FACTORS AFFECTING THE ECONOMIC IMPORTANCE OF ZERO GRAZING ON DAIRY FARMERS IN KERICHO COUNTY

BY

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PRESENTED TO

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List of Acronyms

MOA- Ministry of Agriculture.

GDP- Gross Domestic product.

GOK- Government of Kenya
Chapter one

1.1 INTRODUCTION

The economy of Kenya is made up of many sectors contributing to the national gross domestic product (GDP) but of all these sectors agriculture is the dominant one as it contributes to food security in the country and also enables farmers to earn income from the sale of their produce in the market. It also creates self-employment to the farmers and thus contributing to the increase in their economic welfare and living standards (Wahome et al., 2008).

The agricultural sector is made up of several sub-sectors the main sectors being the crop and livestock sub sectors. Livestock sub sector mainly involves keeping of dairy or beef cattle or cows for the for the purpose of milk or beef production and even hides and skin production for local consumption or for sale in the local or the international markets. It is a sub-sector that cannot be ignored if the Kenya’s vision 2030 is to be achieved as it has the potential of contributing to 10% of the total gross domestic product(GDP) and in the agriculture context it contributes to 30% of agricultural domestic product(M.O.A.,2006).

Foreign exchange in Kenya is the major contributor to the stabilized balance of payments and since the livestock sector earns the country foreign exchange through export of the live animals, hides, skins, dairy products, it cannot be neglected. The government should allocate a greater portion of the incentives to this sector to reduce the costs of production and hence enabling the farmers to compete favorably with the producers of other countries hence enabling them to acquire a great portion of the market share and thus improve the viability of their production (G.O.K., 2002).

The government has done a lot to improve the dairy sector through the introduction of new quality breeds but a lot need to be done in terms of introducing new livestock production systems which are more efficient and in particular zero grazing system. It is a system where small space is utilized to keep dairy cattle in the zero grazing units and cut-and-carry fodder system I used in feeding the cattle. This is because the farm sizes are diminishing due to
population pressure resulting in less land remaining for extensive livestock production and the lack of sufficient and high quality livestock feeds lead to under feeding of the dairy cattle resulting to under-productivity (Karanja et al., 2003).

1.2 Problem statement

There are several strategies for improving income and food security in the developing countries; this is through the altering of the production systems of livestock production leading to an increase in the productivity and trade in the livestock production for example by practicing zero grazing. This is because increasing the production of livestock improves both gross national product in the developing countries and the potential world food supply (ILCA., 2005).

Zero grazing is a viable agribusiness activity that can improve the economic livelihood of dairy farmers in Kenya because of high milk production for sale and farmers are able to access credit from the financing institutions in Kenya to improve the dairy activity (Mogaka., 2009). Dairy production has high contribution to the farm income compared with the crop production in Kenya. Research (Kithale., 2009)

Despite the economic benefits of zero grazing that several studies have shown, no study has ever been conducted in Kericho county on the factors affecting the economic importance of zero grazing in Kericho County. It is not therefore it is not very clear whether farmers in Kericho county understand the factors affecting the benefits of zero grazing or not. Some farmers in the county realize few benefits from zero grazing due to the lack of awareness of the factors affecting the economic benefits of zero grazing. This means that illuminating the factors of the economic benefits of zero grazing in this study will help the farmers to adjust their production so as to realize the full benefits of zero grazing by eliminating the negative factors towards the benefits of zero grazing.

The proposed study seeks to find out how avoiding the negative factors towards economic benefits of zero grazing can help farmers increase their income of dairy farmers in order to enhance and the realization of the economic benefits of zero grazing among the dairy farmers in Kericho county. This is because I want to find out if avoiding the factors negatively affecting zero grazing in dairy farming can lead to increased milk production in the dairy stock therefore
leading to increased income for the dairy farmers and if it will make dairy production viable in
the dynamic Agribusiness sector.

1.3 The purpose of the study

The general objective of this study is to provide an understanding of zero grazing and extensive
dairy production in the Kenyan highlands and to provide an insight of the economic aspects
behind the extensive and zero grazing livestock production.

Specific objectives

I. To determine the factors affecting the economic benefits of zero grazing farming.

II. To determine some of the socio-economic factors influencing the decision to practice
zero grazing amongst smallholder farmers in Kericho County.

1.4 Hypothesis

I. The availability of credit, the education level, the types of forages used and the
disease prevalence are the factors affecting the economic benefits of zero grazing.

II. Availability of capital, education level, and the norms and traditions do not
influence the decision to practice zero grazing.

1.5 Justification of the study

Agricultural production is an important income generating activity to the people
of Kericho County. Reduction of cost and maximization of output has been
identified as key to the realization of the farmer’s objectives to generate higher
net income. An economic analysis on the economic importance of Zero grazing
will provide and understanding into the different ways extension workers can use
to convince farmers to adopt zero grazing. This study comes up with imperative
information that brings out clearly the economic aspects behind zero grazing in
dairy production. Some of the users of this information include the following:
Farmers in Kericho county and Kenya as a whole can use this information to learn on how they can optimize on the use of land in agricultural production and how to improve the productivity of the livestock herd so as to have high returns from their investment in dairy production.

The Ministry of Agriculture and livestock development finds this information very useful in ascertaining and justifying the factors behind the current productivity status in dairy sector in Kericho County and the reason behind the current low milk supply in Kericho County.

The county agricultural divisions can find this information very useful in making informed decisions regarding the steps to revitalize the dairy sector in the county.

The county veterinary department can find this information very useful in ascertaining the reasons behind the prevalence of the contagious cattle diseases in the county and the role of zero grazing in reducing the prevalence of the diseases.

1.6 Study area

Kericho county is located in the cool tropical high lands, it has very large fertile land area with very favorable temperature ranges (16-27 degrees Celsius), it has very reliable rainfall throughout the year, it supports very many agricultural activities including the tea production but more importantly dairy production because it is one of the leading milk production counties in the country.
These rainfall and temperature ranges favors the growth of livestock pastures and ensures the availability of water for the livestock together with reducing heat stress to animals since temperatures are very favorable.

Because of the above characteristics, I find the area very suitable for the study as there are many livestock production systems in the county ranging from intensive to extensive livestock production systems and there is the availability of the respondents who are the dairy farmers to fill the questionnaires based on their experience in the zero grazing farming or in the free range dairy production farming.

1.7 Organization of the project

The rest of this project is organized as follows: Chapter 2 provides an overview of relevant literature on the empirical work related to analysis of factors affecting the economic benefits of zero grazing. Chapter 3 gives an overview of the methodology that is used in the study. Chapter 4 of the project outlines the results and discussions of the study. Chapter 5 gives the conclusion of study based on data collected while chapter six of the study provides the list of references used in the study.
Dairy production systems play a big role in the dynamics of agricultural systems. Many systems of dairy production exists some allowing for efficient resource use and spreading of risks while others do not. Livestock production systems range from unrestricted grazing restricted to zero grazing or stall-feeding. This is because land is becoming increasingly cultivated for the crop production in order to enhance food security. Despite the benefits accruing from the crop production, there has been the encroachment of the livestock production areas thereby leaving only small fraction of the land to be used for livestock production and there will be the diminishing of the grazing lands and hence the reduction in the amounts of pasture for unrestricted grazing hence justifying zero grazing dairy production (Mohamed et al., 2003).

(Otieno et al., 2012) applied the stochastic metafrontier method to estimate the technical efficiency levels in beef production in Kenya. He also applied the Tobit model to assess factors that might influence efficiency. He found out that there is considerable scope to improve production in Kenya considering the importance of livestock production enterprise to the rural livelihoods and its potential role in poverty eradication and therefore there is need for appropriate development strategies for enhanced efficiency. He concluded that controlled cattle breeding method, access to market contract, availability of a professional farm manager, off-farm income, herd size and farmers age contribute positively to efficiency in beef production. The study attempts to bring out the economic aspect of efficiency in the beef production in Kenya. However it does restrict itself to beef production alone ignoring the dairy sub sector of livestock production, the study does not also bring out clearly what efficiency has to do with the improvement of the economic status and welfare of the beef farmers in Kenya.

(Ng’ang’a et al., 2010) applied a stochastic profit frontier and inefficiency model to measure the production efficiency of smallholder milk producers in Kenya. He found out that the profit efficiencies of the sampled farmers varied widely between 26% and 73% with mean of 60% suggesting that an estimated 40% of the profit is lost due to a combination of both technical and allocative efficiencies in the smallholder dairy milk production. He also found out that the level of education, experience, and the size of the farm influenced profit positively while profit
efficiency decreased with age. He concluded that profit inefficiencies among smallholder dairy milk producers can be reduced significantly with improvement in the level of education of the sampled farmers. This study brings out clearly the issue of efficiency in the smallholder milk producers in Kenya and the factors that influence efficiency in dairy production in Kenya, however we cannot ascertain from this study what can be done to improve production of milk among the smallholder dairy farmers in Kenya and also we cannot tell how the efficiency in dairy production can improve the economic standard of the dairy farmers.

(Majiwa et al., 2012) used the cob-Douglass stochastic production frontier model to identify the determinants of technical efficiency in smallholder dairying in Kenya. He found out that that means efficiency was 79%, which suggested that 21% of the production was lost due to technical inefficiency. He also found out that technical efficiency also varied across regions ranging from mean of 83.9% in the Central region and 72.5% in the Nyanza region. Land size, access to extension services, infrastructure and the level of schooling was also found to reduce the efficiency of smallholder dairying in Kenya. The study does bring what factors reduce efficiency in dairy production but we cannot tell what can be done to improve efficiency in dairy production in Kenya.

(Kamau et al., 2012) used the empirical analysis, primary data from Nyeri to estimate the effect of increasing usage of animal feeds of the farm incomes and poverty of the smallholder farmers in Kenya. He found through regression that the production effect on animal feeds is strongly positive despite the small quantities of feeds applied by the smallholder dairy farmers in Kenya. Through the simulation results, he concluded and confirmed that increasing the animal feeds in the livestock sector increases the output of livestock and substantially contributes to poverty reduction among the smallholder dairy farmers in the study area (Nyeri). The issue of how the use can improve the living standards have been brought out clearly here but what can be done to improve the efficient usage of the pasture to increase production of dairy products in not very clear in this study.

(Omondi et al., 2009) used a cross-sectional study to determine the status of good dairy farming practices on the zero grazing small scale farms in Limuru District in the central highlands of Kenya. Fourty farms in two clusters of twenty farms marketing milk through the formal and informal markets respectively were randomly selected and an observational checklist was used
to compare five parameters; Animal health and use of veterinary machines, animal housing conditions, animal feeding and watering, milk hygiene and manure management. He found out that there were no statistically significant differences (p>0.05) in management practices between farmers in the two clusters except for the source of water (p<0.05) and quality feeds (p<0.05). He also found out that there was a positive correlation (p<0.05) between the farmers level of education and quality of feeds fed to dairy cattle. He concluded that in overall, the status of good dairy farming practices was found to be unsatisfactory. The prevailing situation could have far reaching implications on the dairy value chain with regard to trade in regional and international markets. The status of good dairy production practices like zero grazing has been brought out very implicitly in this study but what the good dairy practices can do to improve the living standards and the welfare of the dairy farmers has not been shown here.

The studies above clearly show that dairy farmers clearly understand the efficiency aspect in dairy production and in beef production and factors that can reduce or encourage it but they do not know how to maximize the efficiency to improve their living standards, the farmers also understand what practices can improve the production in dairy production but they are not aware of the economic aspect of the practices and how they can break-even in their production. Since the economic aspects and the factors affecting the benefits of dairy production and particularly zero grazing has not been brought out, this forms a huge gap for investigation and therefore the use of zero grazing to improve the living standards and welfare of dairy farmers forms an area of study.
3.0 METHODOLOGY

3.1 Data collection procedure and sampling design

The primary data was mainly used this study and was obtained using the semi-structured questionnaires which were administered to the households which were sampled. These questionnaires were completed through schedules with the households head in Kericho County. The primary data comprises of the socio-economic characteristics of the zero grazing farmers and the characteristics of the farmers who are practicing zero grazing and those who are not practicing zero grazing, the benefits that are accruing from the zero grazing enterprise were also collected. Both qualitative and quantitative data was collected in the study to answer different questions attributes like gender, access to extension services and credit seeking behavior were collected for the qualitative part among many others. Whereas for quantitative part, number of hours worked per day by each worker, age among other different variables were collected.

Multi-stage sampling was used in this study. Purposive sampling was used to select Kericho as the study area. Purposive sampling was also used to select the zero grazing farmers among other farmers in the County. Random sampling of the zero grazing farmers was done using the central limit theory (CLT). CLT states that as the number of occurrences (n) increases, the expected results move closer to the actual results. A sample size that is greater than 30 is justified to infer population characteristics from the sample selected. A total of 40 respondents were selected and interviewed.

3.2 Model used

Ordinary least square (OLS) regression model was used in the study to analyze the relationship between Benefits of zero grazing and the socio-economic variables. The model is normally used to show a linear relationship between the dependent variable and the independent variable and it stated as follows:

\[ Y = \alpha + \beta X_1 + u_i \]

Where:

- \( Y \) = Benefits of zero grazing (dependent variable).
- \( \alpha \) = Constant (other factors which were not included in the model but affect the dependent variable)
\[ \beta = \text{Co-efficient (to be determined by the variable)} \]
\[ X_1 = \text{Variable (independent variable)} \]
\[ u_i = \text{Error term}. \]

### 3.3 Variables included in the model.

A number of variables were included in the model so as to answer the study objectives and these included:-

Table 1: variables included in the model

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description of the variable</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefitsawareness</td>
<td>Whether the farmer is awareness of benefits</td>
<td>±</td>
</tr>
<tr>
<td>Sourceoffinance</td>
<td>Source of finance for the farmer</td>
<td>±</td>
</tr>
<tr>
<td>Sourceofcredit</td>
<td>Source of the credit</td>
<td>±</td>
</tr>
<tr>
<td>Landtenure</td>
<td>Forms of land tenure</td>
<td>∨</td>
</tr>
<tr>
<td>Hrsperday</td>
<td>Hours worked per day by the worker</td>
<td>∨</td>
</tr>
<tr>
<td>Labourutilization</td>
<td>Zero grazing and labor utilization</td>
<td>±</td>
</tr>
<tr>
<td>Extensionserviceccess</td>
<td>Access to the extension services</td>
<td>∨</td>
</tr>
<tr>
<td>Influencezerograze</td>
<td>Influence of extension service to zero graze</td>
<td>∨</td>
</tr>
<tr>
<td>Effectsdisease</td>
<td>Effects of disease outbreaks</td>
<td>−</td>
</tr>
<tr>
<td>Foragesused</td>
<td>Types of forages used</td>
<td>÷</td>
</tr>
</tbody>
</table>

Source: Author’s creation

Awareness of the benefits was included in the model because only those farmers who are aware of the benefits of zero grazing were expected to practice it. This is because they were able to seek information from the extension officers and other relevant agricultural authorities on the
ways of efficient zero grazing production to maximize on the profits and the benefits of zero grazing. Source of finance was also included in the model because it was expected that those farmers were able to access credit were able to access enough capital to venture and to invest in the zero grazing enterprise. Those farmers who were able to access credit had large capital base hence higher returns per unit capital invested and this contributed to the economic benefits of zero grazing.

Source of credit was also included in the model because it was expected that those farmers who accessed credit from the informal lending had fair interest rates and convenient ways of payment. This means that the farmers could get high returns per unit capital invested and this led them to enjoy the economic benefits of zero grazing than those who borrowed from the banking institutions. Land tenure was used since it was expected that those farmers who owned land individually are more likely to make independent decisions and are not tied to restrictions of anybody and this leads directly to increases in the economic benefits of zero grazing.

The number of hours worked per day was also used because it was expected that the standard working hours by the hired workers leads to less fatigue and increased output per worker. This increases the chances of the zero grazing farmers to attain the benefits due to zero grazing. Labor utilization was used because it was expected that maximum labor utilization by the zero grazing farmer enables the farmer to achieve maximum output per worker and this means increased returns per unit capital paid to the hired labor and this leads to increased economic benefits to the zero grazing farmer.

The access to Extension services was also used in this model because it was expected that those farmers who were able to get the services of extension officers were able to gain technical knowledge on the efficient production ways. The farmers are able to improve efficiency in production and this increases the economic benefits of zero grazing to the farmers. The Influence by extension services to zero graze was also used because it was expected that those farmers who were influenced by the information obtained from the extension officers were able to improve on the ways of production. These farmers are able to increase the quantity and quality of milk production and this increased the economic benefits of zero grazing to the farmers.
The effects of the disease outbreak was included because it was expected that that the disease could the affect the normal physiological functions of the cattle and leads to reduced milk production. Reduced milk production means low sales and low returns and this reduces the economic benefits of zero grazing. The types of Forages used was also included in this model because the use of the highly nutritious forages increases the quantity of milk production and this means high sales of the milk. The increased milk sales mean high returns and high profits which increase the economic benefits of zero grazing enterprise.
4.0 RESULTS AND DISCUSSION

4.1 Socio-economic characteristics of Zero grazing farmers

According to Table 2, large percentage of the zero grazing farmers were male (65%) while the females were 35%. This means that females do not indulge in zero grazing enterprise like their male counterparts. The female are also not entitled to the ownership of land and are thus discouraged from engagement in zero grazing by the norms and traditions of the communities in this county. The female cannot easily access credit to increase the capital base because they do not have enough collateral to borrow loans like the title deeds. The females are thus not capable of engaging in the zero grazing than the male gender. The women are not also perceived to be well versed with the efficient technologies used in the zero grazing enterprise like the milking machines, the chaff-cutters and therefore most of the women do not engage in the zero grazing enterprise like their male counterparts do.

The results show that 70 percent of the zero grazing farmers were aware of the benefits of zero grazing. This indicates that the farmers engage in zero grazing only if they are aware of the benefits of zero grazing. This is because by being aware of the benefits of zero grazing, they will strive to learn about the importance of quality feed, quality breed and zero grazing as well as animal health and disease awareness for the purposes of producing quality breeds and healthy heifers. This also shows that those members of the society who are enlightened about the benefits of zero grazing are motivated to seek the services of the extension officers and the information which they get from the extension officers enable them to achieve the benefits of zero grazing.

According to the results of this study, 72 percent of the zero grazing farmers have farming as the main occupation. This shows that in this enterprise, one can achieve his or her objectives only in he/she concentrates on the activities involved here without digressing into other activities. This is because one is able to put all his/her energies and resources including time into this activity and thus achieve success in this enterprise with a lot of efficiency. Engaging in other activities like employment or private businesses will reduce concentration in zero grazing and also reduces the time, resources and efforts that are placed to this activity implying that it will be very difficult for
the zero grazing farmers to achieve his/her benefits in this enterprise. The results also show that 73 percent of the zero grazing farmers have acquired secondary school education and above. This suggests that those members of the society who have acquired secondary school education and above have gained the conceptual skills, management skills, marketing skills, and profit maximization skills subject to the underlying constraints thus they can start and run the zero grazing enterprise with success. Those members of the society who have only the primary school lack these conceptual skills, they are risk averse and are poor in management meaning that they are not likely to practice zero grazing.

Results indicate that 68% of the zero grazing farmers seek credit while 32% do not seek credit. This implies that credit seeking is an incentive to zero grazing because the farmer will get the capital to invest in the zero grazing enterprise and thus higher returns and high marginal returns. Those farmers who don’t seek credit have low capital base even if the start this enterprise and consequently low returns in the end. Results show that 65% of the zero grazing farmers seek credit from the microfinance and other informal financial institutions like individual lending. This shows that there are fair credit terms in the informal lending institutions and the interest rates may be low enough for the farmers and the repayment procedures are very convenient to the farmers. Therefore farmers who seek credit from the informal financial institutions have high returns to capital invested than those who seek credit from the banking institutions.

The results of the study show that 75% of the zero grazing farmers own land individually. This indicates that individual land ownership is a stepping stone towards attaining the benefits of zero grazing. This is because one is not tied to the restrictions of the land owner as in the case of leasehold and also that a farmer can plan his/her activities on the farm without restrictions by the members of the society as in the case of the communal land ownership. The results indicate that hired labor is 68% of among the zero grazing farmers. This means that for the zero grazing farmers to achieve the benefits of zero grazing, one has to have hired labor. This is because the hired labor is easy to supervise as opposed to the family members, the farmer can ensure maximization of the output per worker and hence maximum utility of the capital paid in terms of salaries and wages to the workers.

According to the results of the study, 77% of the workers on the zero grazing enterprises work for eight hours per day. This means that for maximum labor utilization in zero grazing, one has to
ensure that the hired workers work for eight hours, this is because of reduced fatigue, increased worker motivation and hence increased output. It also shows that zero grazing enterprise is a viable one which also takes upholds the workers welfare. The results also show that 85% of the zero grazing enterprises have maximum labor utilization. This means that it is a good and viable enterprise which ensures that there is increased utility of the capital in form of salaries or wages paid to the workers.

According to the results of the study, 73% of the zero grazing farmers/enterprises have access to the extension services. This implies that those who engage in this enterprise have had access to the extension services and that they got information on the benefits of zero grazing from these officers and also they got information on the most efficient methods of production in order to achieve the benefits of zero grazing. This also means that it is difficult for the zero grazing farmer to gain from zero grazing without the assistance of extension officers. Results also show that 68% of the zero grazing farmers were influenced by the extension services while 32% of the zero grazing farmers were not influenced by the extension services to zero graze.

This is because extension officers provide information regarding the benefits of zero grazing and on efficient production methods and even on the most productive breeds to rear. Hence most of the farmers who practice zero grazing had access to this information while small percentage of those practicing zero grazing had access to this information. This means that farmers are influenced by extension officers to venture into this enterprise.

According to results 70% of the zero grazing enterprises were not affected by disease outbreak while 30% of the zero grazing enterprises were affected by the disease outbreak.

This is because cattle under the zero grazing are not exposed to the hosts of the pests and diseases as they do not intermingle with the neighboring cattle by other farmers. The hygiene of the zero grazing units are up to date as disinfectants are used for anyone accessing the units and washing of the cattle wastes and the forage remains/residues is done and therefore it is difficult for the disease to develop as conditions do not favor the hosts of the pests and diseases. This means that zero grazing is the most efficient production activity in dairy production more as it leads to production of healthy animals and their products for subsistence and for sale in local and external markets.
Results indicates that 68% of the zero grazing enterprises encounter reduced milk production as a result of the disease outbreak while 32% of the zero grazing enterprises encounter increased production costs, reduced efficiency in production and other effects.

The reason is that diseases lower the metabolic rates and other physiological functions of the cattle including the process of milk production. The cattle are not able to feed well and this translates to low output in terms of milk production. This implies that diseases are the major causes of economic losses in the zero grazing enterprise based on the fact that it reduces milk production and leads to low sales and low returns hence economic losses in this enterprise.

According to the results, 70% of the zero grazing farmers use hay as the main feed for their cattle while 30% of the zero grazing farmers use Napier grass, crop residues, banana plants, and leguminous crop remains. The reason for this is that hay is highly nutritious and lead to maximum milk production which is the main objective of the zero grazing farmers as this translates to increase sales returns and hence income leading eventually to the economic empowerment of the farmers. This means that for farmers to achieve the economic benefits of zero grazing, they have to use highly nutritious feeds like hay which increases milk production and thus increased returns from the sale of milk which leads to improvement of marginal returns of this enterprise.

The results of the study found out that 70% of the zero grazing farmers have the economic benefits as a result of zero grazing while 30% of the zero grazing farmers have food sufficiency and other non-economic benefits as a result of zero grazing.

The reason for this is that most of the farmers (70%) engage in this activity with the aim of increasing milk production from their cattle which they sale to get high sales leading to the high returns and therefore high profit. This profit will lead to increased investment and capital formation which increases the economic well-being and living standards for the farmers.

Only a small percentage of the zero grazing farmers engage in this production for milk to be used for subsistence or home consumption. This therefore means that zero grazing can be one of the
viable agribusiness enterprises to be used for the economic empowerment of the members of the society and can even be used by the government in the economic stimulus program.

According to the results, the mean age of the farmers practicing zero grazing is 34 years with a standard deviation of 7 years. This is because this age is youthful and hence the farmers of this age have energies and vigor to engage in zero grazing. Farmers above this age have their energies and vigor reduced hence will not wish to engage actively in the zero grazing enterprise. This indicates that this enterprise needs young energetic people who are able to engage in the rapid activities of this enterprise and who have the skills to save and maximize on the available capital.
Table 2: Descriptive statistics for frequencies and continuous variables.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Descriptive statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (% male)</td>
<td>65</td>
</tr>
<tr>
<td>Awareness (% aware)</td>
<td>70</td>
</tr>
<tr>
<td>Occupation (% farmers)</td>
<td>72.5</td>
</tr>
<tr>
<td>Education level (% higher education)</td>
<td>72.5</td>
</tr>
<tr>
<td>Source of finance (% seek credit)</td>
<td>67.5</td>
</tr>
<tr>
<td>Credit source (% microfinance institutions, informal finance)</td>
<td>65</td>
</tr>
<tr>
<td>Forms of land tenure (% individual)</td>
<td>75</td>
</tr>
<tr>
<td>Source of labor (% hired)</td>
<td>67.5</td>
</tr>
<tr>
<td>Hours worked per day (% 8hours)</td>
<td>67.5</td>
</tr>
<tr>
<td>Labor utilization (% maximum)</td>
<td>85</td>
</tr>
<tr>
<td>Access to extension services (% accessing)</td>
<td>72.5</td>
</tr>
<tr>
<td>Influence of extension services to zero graze (% influenced)</td>
<td>67.5</td>
</tr>
<tr>
<td>Disease outbreak effect (% not affected)</td>
<td>70</td>
</tr>
<tr>
<td>Effects of the disease (% reduced milk production)</td>
<td>67.5</td>
</tr>
<tr>
<td>Types of forages used (% hay)</td>
<td>70</td>
</tr>
<tr>
<td>Benefits (% economic)</td>
<td>70</td>
</tr>
<tr>
<td>Age (mean age)</td>
<td>34.08(6.974)</td>
</tr>
</tbody>
</table>

Note: Standard deviations for continuous variables are in parenthesis.
4.2 Factors affecting the economic benefits to zero grazing farming

Regression results from table 3 show that five variables are significant except for benefits awareness, source of finance, source of credit, land tenure and effects of the disease. Constant term refers to other factors that were not included in the model but affect the dependent variable.

There is an inverse relationship between awareness of zero grazing benefits and the economic benefits from zero grazing unlike earlier predicted. This can be explained by the fact that, farmers who are aware of the benefits do not seek more information about other economic benefits of zero grazing and therefore they do not widen their scope of knowledge about the economic benefits of zero grazing. This means that they can do very little to this venture which can only lead to the limited economic benefits they are aware of unlike if they had sought more information on other benefits.

There is an inverse relationship between the economic benefits of zero grazing and credit seeking by the farmers like earlier predicted. This is due to the fact that credit seeking attracts penalties in form of interest on loans on the default of payment implying that there is reduction in the venture capital hence reduction in the returns from zero grazing lending to the reduced economic benefits to the zero grazing enterprise.

There is an inverse relationship between seeking credit from the micro-finance and the informal credit institutions as earlier predicted. This is because the micro-finance institutions and the informal lending institutions do not have properly laid out loan repayment procedures and the terms of the loans can be altered without notice to the consumers. This leads to uncertainty to the farmers and lack of concentration in the zero grazing enterprise and this signifies failure of this enterprise and this prevents the economic benefits from being realized.

There is a positive relationship between the individual land ownership and the economic benefits of zero grazing as earlier predicted. This is because individual land ownership enables the farmer to concentrate in his/her farming activities and is not tied to the schedules of the owner of the land for the case of leasehold and to the other members of the community in the case of the communal land ownership. The farmer can make his/her independent decisions and set the strategies to attain the economic benefits of zero grazing.

There is an inverse relationship between workers working for eight hours unlike earlier predicted. This is because this number of hours is perceived by the workers as overtime working
and this increases fatigue on the workers and reduces motivation and concentration to work. This therefore leads to decreased output per worker implying reduced returns on the wages paid by the farmer and thus there are reduced marginal returns to the zero grazing enterprise. We have a positive relationship between labor utilization and economic benefits like earlier predicted. This is because zero grazing has maximum labor utilization and this leads to increased returns on the capital paid to the workers since there is maximum output per worker. Therefore the farmer is able to have employees who can work with him/her and maximize on the output of the enterprise for increased profits per unit capital invested.

There is a positive relationship between the influence of the extension services to zero graze and the economic benefits of zero grazing as earlier expected. This is because farmers who are influenced by the extension officers to zero graze can seek more technical information from the extension officers on the most efficient methods of production. These farmers are more likely to utilize this information than the farmers who are not influenced and they are in a greater position to realize the economic benefits of zero grazing. There is a negative relationship between the effects of disease outbreaks and the economic benefits as earlier expected. This is because disease reduces the volume of milk production and this means there is reduced quantities of milk available to the farmers to sale and hence there are reduced marginal returns. This therefore means that disease outbreaks reduce the economic benefits of zero grazing.

There is a positive relationship between the forages used and the benefits of zero grazing as earlier predicted. This can be explained by the fact that use of improved and highly nutritious forage feeds like hay leads to the increased milk production in the zero grazing enterprise. This means that use of highly nutritious forage feeds leads to economic benefits of zero grazing as a result of the increased rates of marginal returns due to increased milk production.
Table 3: Regression results for the estimates of relationship between the economic benefits of zero grazing and the factors affecting the economic benefits of zero grazing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Co-efficient</th>
<th>Standard Error</th>
<th>Significance (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.316</td>
<td>0.350</td>
<td>0.374</td>
</tr>
<tr>
<td>Benefitsawareness</td>
<td>-0.2440.149</td>
<td>0.113</td>
<td></td>
</tr>
<tr>
<td>Sourceoffinance</td>
<td>-0.2090.148</td>
<td>0.168</td>
<td></td>
</tr>
<tr>
<td>Sourceofcredit</td>
<td>-0.196</td>
<td>0.151</td>
<td>0.203</td>
</tr>
<tr>
<td>Landtenure</td>
<td>0.166 0.160</td>
<td>0.308</td>
<td></td>
</tr>
<tr>
<td>Hrsperday</td>
<td>-0.274</td>
<td>0.157</td>
<td>0.091</td>
</tr>
<tr>
<td>Labourutilization</td>
<td>0.452 0.183</td>
<td></td>
<td>0.019</td>
</tr>
<tr>
<td>Extensionservaccess</td>
<td>-0.268</td>
<td>0.141</td>
<td>0.067</td>
</tr>
<tr>
<td>Influenceextentozerograze</td>
<td>0.254 0.147</td>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>Effectsdisease</td>
<td>-0.198</td>
<td>0.152</td>
<td>0.202</td>
</tr>
<tr>
<td>Foragesused</td>
<td>0.371</td>
<td>0.146</td>
<td>0.017</td>
</tr>
</tbody>
</table>
5.0 CONCLUSION

The aim of the study was to study the factors affecting the economic importance of zero grazing and to analyze the socio-economic characteristics of the zero grazing farmers together with identifying the factors affecting the economic benefits of zero grazing. Ordinary square model was used in the attainment of these objectives. The study found out that the number of hours worked per day by the workers, labor utilization, Extension services access, influence by extension officers to zero graze and the types of forages used were significant factors that affected the economic benefits of zero grazing. From the results of this study, it is important to encourage zero grazing farmers to embrace new technologies like milking technologies; harvesting mechanics like the chaff cutters to increase the efficiency in feeding the animals. Cooling technologies should also be adopted so as to increase the shelf life of milk on transit to the market. Extension services should be increased to the zero grazing farmers because this will encourage farmers to practice whatever they learn on the improved methods of production and the improved financial management of the zero grazing enterprises.

There is also urgent need for the government to improve infrastructure in the county especially roads so as to reduce the time taken for milk to reach the market from the farm and this reduces milk loses due to spoilage as milk is a highly perishable product.
6.0 REFERENCING


