research is for academic purposes only and thus your responses will be treated with utmost confidentiality. You are requested to give your responses as honestly as possible.

Thank you in advance for participating in this research.

Yours sincerely

Hyrine Matheka

Appendix IV: Households Questionnaire in Tinderet Division

| **QUESTIONS** | **RESPONSES** | ***INSTRUCTIONS*** |
|---|---|---|
| Date of interview | _____ /_____/ 2011 | *DD/MM/YY* |
| Administrative sub location | _____<br>_____ | *WRITE THE NAME* |
| Do you own goats or sheep? | Yes [1] No [2] | *CIRCLE THE MOST APPROPRIATE*<br>• *IF OWNED FOR LESS THAN 2 YEARS SKIP THE HOUSEHOLD* |
| If Yes above , for how long have you been keeping goats and sheep? | For less than two yrs [1]<br>For the last 2 or more yrs [2] | |
| **SOCIO DEMOGRAPHIC PROFILE** | | |
| House hold head Age | _____ years | *IN COMPLETE YEARS* |
| Gender (house hold head | Male [1] Female [2] | *CIRCLE THE MOST APPROPRIATE* |
| What is your marital status? | single [1] married [2]<br>separated [3] divorced [4]<br>widowed [5] cohabiting [6] | |
| What is your highest level of education | None[1] Primary [2] | |

| | | |
|---|---|---|
| | Secondary [3] College [4] University [5] | |
| What is your religion? | Catholic[1] SDA [2] Muslim [3] Protestant [4] No religion [5] Others [6] specify _____ | |
| Household members by age | 5 and below yrs ____ 6-12 yrs_____ 14-60 yrs _____ 60 yrs and above _____ | *WRITE THE NUMBER OF EACH CATEGORY* |
| Household members by sex | Male _____ Female _____ | *WRITE THE NUMBER OF EACH CATEGORY* |
| Educational status | None _____ primary _____ secondary_____ college and university _____ | *WRITE THE NUMBER OF EACH CATEGORY* |
| House rooftop type | Thatched [1 ] Corrugated iron sheet [2] any other [3] (specify)_____ | *CIRCLE THE MOST APPROPRIATE* |
| **SMALL RUMINANTS AND HOUSEHOLD INCOME** | | |

| | | |
|---|---|---|
| How much is your household income per month in Kshs | Below 3000 [1]<br>3001-5000 [2]<br>5001-10000 [3]<br>Above 10000 [4] | *CIRCLE THE MOST APPROPRIATE* |
| How much is your household income per month from goat | Kshs _____ | *WRITE THE NUMBER OF EACH CATEGORY* |
| How much is your household income per year from sheep | Kshs _____ | |
| Kindly rank how you spend your income from sheep and goats | Education<br>Food<br>Health care<br>Clothing<br>Buying farm inputs<br>Others[6] specify_____ _____ | *RANK WITH 1 BEING THE MOST IMPORTANT-LARGEST CONSUMER OF THE INCOME* |
| Other than income from goats and sheep what are your other sources of income | Food crops [1]<br>Cash crops [2]<br>Business [3]<br>Formal employment [4]<br>Informal employment [5]<br>Others[6](specify)____ _____ | *CIRCLE THE MOST APPROPRIATE* |
| **SMALL RUMINANTS REARING AND FOOD PRODUCTION** | | |
| How do you improve your soil fertility | Fertilizer [1] Manures [2] None [3] | *CIRCLE THE MOST APPROPRIATE* |
| If manure , where do you get them from | Goats [1 ] Sheep [2] Cattle [3]<br>Chicken [4]<br>Others [5] (specify) _____ | |
| If fertilizer, what source of income do you use to purchase | Sell food crops [1]<br>Sell cash crop [2] | |

| | | |
|---|---|---|
| | Sell of sheep and goats [3]<br>Salary from employment [4}<br>Others [5]<br>specify_____ | |
| How much milk do you get from your goats and sheep | _____<br>litres | WRITE THE NUMBER OF LITRES |
| How else does goats and sheep contribute to your household food | Meat [1] Blood [2]<br>Other [3]<br>specify_____ | *CIRCLE THE MOST APPROPRIATE* |

| **SMALL RUMINANTS REARING AND HOUSEHOLD NUTRITIONAL INTAKE** | | |
|---|---|---|
| How many meals does the family in a day | More than three [1] Three [2]<br>Two [3] One[4] | *CIRCLE THE MOST APPROPRIATE* |
| How often do you have animal proteins in your meals | Daily [1] 4-5 days in a week[2]<br>2-3 days in a week [3] Once a week[4] | *CIRCLE THE MOST APPROPRIATE* |
| What are the sources of those animal proteins? | Cow milk [1] Goat milk [2]<br>Cattle meat [3] Goat/ Sheep meat [4]<br>Poutry meat/ products [5]<br>Others specify [6] _____ | *CIRCLE THE MOST APPROPRIATE* |

**SMALL RUMINANTS REARING AND HOUSEHOLD POWER DYNAMICS (***please indicate by ticking on the provided box who mostly undertakes the various tasks in your family.)*

| **Labor distribution** | Man | Woman | Woman and man | Female child | Male child | Hired labor | Veterinary officer |
|---|---|---|---|---|---|---|---|
| Buying of sheep and goats | | | | | | | |
| Take to pasture /give folder | | | | | | | |
| Clean sheep and goats stay | | | | | | | |
| Mating | | | | | | | |
| Milking | | | | | | | |
| Vaccination | | | | | | | |
| Selling of other small ruminants' products | | | | | | | |
| Sell/slaughter/give away the small ruminants | | | | | | | |