GROSS MARGIN ANALYSIS AND PERCEPTION OF SMALLHOLDER CATTLE FARMERS USING ARC'S CATTLE INFRASTRUCTURAL FACILITY SCHEME IN FETAKGOMO MUNICIPALITY, SEKHUKHUNE DISTRICT OF LIMPOPO PROVINCE

BY

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Declaration

I, Mampane Moshoene Samuel, declare that the research report entitled: **Gross Margin Analysis and Perception of Smallholder Cattle Farmers using ARC's Cattle Infrastructural Facility Scheme in Fetakgomo Municipality, Sekhukhune District, Limpopo Province**, South Africa submitted to the University of Limpopo in partial fulfilment of the requirement of the degree in Agricultural Economics, has not been submitted before and that all sources or materials used have been duly acknowledged.

Student: …… date:……..…

Mr Mampane M.S

DEDICATION

I dedicate this research project to my parents: Mr M.P. Mampane and Mrs L.M. Mampane; and my late Grandmother, Sarah Sehludi Sefoka.

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ABSTRACT

Cattle herd productivity in the smallholder sector is generally low in South Africa (Mapiye *et al*., 2009) with cattle off-take rates being as low as 15% per annum (ARC*,* 2016). Among the leading causes of reduced productivity in smallholder herds is cattle mortality caused by diseases and parasites, especially ticks (Hesterberg *et al*., 2007). Ticks and the diseases they transmit have been identified as the major cause of widespread morbidity and mortality in cattle kept by smallholder farmers in the semi-arid areas of South Africa (Dold and Cocks, 2001; Mapiye *et al.*, 2009) which results in poor animal welfare. Access to animal health infrastructure and technology can help reduce the problem of cattle diseases.

The study was conducted to examine the impact of ARC's Infrastructural Facility Scheme on the profitability of cattle farming and perceptions of smallholder cattle farmers. The study had four objectives; (i) to identify and describe the socio-economic characteristics of smallholder cattle farmers in Fetakgomo Municipality and Makhuduthamaga Municipality; (ii) to assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area; (iii) to determine and analyse the profitability of smallholder cattle farmers in the study area and (iv) to assess the effect of cattle farmers' socio-economic characteristics on cattle farming profitability in the area. A total of 224 smallholder cattle farmers were interviewed, of which 124 farmers were beneficiaries and 100 were non-beneficiaries. The Purposive Sampling procedure was employed to determine the desired sample size in both the two Municipalities.

The results showed that 55% of the smallholder cattle farmers were beneficiaries and 45% of the smallholder cattle farmers were non-beneficiaries out of the sample size. There were more male-headed households of the beneficiaries and more female-headed households of the non-beneficiaries. An analysis of the farmers' socio-economic characteristics further showed that the majority of the smallholder cattle farmers prefer using family labourers or household labourers in their cattle farming. The results depict that beneficiaries of the Animal Health Wise Project used 76.2% of the family labour and 23.8% of hired labourers for beneficiaries whereas for the non-beneficiaries, it was

68.7% of the family labour and 31.3% of hired labour. Using family labour helped in minimising costs of labour.

Farmers were asked a set of Likert type scale questions about their perceptions on the project. The perception index score revealed that the smallholder cattle farmers had a negative perception of it as the index score was skewed to the left with the value being -0.428. Profitability was measured through Gross Margin Analysis. The Gross Margin Analysis revealed that the mean value of the total revenue and gross margin for the beneficiaries were bigger than non-participants. This was because beneficiaries tend to sell their cattle at a higher price compared to the non-participants. Furthermore, smallholder cattle farmers that are beneficiaries tend to use the infrastructure and through that, their cattle productivity is higher resulting in higher gross margin and total revenue compared to the non-participants.

The Multiple Linear Regression Model was used to assess the effect of cattle farmers' socio-economic characteristic on the gross margin of the farmers in the study area. The results revealed that only 3 variables were significant. The total herd size, project participation and access to the market were significant at 1% and all had a positive effect towards the gross margin. The study suggested that there should be more infrastructural facilities that are built in other municipalities. By so doing, smallholder cattle farmers will use the facilities to improve their herd productivity and also improve their cattle's health status. It was also recommended that there should be some training based on the use of the cattle infrastructural facilities scheme so that farmers can use the facilities effectively.

Key words: Smallholder Cattle Farmers, Perception, Animal Health Wise Project, Infrastructural Facilities.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ARC	Agricultural Research Council
BQ	Black Quarter
DAFF	Department of Agriculture Forestry and Fisheries
DOF	Department of Agriculture
FAO	Food Agriculture Organisation
FMD	Foot and Mouth
GDP	Gross Domestic Product
KYD Scheme	Kaonafatso Ya Dikgomo Scheme
IFAD	International Fund For Agricultural Development
IDC	Industrial Development Corporation
LSD	Lumpy Skin Disease
NDA	National Department of Agriculture
NDP	National Development Plan
NERPO	National Emergent Red Meat Producer's Organization
Stats SA	Statistics South Africa
WFO	World Farmers Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Agriculture remains the single largest source of income and livelihoods for rural households in the developing world, providing up to 50 percent of household income in some countries (Jayne *et al*., 2003; Otte and Chilonda, 2002). Furthermore, it remains a significant provider of employment, especially in the rural areas, and a major earner of foreign exchange, despite its relatively small share of the total GDP (Mariara, 2009). It plays a crucial role in the livelihoods of almost one billion of the world's poorest people (Smith *et al*., 2013). Livestock farming is an important activity in rural areas as it is the source of livelihood.

Livestock production provides a major support to the livelihoods of many rural dwellers in Africa where milk, meat and blood are important dietary components (Mariara, 2009). Moreover, livestock production contributes more than 40% of the South African Agricultural Gross Domestic Product (GDP) (ARC, 2016). Livestock is largely in the smallholder farmers sector in South Africa mostly to sustain their livelihoods (Rootman *et al.,* 2015).

Smallholder farmers are defined as those farmers owning small plots of land and they tend to hold livestock both for household food and for nutritional security (Udo *et al.* 2011). Furthermore, they also have limited resources compared to commercial farmers (DAFF, 2012). Smallholder farmers are the drivers of many household economies in Africa. However, their ability to reach their maximum potential in production is often hampered by several constraints. The constraints include: limited access to infrastructure, limited access to capital and limited access to markets.

In an effort to mitigate some of the constraints to livestock production in the smallholder sector, the Agricultural Research Council (ARC) implemented a project called the "Animal Health Wise Project". The project facilitates refurbishment of old dipping tanks, provision and installation of animal handling tools or facilities, namely; neck clamps and crush pens. The infrastructure support project was borne out of a national beef cattle

improvement scheme that is known as the Kaonafatso ya Dikgomo (KyD) Scheme, which is aimed to facilitate access of smallholder cattle farmers to the mainstream of the agricultural economy of the country (ARC, 2016). Through the infrastructural support programme, it is anticipated that smallholder farmers will have access to adequate and functional farm technologies such as the dipping tanks, water points, crush pens and even boreholes that address the issues related to the animal health. Furthermore, giving access to these technologies for farmers is expected to improve the animal health status of cattle and create market access opportunities for smallholder beef producers.

The provision of infrastructural facilities is increasing rapidly. However, there are no noticeable improvements that are leading to transformation in the life of rural peasant farmers as well as their level of production and gross margin. The possible reasons are linked to the grossly inadequate quantity and quality of the infrastructural facilities provided in the rural areas and the so-called “existing “ones are in a bad functioning state. One contributing factor that is detrimental to the state of these infrastructural facilities and their inability to bring positive outcomes (either quality or quantity) is basically the perception of the farmers towards using the infrastructural facilities. Assefa, van den Berg and Conlong (2008) noted that farmers’ perceptions could act as a constraint to improved quality and high production. Hence, it is important that perceptions of smallholder cattle farmers on new technologies or infrastructural be addressed thoroughly. Thus, perceptions are among the numerous factors that affect farmers’ when it comes to adopting new technologies or infrastructural facilities. Perceptions of farmers’ are closely related to the farmers’ socioeconomics characteristics.

1.2 PROBLEM STATEMENT

Cattle herd productivity in the smallholder sector is generally low in South Africa (Mapiye *et al*., 2009) with cattle off-take rates being as low as 15% per annum (ARC, 2016). Among the leading causes of reduced productivity in smallholder herds is cattle mortality caused by diseases and parasites, especially ticks (Hesterberg *et al*., 2007). Ticks and the diseases they transmit have been identified as the major cause of widespread morbidity and mortality in cattle kept by smallholder farmers in the semi-arid areas of

South Africa (Dold and Cocks, 2001; Mapiye *et al.*, 2009). Access to animal health infrastructure and technology can help reduce the problem of cattle diseases.

Most cattle farmers in rural areas operate without access to facilities such as crush pens, dipping tanks and handling yards and this affects their productivity (ARC, 2003). Livestock development programmes have the potential to improve the farmer's access to technologies, improve productivity and profitability, and enhance equitable access and participation in the sector (NDA, 2006). Since the Agricultural Research Council (ARC) introduced the Health Wise Project (ARC's Infrastructural Facility Scheme), there is no information on whether this has affected cattle production, profitability and improved use of technologies by farmers. It is also not clear to what extent farmers use the facilities and their perceptions on the ARC led intervention. This study therefore intends to fill the identified gaps by assessing the effect of facilities' usage on smallholder cattle farmers' profitability and the perception of the smallholder farmers towards the use of the infrastructural facility in the study area.

1.3. Motivation of the study

Poor animal welfare and diseases continue to constrain livestock productivity, agricultural development, human wellbeing and poverty in many regions of the developing world (Perry and Grace, 2009). Rushton (2009) highlights that livestock diseases and parasites account for direct losses (deaths, slow growth, and reduced fertility) and indirect losses (additional drug costs, vaccination costs) towards farm revenue. With livestock in developing countries being a source of food, provision of income, transport, store of wealth and draught power, disease and parasite control is of paramount importance, especially for smallholder farmers.

Ticks are considered to be the main health issue smallholder farmers face. Rajput *et al*., (2006) agree with Rushton (2009) by stating that ticks and diseases cause substantial loss in production, reduce animal productivity and often death. Ticks cause hide damage; introduce toxins and suck blood from animals (Atif *et al.,* 2012). Ticks can transmit diseases from infected cattle to healthy ones, and they are considered to be amongst the most important vectors of diseases affecting livestock (Jongejan and

Uilenberg, 2004). It is imperative that smallholder cattle farmers are aware and understand the contribution animal health has towards effective production management practices. Moreover, according to Rahman (2003), farmers' perceptions are important because they are a guiding concept of human behaviour and or decision-making. Implying that if farmers have a positive perception towards the Animal Health Wise Project this will result in good outcomes of the farmer's gross margin.

Therefore, this study is motivated by a need to improve the incomes of smallholder cattle farmers, to mitigate challenges faced in the area of poor infrastructural facilities and also to assess the perceptions of smallholder cattle farmers using the infrastructural facilities. A lot of smallholder cattle farmers experience low productivity and high herd mortality caused by diseases and parasites, especially the ticks. Furthermore, the study intends to assess the perception of the smallholder cattle farmers on the cattle infrastructure facility. The study will assess how the use of these facilities has assisted in enhancing their income.

1.4 Scope of the study

1.4.1 Aim of the study

The aim of the study is to analyse the impacts of the ARC's cattle infrastructural facility scheme on profitability of cattle farming and perceptions of smallholder cattle farmers in the study area.

1.4.2 The objectives of the study are to:

I. Identify and describe the socio-economic characteristics of smallholder cattle farmers in the study area.
II. Assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area.
III. Determine and analyse the profitability of smallholder cattle farmers in the study area.
IV. Assess the effect of cattle farmers' socio-economic characteristics on their gross margin in the study area.

1.4.3 Research Hypotheses

I. Socio-economic characteristics do not have a significant effect on the gross margin of the smallholder cattle farmers in the study area.
II. The perception of the smallholder cattle farmers does not have a significant effect on the usage of the infrastructural facility in the study area.

1.5 Organizational structure of the study:

This study consists of Five (5) chapters. The first chapter provides the general introduction of the study. It consists of the background, problem statement and aim and objectives of the study. Chapter 2 consists of literature review where a review of previous studies related to this study was conducted. Chapter 3 shows the methodology and analytical procedures that were used to conduct this study. Chapter 4 indicates the results obtained from the study and their interpretation. The final chapter in the study, which is chapter 5, consists of the summary, conclusion and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter gives reviews previous studies that were done both in South Africa and other countries. The chapter covers the general background of the South African cattle industry, the importance of the cattle infrastructural facilities, the prevalence of cattle diseases and parasites in South Africa and across the world. Findings of the previous studies on the effect of socio-economic characteristics of smallholder cattle farmers and their impacts of access to infrastructure on profitability are also considered.

2.2 Background of the South African Cattle industry

In South Africa, the livestock sector is an integral component of the country's agricultural production system contributing positively towards the country's socio-economic development. South Africa's total gross value of agricultural production recorded a 12.5% increase in the 2016/17 production season which is more than the 2015/16 agricultural production (DAFF, 2017). The increase was credited to animal products which had the highest contribution of 46.5% compared to 27.7% and 25.8% coming from horticultural products and field crops, respectively (DAFF, 2017). According to DAFF (2017), the animal production decreased by 0.6% compared to the previous production season, as a result of a decrease in number of stock slaughtered and also inadequate management practices.

Industrial Development Corporation (IDC, 2016) stated that the contribution can be further increased if livestock, particularly cattle from the rural sector is brought into the formal economy. It is estimated that close to 40% of the 14.1 million cattle available in South Africa are owned by the smallholder sector (DAFF, 2012). The remainder, that is 60%, is owned by well-established large scale commercial farmers (DAFF, 2012; ARC, 2013). Cattle is seen as an important resource to South African livestock sector and are a multifunctional livelihood strategy and food security source, especially for the rural

poor (Ndoro *et al.*, 2014). Cattle farming provides nearly 60% of the value of edible products (meat and milk) which comes from the livestock sector (FAO, 2006).

2.3 Challenges that smallholder farmer's encounter in cattle production

In South Africa, smallholder agriculture has been recognised as the vehicle through which the goals of reducing food security and poverty, and increasing rural development can be achieved (DAFF, 2012; Pienaar and Traub, 2015; IDC, 2016). However, such suppositions on the role of the smallholder sector remains subject to debate with researchers such as Tshuma (2012) and Larson *et al.,* (2014) having asked whether rural development strategies should chiefly depend on smallholder farming or not, for employment opportunities and poverty alleviation. According to NPC (2011), the South African National Development Plan (NDP) mandated the smallholder sector to drive development in the rural areas for improvement of livelihoods. DAFF (2012) also supported the notion that smallholder farmers do have the potential to drive and support livelihoods of the rural poor in South Africa. However, strategies targeting the development of the smallholder farmers should identify and acknowledge factors such as diverseness of the smallholder sector (Pienaar and Traub, 2015). This is because the use and application of the term "smallholder" has been seen to have a general suggestion that farmers in this sector are relatively homogenous (Cousins, 2010). However, this tends to obscure class-based variances between farmers in this sector, hence it causes misleading assumptions about common interests in development planning (Cousins, 2010).

Emerging farmers are reported to be confronted by challenges such as poor infrastructure, lack of transportation to the markets, poor access to finance, lack of marketing skills and information, high transaction costs, lack of agricultural implements to better production and low education levels (Land bank, 2011; Khapayi and Celliers, 2016; DAFF AGRI-News, 2016). Among other constraints, MacLeod *et al.,* (2010) cited: lack of land title, variability of climate, poor access to extension support and poor knowledge of rangelands and management of animals as the major challenges confronting the farmers. However, National Emergent Red Meat Producer's Organization (NERPO) (2004), reported severe shortage of skills among emerging

farmers as a major constraint to their growth. Consequently, these challenges and constraints affect the sustainability of the smallholder cattle farming system.

2.3.1 Cattle parasites and diseases prevalence among smallholder farmers

The occurrence of parasites and diseases constitute a major constraint to cattle production in the smallholder sector (Agholor, 2013). The importance of livestock in poor areas is to sustain livelihoods and animal health is very influential in this regard according to Bayer *et al*., (2003). Animal diseases affect poor people who are also exposed to challenges in dealing with animal health, and this is due to lack of information access, the expense of animal health production inputs and effective coping strategies when dealing with disease outbreaks (Ogunkoya, 2014).

There are three groups of diseases that are commonly dealt with in smallholder animal health. These are: endemic diseases, epidemic diseases and tick-borne diseases. Endemic diseases such as mastitis, pneumonia and parasite transmitted diseases have major impacts on smallholder animal health. This is due to productivity losses, costs of control or eradication programs (Perry and Grace, 2009). Endemic diseases tend to be those that exert their greatest effect at farm level. Epidemic diseases are those that threaten farm production and national livestock industries.

Rich and Perry (2011) state that such diseases included high levels of mortality, high control or eradication costs and restricts trade. Epidemic diseases can cause severe shocks to smallholder animal health by wiping out the whole herd. Diseases such as foot and mouth are considered to be epidemic as well. Zoonotic diseases such as Rift Valley Fever, Brucellosis and rabies have impacts mainly on human health, animal health or even both (Bruckner *et al*., 2002). They tend to affect smallholder farmers who are in close proximity with their cattle. With regard to the study area, Black Quarter, Foot and Mouth Disease (FMD) and Heart water are common diseases that farmers experience in South Africa.

2.3.1.1. Black Quarter (BQ)

Black Quarter is said to be an acute infectious disease of cattle, which causes severe inflammation of skeletal, and cardiac muscle (Sultana *et al.,* 2008). The impact of black quarter on smallholder farmers is significant. Furthermore, most cases of black quarter outbreak occur in the warmer months of the year. With the bacterial spores able to withstand various environmental stresses, they can persist for a number of years within an area (Sultana *et al.,* 2008). Clinical symptoms include presence of muscle swelling on the affected area. However, post mortem findings include dark and discoloured muscles. The key to prevention is a strict vaccination programme, given that the disease can cause high mortalities and financial loss.

2.3.1.2. Foot and Mouth Disease (FMD)

Foot and Mouth Disease (FMD) is highly contagious with low mortality rates, however it accounts for extreme losses in terms of livestock productivity and trading ability (Longjam *et al.,* 2011). In addition, Knight-Jones and Rushton (2013) highlight that direct loss due to FMD is low meat and milk production, loss of weight, loss of draught power and marginally cases of death. Indirect losses speak to additional control costs, prevention costs and marketing ability of livestock.

2.3.1.3. Tick and Tick-borne diseases

Another important aspect of animal health is controlling tick and tick-borne diseases, which impact production management potential on cattle. Ticks transmit a variety of micro-organisms, protozoa and viruses. Research showed that most farmers in the smallholder sector notice ticks as the most important ecto-parasite that affects animal production and health (Dold and Cocks, 2001; Rajput *et al*., 2006). According to DAFF (2008), ticks cause loss of blood, retardation in growth and loss of weight, irritation due to biting (tick worry), hence reduced feed intake. Also by piercing the animal to suck blood, ticks cause damages to hides and skins, introduces toxins and predispose cattle to secondary infections and thus reduces animal health (Mtshali *et al*., 2004, DAFF, 2008). In South Africa, one of the main tick-borne diseases with a significant economic

impact on cattle production in the smallholder sector is Cowdriosis (ehrlichia ruminantium) with a common name “Heart water”.

This disease is transmitted by the African bont tick (Amblyomma hebraeum) and is endemic in most areas of the Sub-Saharan region (Rushton *et al.,* 2002). Moreover, the disease is one of the major causes of livestock losses for smallholder farmers. Typically, the infection causes a high fever, nervous signs, accumulation of fluid around the cardinal and lung cavity, thus leading to death (Allsopp, 2009).

The impact of Heart water on smallholder production systems has been well documented in literature. Research by Makala *et al.,* (2003) revealed that Heart water is regarded as a serious disease from which smallholder farmers sustain great losses in terms of cattle numbers, thus impacting negatively on their livelihood sustainability. The relevance of highlighting the aforementioned diseases is due to their influence on smallholder cattle production systems within the Sub-Saharan region.

With regard to ticks and tick-borne diseases, it is crucial that intervention controls are implemented, especially for smallholder cattle farmers who find this issue a challenge to manage. These interventions need to address the problem; they must be economically viable and socially acceptable to farmers. Tick control interventions could be through: chemicals acaricides or vaccinations, genetic resistance which speaks to breeding animals for resistance and veld management by means of veld burning, stocking rates and veld resting systems (Jongejan and Uilenberg, 2004).

A study by Ocaido *et al*., (2009) in Uganda, assessed the impact of diseases and vectors towards smallholder cattle production. The study revealed that diseases such as Foot and Mouth (FMD), anaplasmosis, Lumpy Skin Disease (LSD) and Heart water were commonly diagnosed in sick animals. Economic loss to farmers in the form of mortality, milk production loss and draught power ability influenced livelihood sustainability negatively amongst farmers. Conventional methods such as dipping, vaccinations and or spraying were employed by farmers to address tick loads and aforementioned diseases.

Animal parasites and diseases are highly predominant and cause major impacts to livestock production in the tropical and subtropical areas despite being widespread globally (Masika, 1997). This is the result of favourable climatic conditions and the vegetation types that exist in the area compared to temperate areas. South Africa is located in the subtropical area and the smallholder sector is greatly constrained by parasites and diseases, especially in cattle farming.

Apart from external parasites, common internal parasites such as round worms and flukes cause major challenges in smallholder cattle farming. Livestock Health and Production Group (LHPG) (2014) stated that there was a notable increase in cases of internal parasites infestations in the country with new reports of wire worm and bankrupt worm have been reported. Musemwa *et al*., (2008) reported that cattle diseases and parasites occurrence is one of the most important factors that have caused a decline in cattle productivity in South Africa's rural areas. Thus, animal health concerns affect the number and quality of animals and its products to be sold and in many cases increase morbidity and mortality, hence they are barriers to trade (Chawatama *et al*., 2005; Mwacharo and Drucker, 2005). One of the major causes of parasites and disease transmission between different communities is the uncontrolled movement of animals and animal products (Musemwa *et al*., 2008).

2.3.2 Poor marketing management by smallholder cattle farmers

In most developing countries, low national investments on marketing inputs and services, research and support has been done (Lebbi, 2004). Formal marketing of cattle in communal areas is characterised by absent or ill-functioning markets (Kusina and Kusina, 1999; Seleka, 2001; Moll *et al*., 2007). Smallholder farmers are often located in the marginal areas characterised with poor communication infrastructure particularly access roads to markets, thereby limiting cattle farmers' capacity to transport cattle to the few available slaughter facilities (Bayer *et al*., 2001). These constrain farmers thereby forcing them to opt to sell their cattle through informal markets whereby they compromise on prices.

Smallholder cattle farmers can increase their revenue base by adding value to cattle products, by conducting market research promoting cattle products, by convincing the public on health benefits associated with consumption of cattle meat (Peacock *et al*., 2005) through offering promotions and advertisements. For farmers to economise on transport for transporting their cattle to auction pens, there is a need to form cooperatives and pull their resources together (Kusina and Kusina, 1999), so that they spread the cost and realise meaningful income returns. Risks that smallholder producers face are linked to prices, quality, quantity and timing of delivery. Transaction costs (Hobbs, 1996), is another factor which has a significant impact on marketing decision. Some factors like age, education and farm profit (Hobbs, 1997), affect farmers in their marketing channel choice.

2.4 Factors shaping smallholder farmers' perceptions of technology interventions

According to Rahman (2003), farmers' perceptions are important because they are a guiding concept of human behaviour and or decision making. Furthermore, Hashemi and Dalamas (2011) suggested that perceptions play a major role in the behaviour of farmers towards the use of new technology. Therefore, farmers' perceptions should receive special attention from extension services, policy makers and other stakeholders in the farming industry. Assefa, van den Berg and Conlong (2008) noted that farmers' perceptions could act as a constraint to improved quality and high production. Hence, it is important that perceptions of smallholder cattle farmers on new technologies or infrastructural be addressed thoroughly. Thus, perceptions are among the numerous factors that affect farmers' when it comes to adopting new technologies or infrastructural facilities. Perceptions of farmers' are closely related to the farmers' socioeconomics characteristics.

Socioeconomic characteristics of smallholder farmers has an impact on smallholder decision and perception towards infrastructural facilities and adoption of agricultural technologies. Moreover, several studies have examined the influence of socio-economic variables on farmers' adoption decisions of agricultural technologies or infrastructural facilities using either the probit/logit model (Kabede *et al*, 1990, Kaliba *et al*, 1997) or the ordinary least squares linear regression model ((Rezvanfar, 2007; Rezvanfar and

Arabi, 2009; Mafimisebi *et al*, 2006; Rahman, 2007). In those models, the dependent variable was specified as a function of farmer-specific attributes (e.g. gender, age, experience, education, household size, income, extension contact), and farm attributes (e.g. farm size, farm type, location). Usually the choice of variables included in these models were not based on any strong theoretical grounds but are guided by past studies and experience.

2.5 Smallholder farmer's social characteristics as constraints towards the decision making of using the infrastructural facility:

Characteristics such as education, age, gender, household size may have an influence on the decisions made by farmers and development of their farming enterprises (Guzman and Santos, 2001). Moloi (2008) asserted that farmer's income often differs according to farmer's characteristics such as education level, age of household head, and household size. According to Land Bank (2011), the educational level enables farmers to effectively manage their farming operations. This implies that better educated farmers have more room for succeeding in the farming business. This is because their level of education helps them to understand and interpret market information correctly; have the ability to network and communicate their business ideas; have better general farm management principles and marketing skills; and develop financial intelligence. Several studies have found a direct relationship between the level of education and successful performance in farming (Montshwe *et al.,* 2005; Bizimana *et al*., 2004 and Mohammed and Ortmann, 2005). According to Montshwe *et al*., (2005), the training received by smallholder farmers was found to have improved the possibility of the farmers to sell livestock which in turn created income for them.

Wye (2003) acknowledged appropriate training, socio-economic conditions, and accessibility to extension services as factors that affect access to markets by smallholder farmers. Considering the free market situation that prevails in South Africa, Moloi (2008) indicated that emerging farmers with low levels of education and receiving poor support will face challenges related to market access. Thus, education plays a key role as it assists smallholder farmers to understand and interpret information on the

market, having improved production and marketing skills, and more importantly the ability to communicate their business ideas to others (Montshwe *et al.,* 2006; Mohammed and Ortmann, 2005).

Age is a very important attribute concerning efficiency and decisions made by a farmer. Older farmers possess more experience compared to young farmers due to their risk-taking attitude (Makhura, 2001). Ngqangweni and Delgado (2003) found out that older farmers were more likely to invest in livestock compared to younger farmers in Limpopo.

Land Bank (2011) asserted that the middle-aged farmers are likely to be more successful compared to older famers. This was consistent with the findings by Makhura (2001), who indicated that despite older farmers being found to be more likely to participate in markets, they significantly sold less compared to younger farmers. However, for a farmer who has been engaged in farming for a long time, the chance of success is higher (Land Bank, 2011). For the smallholder cattle farmers to receive higher revenue when they sell their cattle, the cattle have to be healthy, thus making use of the infrastructural facilities giving farmers a chance for their cattle to be parasite free and being health. The farmers' objective is to receive higher revenue.

Mathonzi (2000) found out that household size negatively impacted on farm income, especially for households with a large size and majority of the members were not participating in the business. However, Ijatuyi *et al.*, (2017) stated in their study, that as household size increases in a family or rural household, it is a greater contributor to the level of productivity because a farmer will incur lesser cost of labour whilst producing more total output, especially that smallholder cattle farmers use household labour due to financial constraints.

Gender is one important factor when coming to participating in cattle faming. Ijatuyi *et al., (2017*) based on a study conducted in North West Province revealed that there were more males in cattle farming than females. Women play a vital role in advancing agricultural development and food security in the world. They participate in many aspects of rural life e.g. marketing of produce, tending animals, collecting water and wood for fuel, and caring for family members. There is still a huge gap in the process of

promoting gender mainstreaming knowledge, especially in the underdeveloped world. In Africa, although most agricultural activities are carried out by women [Food Agriculture Organisation (FAO), 2010; World Farmers Organization (WFO), 2016], large-stock, especially cattle are largely owned by males (Mapiye *et al.,* 2009). Therefore, the South African government is currently promoting and advocating the participation and involvement of women in all economic spheres, including agriculture and cattle farming.

2.6 Importance of the infrastructural facilities

Communal farmers in rural areas face many challenges that constrain them from generating income from their livestock. These challenges include lack of access to land and water, lack of access to marketing channels, smaller herd size, risks associated with animal diseases, drought and theft (Montshwe, 2006).

Profitability is the primary goal of all farm business projects. Without profitability, the farm business will not survive in the long-run. Hence, measuring past and current profitability and projecting future profitability is very important (Hamra, 2010). Several studies have shown that certain factors affect profitability of which Tahir *et al.,* (2010), Mandaka and Hutagaol (2005), and Tajerin and Noor (2003) showed that the actual profit was not only affected by prices of production inputs, but also by management and socio-economic factors including age, education, experience, and capital.

The government has taken a number of measures to restructure the rural financial markets with the objective of building, from the bottom up, a system of financial services that provides much broader access for all. The Strauss Commission, which examined all aspects of rural finance, made recommendations for further improvements to rural financial markets including a new role for the Land Bank, which is now being implemented. The ACB, which provided cheap credit to large farmers and support through rollovers of loans to highly indebted farmers, has now ceased its operations (DAFF, 2012).

In South Africa, the central government, as well as provincial governments, continue to invest funds in agricultural extension. Limpopo, a province contributing about 5 % to the South Africa's total beef production (Republic of South Africa, 2012), has the country's

highest agricultural extension expenditure at provincial level (Worth, 2012). And consequently, the government together with the Agricultural Research Council started a project to refurbish the old agricultural facilities like the crushing pens to be accessible to farmers in order to handle parasites and diseases such as ticks.

An understanding of the behaviour of livestock will facilitate handling, reduce stress, and improve both handler safety and animal welfare. Large animals can seriously injure handlers and/or themselves if they become excited or agitated (Blecha *et al*., 2002). Reducing stress on animals has been demonstrated to improve productivity and prevent physiological changes that could confound research results. Recent studies have shown the adverse effects of stress on animals. Restraint, electric prods and other handling stresses lowered conception rates. Transportation and restraint stress reduced the immune function in cattle.

According to DAFF (2014), the crush pen is needed for vaccinations, deworming, etc. The neck clamp is needed if one must aid a cow with calving. The pens and narrow alley help confine animals that need to be handled and driven into the crush pen or neck clamp. Well-designed handling facilities help to minimise animal confusion and stress. The use of electric prod is not recommended because they cause animals unnecessary pain and stress whereas poorly designed facilities increase stress on the animals and may cause poor performance, which can affect meat quality.

2. 7 Chapter summary

This chapter reviewed literature on the general background of the South African cattle industry, the trends in cattle production. The chapter also looked at the challenges that farmers encounter in cattle farming, the deficiencies in cattle infrastructure towards animal health as a constraint towards smallholder farmers' development. It also looked at the prevalence of cattle diseases and parasites as a constraint towards productivity and profitability. Lastly, the chapter looked at the findings of socioeconomics characteristics of smallholder cattle farmers on their impact towards participating in projects. Moreover, the chapter also considered the farmers' perception towards using the infrastructure.

CHAPTER 3

METHODOLOGY AND ANALYTICAL PROCEDURES

3.1 Introduction

This chapter outlines the description of the study area, the research methods employed when conducting the study. It also explains how and where this study was conducted, sample size, sampling approaches and data analysis employed in the study. This chapter also gives a description and measures of the dependent variable and independent variables.

3.2 Study area

The study was conducted in two Municipalities which were Fetakgomo Local Municipality and Makhuduthamaga Municipality. The two municipalities are based in Greater Sekhukhune District, Limpopo Province of the Republic of South Africa. Fetakgomo Municipality shares boundaries with Makhuduthamaga; Greater Marble Hall, Greater Tubatse and Elias Motsoaledi Local Municipalities of the Sekhukhune District. It covers a surface area of 1 105 km^2, with a total population size of about 93 795, with the unemployment rate of 58.9 % and a total number of 7 960 agricultural households (Stats SA, 2011).

Makhuduthamaga Local Municipality is based in Sekhukhune District, Limpopo Province of the Republic of South Africa. The municipality shares boundaries with Fetakgomo; Greater Marble Hall, Greater Tubatse and Elias Motsoaledi Local Municipalities of the Sekhukhune District. It covers a surface area of 2096.60 km2, with a total population size of about 274 358, with the unemployment rate of 62.7 % and a total number of 24 803 agricultural households (Stats SA, 2011). People in the selected area speak Sepedi as their home language.

From Figure 3.1, which is the map; the study areas were denoted by the Red arrow mark showing the points where questionnaires were administered.

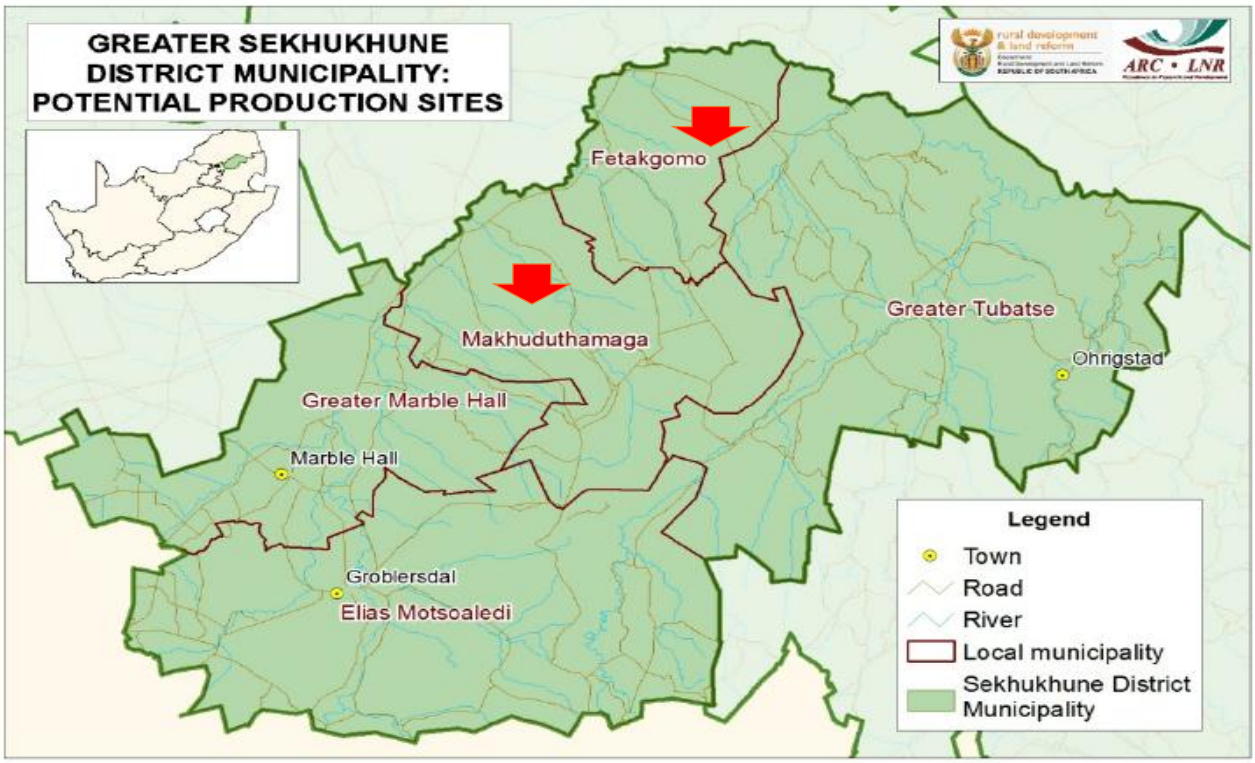

Figure 3.1: Map of Fetakgomo Municipality

3.2.1 Background of the Animal Health Wise Project

The project is located in Fetakgomo Municipality. The Municipality was chosen because Fetakgomo has many cattle farmers as compared to other Municipalities in the Sekhukhune District. The project focused on 6 villages within the Municipality, the six areas were: Stryd-kraal, Ga-Phaahla, Mohlaletsi, Mooilek, Seokodibeng and Ga-Mampa.

The project aims to facilitate the refurbishment of old dipping tanks, provision and installation of animal handling tools or facilities, namely; neck clamps and crush pens. The infrastructure support project was borne out of a national beef cattle improvement scheme that is known as the Kaonafatso ya Dikgomo (KyD) Scheme, which is aimed at facilitating access of smallholder cattle farmers to the mainstream of the agricultural economy of the country (ARC, 2016).

Through the infrastructural support programme, it is anticipated that smallholder cattle farmers will have access to adequate and functional farm technologies that will further

improve their profitability and their cattle health status. Farmers utilise the infrastructure for dipping and animal handling for various activities including dehorning, vaccination, tagging and branding, training on cattle identification and record keeping.

Figure 3.2: A picture that illustrates a farmer taking his cattle into the dipping tank cattle
Source: Picture taken by author during survey (2017).

Figure 3.2 indicates a farmer in Fetakgomo Municipality taking his cattle/cow into the dipping tank, as the cow will swim into the water mixed with chemical/ dip to try to remove the ticks from the cattle. The dipping tank shown from the figure is part of the Infrastructural facility that is provided by ARC to the smallholder cattle farmers.

3.3 Research design

McMillan and Schumacher (2001) define research design as a plan for selecting subjects, research sites, and data collection procedures to answer the research

question(s) or research hypotheses. They further indicate that the goal of a sound research design is to provide results that are judged to be credible. For Durrheim (2004), research design is a strategic framework for action that serves as a bridge between research questions and the execution, or implementation of the research strategy. In this study, the research design is the impact assessment research design, as this study looks at the profitability amongst the participants and non-participants of the Animal Health Wise Project.

3.3.2 Sampling procedure

A sample of 224 smallholder farmers was used in this study. The study targeted the areas of Fetakgomo and Makhuduthamaga Municipalities. The study employed the Purposive Sampling technique. According to Trochim (2006), Purposive Sampling is one of the methods of non-probability sampling. It is approached with a specific plan in mind and targets a specific sample. The choice of the two Municipalities was to determine a comparison between participants and non-participants of the Animal Health Wise Project on their profitability. The researcher, with the help of extension agents or officers in the Department of Agriculture in Sekhukhune District, identified the beneficiaries or participants of the Animal Health Wise Project in Fetakgomo Municipality and also helped in finding the non-participants or non-beneficiaries of the Animal Health Wise Project in Makhuduthamaga Municipality. The infrastructural facility scheme of the project was only given to Fetakgomo Municipality residents, implying that smallholder cattle farmers in Fetakgomo Municipality had access to the infrastructure than the smallholder cattle farmers in Makhuduthamaga.

The study used a sample of 224 smallholder farmers, a mixture of both beneficiaries (124) and non-beneficiaries (100) of the Animal Health Wise Project. The beneficiaries are more than the non-beneficiaries because it was very easy to get hold of the smallholder cattle farmers that were beneficiaries than non-beneficiaries of the Animal Health Wise Project.

3.3.1 Data collection

The study used primary data, which was collected through interviews. The method that was used to collect information was face-to-face interviews using structured questionnaires designed in order to collect both qualitative and quantitative data. The structured questionnaire was designed to collect information on farmers' socio-economic characteristics, their perceptions on the usage of the participants of the Animal Health Wise Project, to determine the smallholder cattle farmers' profitability and lastly, the effect of the socio-economics characteristics of the farmers on their profitability. The characteristics included: farmers' age, gender, marital status, education level, project participation, access to market, farming experience in years, access to agricultural extension officers and total herd size. Data was collected from a sample of smallholder farmers that were participants of the Animal Health Wise Project and the non-participants from the two municipalities.

3.4 Data analysis techniques and model

Table 3.1 presents the framework data analysis

Table 3.1: Framework Data Analysis

Objectives	Data source	Method of analysis
Identify and describe the socio-economic characteristics of smallholder cattle farmers in the study area.	Primary data	Descriptive statistics
Assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area.	Primary data	Perception Index Score
Determine and analyse the profitability of smallholder cattle farmers in study area.	Primary data	Gross Margin Analysis
Assess the effect of cattle farmers' socio-economic characteristics on their gross margin in study area.	Primary data	Multiple linear Regression Model

3.4.1 Descriptive statistics

Descriptive statistics such as means, standard deviation, and frequencies were used to describe smallholder cattle farmers' socio-economic characteristics.

3.4.2 Perception index score

The perception index score was intended to address the objective on the perception of smallholder cattle farmers on the facilities provided by ARC in the study area. The farmers were asked to respond to seven (7) questions on the infrastructual facilities and their response was then recorded on a five point Likert scale that ranges from strongly agree, agree,uncertain, disagree to strongly disagree, which was scored 5,4,3,2, and 1, respectively (Balschweid, 2002). The statements regarding the ARC facilities were made in this manner:

1. Using the facilities helps to minimise diseases and parasites on the cattle.

2. The facilities have a positive effect on gross margin.

3. The faciliities are easy to use and accessible at all times.

4. The facillities give easy handling of the cattle.

5. The facilities brought a positive impact on cattle production.

6. There should be an improvement on these facilities.

7. Using the facilities gives a higher price when selling.

The study followed Tatlıdil *et al.,* (2008) procedure on getting the perception index score. Where a farmer assigned the maximum rating of 5 to every question, he or she was assumed to have the highest perception on the infrastructural facilities (5 x 7 = 35). On the other hand, if a farmer assigned the minimum rating of 1 to questions, he or she was assumed to have the lowest (negative) perception (1 x 7 = 7). Therefore, the score per each farmer was the addition of the score (responses) divided by the maximum score (35) possible. This score is the perception score per respondent.

3.4.3 Gross Margin Analysis

Gross Margin Analysis is an analytical tool that represents the contribution made by individual farm enterprises to the overhead cost. It also shows the gains or losses that can be expected if the enterprise increased or reduced in size (Sturrock, 1982). Gross margin is an indicator of profitability (Kahan, 2013), as it checks if the enterprise is viable enough to generate income or its production costs are exceeding the total revenue. According to Farm Gross Margin and Enterprise Planning Guide (2013), gross margin is one measure of profitability, which is a useful tool for cash flow planning and determining the relative profitability of farm enterprise. Gross margin further helps in decision-making, as this will alert the farmer if the production is also viable to generate income rather than loss. Studies conducted by Sarma *et al.,* (2014) on economic analysis of beef cattle and gross margin analysis were used to determine the profitably of the beef cattle farmers. Kryaybil and kidoido (2009) conducted a study and used gross margin analysis to calculate the profitability of Ugandan agricultural enterprise. In this study, gross margin analysis was used to address the third objective that is to determine and analyse the profitability of smallholder cattle farmers in the study area. The gross margin in this study was calculated per annum and per household. Gross Margin Analysis was used to determine profitability. According to Jatto (2012), the mathematical notation for gross margin was presented as:

GM = TR – TVC

Where: GM- Gross Margin

TR- Total Revenue

TVC- Total Variable Costs

The total revenue is the total quantity or number that the smallholder cattle farmer is selling multiplied by the price of that quantity, taking into account that prices for cattle differ from breed to breed (i.e. bulls, cows, oxen and calves). In this study, total revenue was accumulated by asking the farmer or respondent questions on the number of cattle

sold in the present year and also the price of the cattle and at the end adding the total revenue of each cattle sold.

Total variable costs are the costs that the farmer incurred in the production. In this study, the total variable costs we accumulated by asking the farmer or respondent questions on the amount spent on vaccination, the amount of money spent on the hired labourer, the amount of money spent on feeds and the amount money spent on transportation of the cattle to the market.

3.4.4 Multiple Linear Regression:

Multiple Linear Regression Analytical Technique is a statistical tool for evaluating the relationship between one or more independent variables X1, X2…Xn to a single continuous variable Y (Onogwu *et al.,* 2017). According to Hutcheson (2011), Multiple Linear Regression Model can best explain the relationship between a continuous dependent variable (Y) and independent variables. Studies conducted by Otieno *et al.,* (2009), and Ijatuyi (2017) have demonstrated the impact of age, gender, marital status, education level, household size and distance on relative profitability of smallholder cattle farming by use of Multiple Regression Model. Therefore, Multiple Linear Regression Model was used to address the fourth objective assessing the effect of cattle farmers' socioeconomic characteristics on their profitability in the study area. The general Multiple Linear Regression Model is presented as:

$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots\ldots \beta_n X_n + U_i$

Y= dependent variable

β_0= Intercept of the model

β_1 to β_n = Regression coefficients

X_1 to X_n = Independent variables

U_i= Error term

The dependent variable is profitability,

The independent variables (X_1 to X_n) are the variables included in table 2 which have been chosen to have an effect on the farmers' gross margin which is the dependent variable. β0 is the intercept of the regression model, β1 measures the change in y with respect to x1, holding other factors fixed/constant. β2 measures the change in y with respect to x2, holding other factors fixed. The same goes for all the other variables. The error term takes into account the variables that were not included in the model.

The SPSS statistical package was used to test the significance of each variable included in the model.

Model specification:

$$Y=\beta_0 + \beta_1 G + \beta_2 A + \beta_3 HS + \beta_4 Aext + \beta_5 TOL + \beta_6 T + \beta_7 TNS + \beta_8 MS + \beta_9 LE + \beta_{10} Educ + \beta_{11} PP + \beta_{12} AC + \beta_{13} AM + Ui$$

Where: Y: Gross Margin, β_1: Gender (G), β_2: Age (A), β_3: Household size (HS), β_4: Access to extension service (Aext), β_5: Type of labourer (TOL) β_6: Training (T), β_7: Total Herd size (THS), β_8: Marital Status (MS), β_9: Level of experience (LE), β_{10}: Educational Level(Educ), β_{11}: Project participation (PP). β_{12}: Access to Credit (AC) and β_{13}: Access to Market (AM),

Table 3.2: Model variables, description and unit of measurement

Variables	Description	Unit of measure
Dependent variable		
Gross margin	Total revenue – Total variable costs	Continuous
Independent variable		
Gender (G)	1 if gender of farmer is male, 0 otherwise	Dummy
Age (A)	Age of the farmer	Continuous
Household size (HS)	The number of members in the household	Number
Access to extension service (Aext)	1 if the farmers get access to extension service, 0 otherwise	Dummy
Educational level of the farmer (Educ)	1 if farmer never went to school, 2 completed primary school, 3 completed secondary, 4 completed tertiary and 5 completed ABET	Categorical
Training (T)	1 if the farmer attended training on animal health, 0 otherwise	Dummy
Type of labourers ()	1 if family members, 0 hired labourers	Dummy
Total herd size (THS)	The total number of cattle that the farmer has	Continuous
Level of experience (LE)	The total number of years the farmer has been practicing agriculture	Continuous
Project participation (PP)	1 if the farmer is a beneficiary ,0 no-beneficiary	Dummy
Marital Status (MS)	1 if the farmer is single, 2 if married, 3 widowed and 4 divorced	Categorical
Access to credit (AC)	1 if the farmers gets access to credit, 0 otherwise	Dummy
Access to market (AM)	1 if the farmers gets access to market, 0 otherwise	Dummy

3. 5 Limitations of the study

Farmers in the study area were scattered, thus it was quite difficult to reach some farmers in areas that had poor roads. Sampling was also very difficult because some farmers were not registered with the Department of Agriculture and Extension officers do not know of their existence. And lastly, older farmers had difficulty remembering the exact costs they incurred in their production and quantities of inputs they purchase. Ethical consideration was needed to fulfil the requirements of the study and the procedure on getting it took a very long time.

3.6 Chapter summary

This chapter showed the study area where the data was collected, the data set and the analytical procedures that were used to analyse the data. The data was analysed using the Gross Margin Analysis to determine profitability of the smallholder cattle farmers. The perception index score was used to check the perception of the farmers' towards using the facilities provided by ARC and the Multiple Linear Regression Model was used to check the effect of farmers' socio-economic characteristics on their gross margin.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

The aim of the study was to examine the impacts of ARC's cattle infrastructural facility scheme on cattle farming productivity and perceptions of smallholder cattle farmers in Fetakgomo Municipality and Makhuduthamaga Municipality, Sekhukhune district of Limpopo Province. This chapter presents and discusses the empirical results found when the data collected was analysed to achieve the set objectives. The sample farmers were divided into two categories that were the beneficiaries of the ARC project and the non-beneficiaries. The total sample comprised 124 beneficiaries and 100 non-beneficiaries making 224 smallholder cattle farmers.

4.2 Socio-economic and demographic characteristics of smallholder cattle farmers:

Table 4.1: Socioeconomic characteristics of smallholder cattle farmers

	Participants (124)				Non-participants (100)			
	Minimum	Maximum	Mean	Std. Deviation	Minimum	Maximum	Mean	Std. Deviation
Age of the farmer	24.00	91.00	58.89	14.55	29.00	86.00	61.63	14.22
Household size	2.00	19.00	6.79	3.11	1.00	12.00	4.46	2.06
Humber of years in cattle husbandry	3.00	61.00	18.54	12.25	3.00	61.00	19.76	12.59
Total herd size	3.00	68.00	13.67	11.99	1.00	20.00	6.90	4.37

According to table 4.1, age of the smallholder cattle farmers had a minimum of 24 years, maximum of 91 years and an average of 58.89 for the participants of the Animal Health Wise Project. Moreover, the non-participants had a minimum number of Age was 29 years, a maximum number of Age was 86 years and an average age was 61.63.

Household size in most rural areas of African countries is mostly the main source of farm labour (Kibirige, 2018). Household size had a minimum of two household members and maximum number of 19 household sizes and an average of 6.79 for the participants. For the non-participants the minimum household size was 1 and maximum was 12 and the average household size was 4.46. however, Ajani & Ashagidigh (2008) stated that a household's contribution to productivity could be said to be based on a personal view of interest as an increase in household size increases expenditure and this decreases farmer's annual income and in their study the minimum household size number was 3.

Total herd size of the farmers for both the participants and non-participants were that: the participants had a minimum number of cattle being 3, a maximum number of cattle being 68 cattle and the average number of the total herd size being 13.67. The non-participants had a minimum number of cattle being 1, a maximum number of cattle being 20 cattle and the average number of the total herd size being 4.37. Bahta *et.al* (2013), in their study they found the similar results of total herd size of a minimum number of cattle being 5 for participants and 1 for non-participants

The number of years in cattle husbandry; revealed that the participants had a minimum number of years in cattle husbandry being 3 years, a maximum number of years in cattle husbandry being 61 years and the average number of years in cattle husbandry being 18.54. The participants had a minimum number of years in cattle husbandry being 3 years, a maximum number of years in cattle husbandry being 61 years and the average number of years in cattle husbandry being 19.76.

Table 4.2: Demographic characteristics of smallholder cattle farmers' in the study area.

Variables	**Frequency**	**Participants**	**non-participants**	**Total average Percentage (%)**
Gender				
Male	153	94	59	68.3%
Female	71	30	41	31.7%
Marital status				
Single	38	23	15	17%
Married	163	88	75	72.8%
Widowed	23	13	10	10.2%
Access to market				
Yes	119	74	45	53%
No	105	50	55	47%
Access to extension service	164	102	62	73.2%
Yes	60	22	38	26.8%
No				

According to table 4.2, majority of the households were headed by males with 68.3 % and the females having 31.7%. Okoedo-Okojie (2015), in their study found similar results that agriculture is dominated by the men, and that support the findings in this study that shows that cattle farming is dominated by man. The results also indicated that a large proportion of the sample were married which was accounted for by 163 smallholder cattle farmers: participants that were married were about 88 cattle farmers and 75 cattle farmers that were non participants were married bringing about a 72.8 % of smallholder cattle farmers that were married in the study area, followed by single farmers that were 17% and lastly widowed farmers were 10.2%. Moreover, Mumba *et.al* (2012) in their study found similar results that majority of farmers were married and

furthermore revealed that there is a positive relationship towards marital status and gross margin. This finding is this study are further supported by those of Omotayo (2011), were most of the cattle farmers (producers) were found to be married

The study further revealed that smallholder cattle farmer that had access to market were 119 and 105 were not having access to market, the 119 farmers that had access to market was accounted by having 74 cattle farmers that were participants of the project and 45 cattle farmer were not participants. The 105 smallholder cattle farmers that had no access to market was accounted by 50 cattle farmer that were participants and 55 smallholder cattle farmer were not participants.

4.2.1 Participants in the project

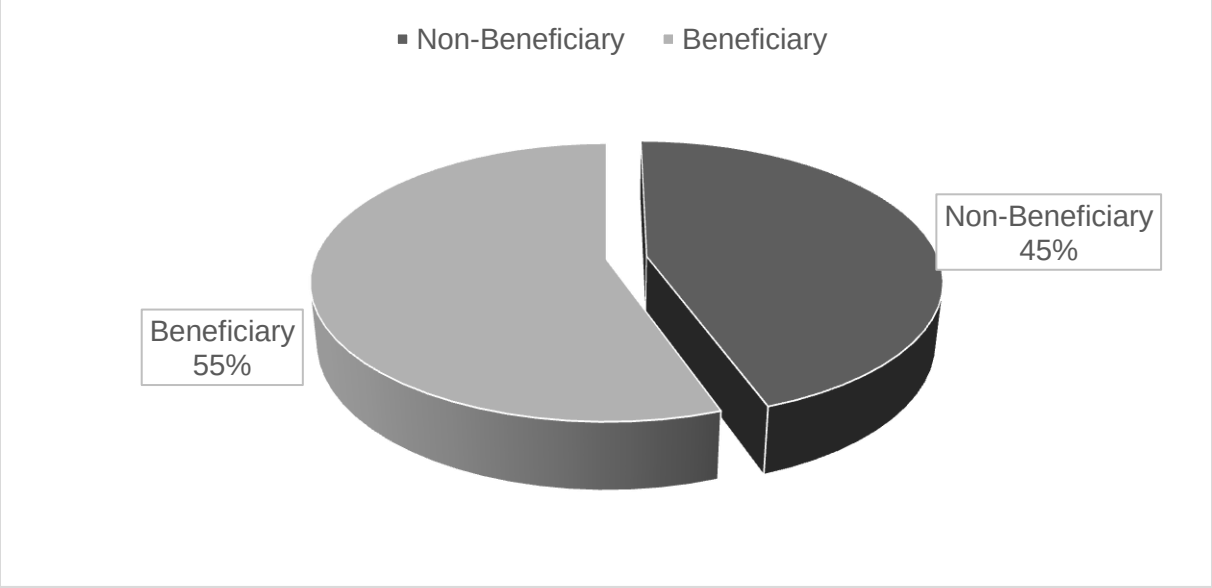

Figure 4.1: Participation in the Animal Health Wise project

Source: From survey data

The results in figure 4.1 has revealed that majority of the smallholder cattle farmers interviewed were beneficiaries of the Animal Health Wise Project with percentage of 55% as for the non-beneficiaries having 45% percentage. Being a beneficiary of the Animal Health Wise Project, smallholder cattle farmers have access to use the infrastructural facility to their best use, the facilities comprise of a crush pen, dipping

tank and handling facilities. Such facilities help the farmers to allow easy handling of the cattle and help to minimise the diseases and parasites, especially the ticks. Non-beneficiaries of the Animal Health Wise Project do not have access to such facilities. In conclusion, being a beneficiary of the project helps the farmers to better their productions and gross margins.

4.2.2 Gender of the farmer

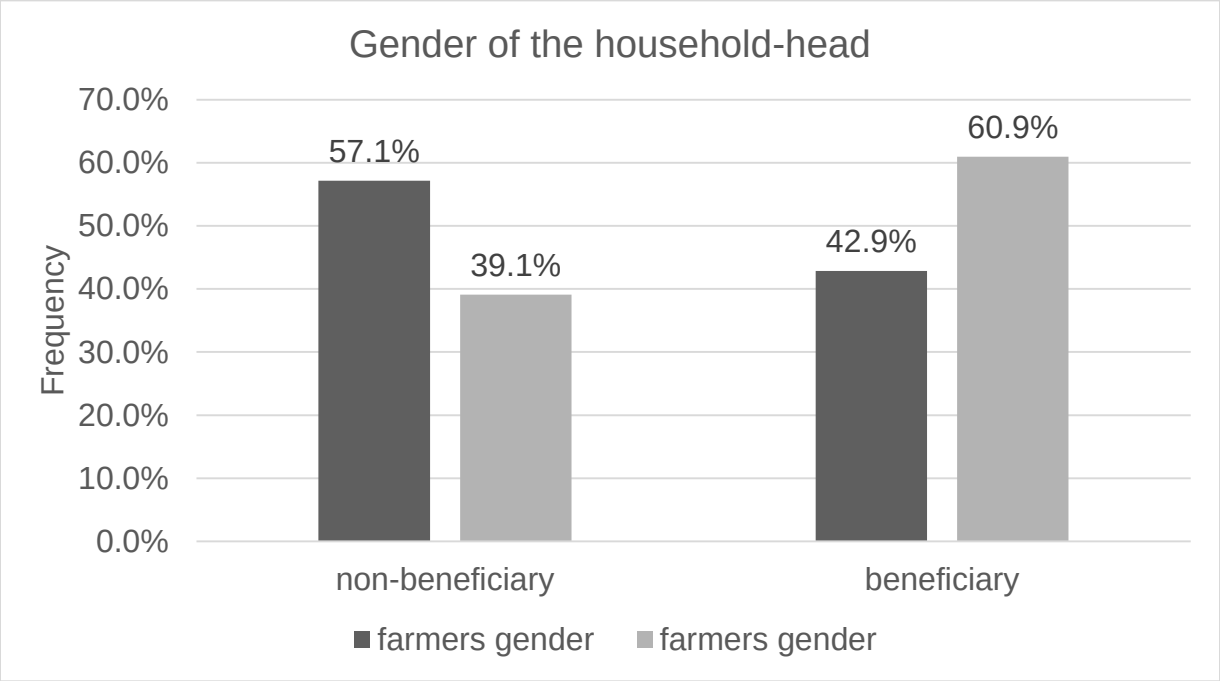

Figure 4.2: Gender of the farmer

Source: From survey data

Figure 4.2 shows the results of the respondents in terms of gender either being a beneficiary and non-beneficiary to the Animal Health Wise Project. There were more female-headed households with (57.1%) being non-beneficiaries, and 42.9% female-headed households being beneficiaries. There were more male-headed households with 60.9% being beneficiaries and 39.1 male-headed households being non-beneficiaries. Majority of farmers practice cattle husbandry or production as their main economic activity due to lack of employment and that there is enough grazing land. The

findings from Ijatuyi *et.al.,* (2017) based on a study conducted in North West Province revealed that they were more males in cattle farming than female participants involved in cattle farming. Phatudi-Mphahlele (2016) found the same corroborating results that showed gore there are more smallholder male farmers that participate in agricultural project than females.

4.2.3 Educational level of the farmer

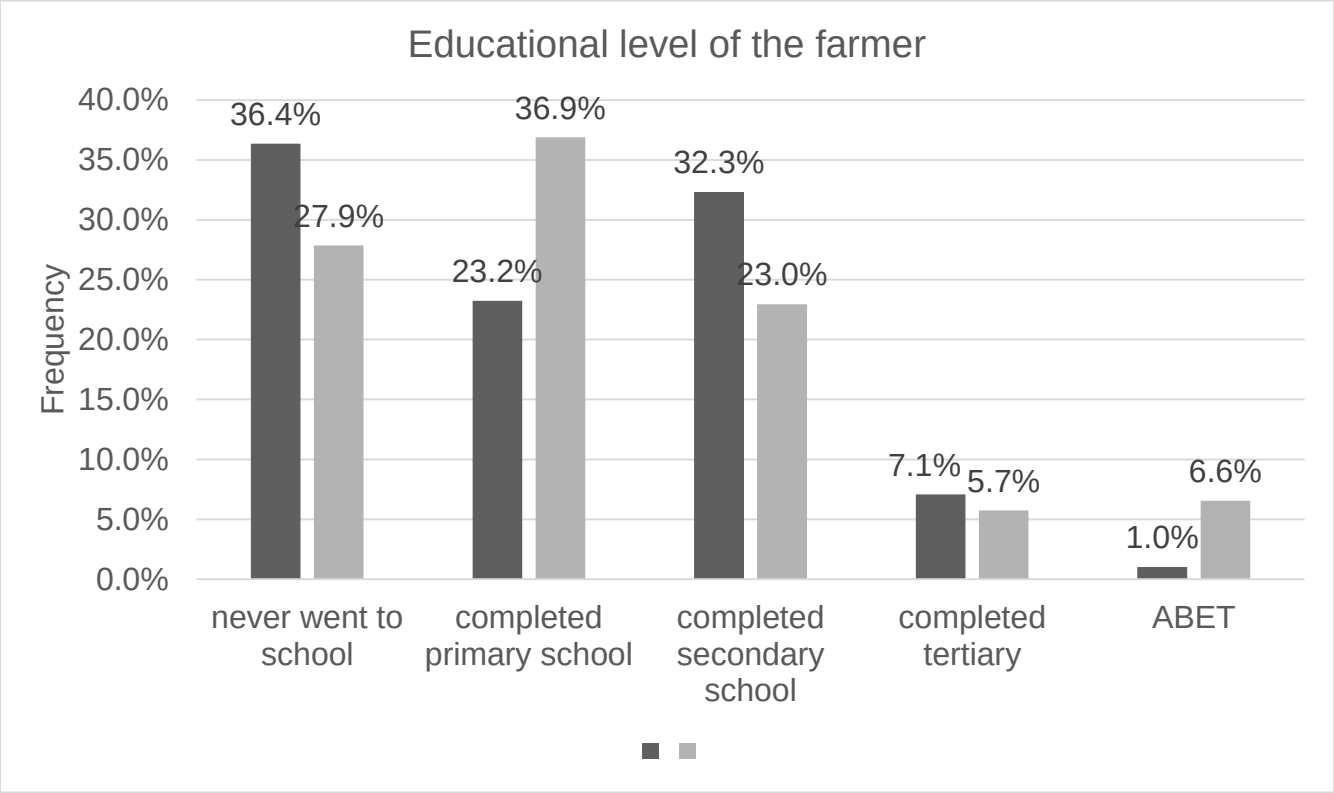

Figure 4.3: Education level of household head

Source: From survey data

Figure 4.3 shows that on average, the beneficiaries of the project majority of them have went to school as 36.9% of them have completed primary school, 23% have completed secondary school, 5.7% of them have completed tertiary and 6.6% of them have attended ABET school and 27.9% have never went to school. For the non-beneficiary, majority of the farmers have never gone to school with a percentage of 36.4%, 23.3% of the farmers have completed primary school, 32.3% have completed secondary school, 7.1% have completed tertiary and 1% of them have attended ABET school. Land Bank

of South Africa (2000), states that farmers who have completed primary are regarded as literate enough to make decisions about production and the requirement of agriculture. However, Cutrufelli (1983) disagrees with that statement and argues that education has negative effects on agriculture as it offers an alternative type of living away from agriculture. It is generally acknowledged that agriculture education and training are of vital importance in promoting sustainable agricultural production, rural development, as well as ensuring household food security. However, Beard (2005), who stated that the better educated a household head, the more likely they are to participate in projects and also supporting the importance of education in investments projects which supports the statement by Land Bank of South Africa. Therefore in this findings are further supported by those of Luvhengo et al. (2015) which their found out that farmers which completed primary are expected to be resource-use efficient compared to the other group of farmers with no education.

4.2.4 Access to extension

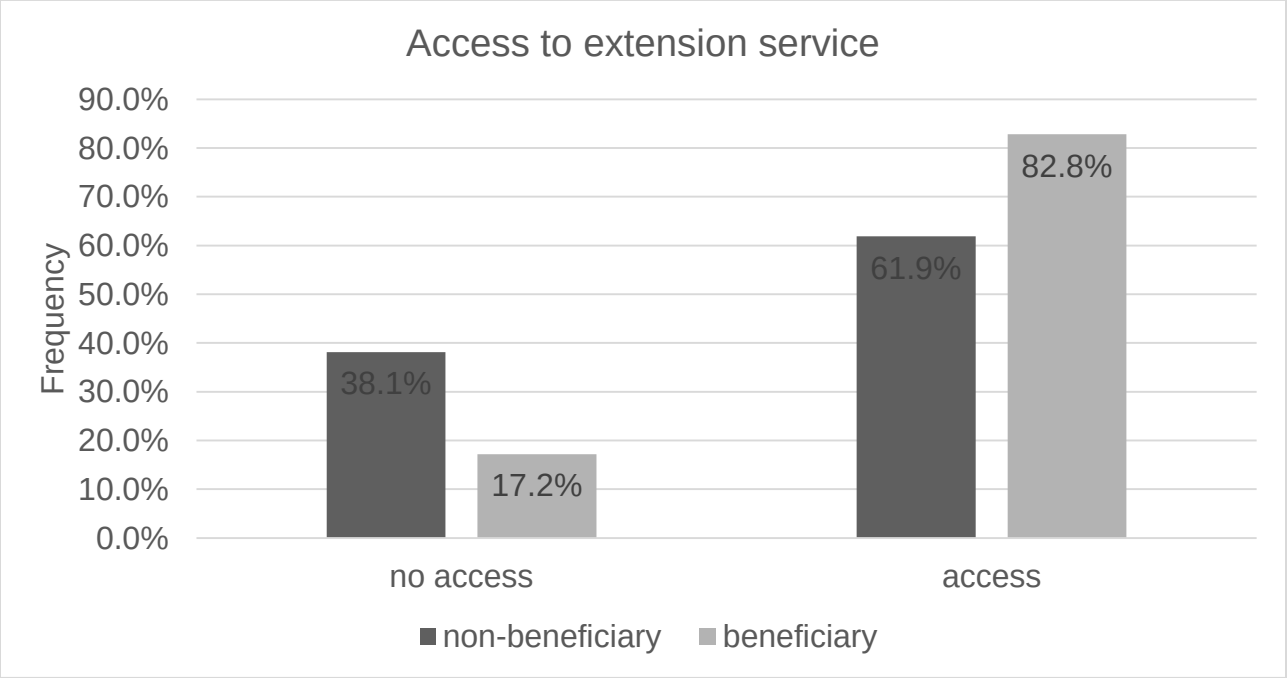

Figure 4.4: Access to extension services

Source: From survey data

The results on figure 4.4 revealed that the majority of the beneficiaries had access to extension service, although beneficiary farmers seemed to have better access than non-beneficiary farmers did. Beneficiaries had 82.8% of access to extension services with 17.2% of the smallholder cattle farmers not having access at all whereas the non-beneficiaries that had access to extension services were 61.9% and 38.1% did not have access to extension services. The ARC project provided beef production advisory services to farmers in addition to infrastructural services. In a study conducted by Enki *et.al* (2001) they revealed that having access to extension service is an important factor as farmers can have access to information and advice towards their farming.

4.2.5 Type of labour

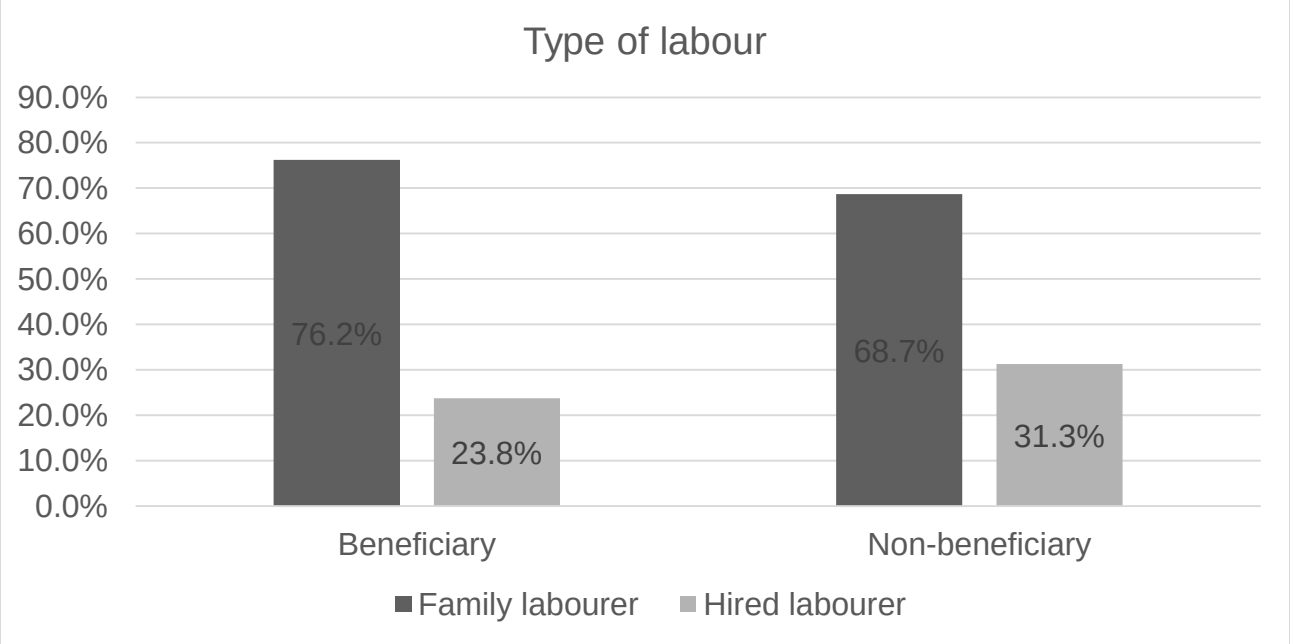

Figure 4.5: Type of Labour

Source: From survey data

The results in figure 4.5 revealed that majority of the smallholder cattle farmers prefer using family labour or household labour in their cattle farming. As the results depict,

beneficiaries of the Animal Health Wise Project have 76.2% of family labour and 23.8% of hired labourer for beneficiaries whereas for the non-beneficiaries is 68.7% of family labour and 31.3% of hired labourer. Smallholder cattle farmers in the study area mainly used family members as labourers to minimise the costs of labour. According to Gebremedin and Jaleta (2010), findings revealed that when a famer uses household labour for the production, that means cost of production will be reduced and as to that gross margin will increase.

4.2.6 Perception Index Score

The perception index score was used to assess the perception of the smallholder cattle farmers on the usage of the ARC's infrastructural facility scheme. A set of 7 questions were asked to know how the smallholder cattle farmers would rate the infrastructural facility. And farmers' responses were recorded on a five point Likert scale that ranges from strongly agree, agree,uncertain, disagree to strongly disagree, which was scored 5,4,3,2, and 1 respectively (Balschweid, 2002). The relevance of the perception index score was to capture the likely perception of the farmers using the infrastructural facilities, whether they had perceived negatively or postively towards the infrastructure which was shown by the skewness. It only applies to the project beneficiaries because the infrastructure was only made available in the Fetakgomo municipality whereas in Makhuduthamaga Municipality it was not made available. The study therefore followed Tatlıdil *et.al.,* (2008) procedure on getting the perception index score of which a farmer assigned the maximum rating of 5 to every question, he or she was assumed to have the highest perception on the infrastructural facilities (5 x 7 = 35) On the other hand, if a farmer assigned the minimum rating of 1 to questions, he or she was assumed to have the lowest (negative) perception (1 x 7 = 7). Therefore, the score per each farmer was the addition of the score (responses) divided by the maximum score (35) possible. This score is the perception score per respondent.

Table 4.3: Perception Index Score

Perception Index Score	
Mean	0.6918
Std. Deviation	0.16076
Skewness	-0.428
Std. Error of Skewness	0.217
Kurtosis	-0.057
Std. Error of Kurtosis	0.431
Minimum	0.30
Maximum	1.00

Table 4.3 shows the average results of the smallholder cattle farmers' perception towards using the ARC's cattle infrastructural facility scheme in Fetakgomo Municipality. With the mean value of 0.6918, maximum value of 1, minimum value of 0.3 and lastly with skewness value of -0.428. Implying that the perception index score of the smallholder cattle farmers was negatively skewed to the left. This implies that smallholder cattle farmers on average have a negative perception towards using the ARC cattle infrastructural facility. For the maximum being 1, this was as a result of farmers' responses being strongly agree on all the questions thus the perception index score was 1 and for the minimum the farmers' responses were 1 to all the question thus 0.3 being the minimum. Assefa, van den Berg and Conlong (2008) in their study, they revealed that perception of farmers could act as a constraint to production. Therefore, in this study it was revealed that smallholder cattle farmers had a negative perception towards using the project. According to the table 4.1, it revealed smallholder cattle farmers in Fetakgomo had an average age of 59 years as to that there was a larger proportion of older farmers. Implying that older farmers are mostly likely to not adopt new technologies since they are used to the old technologies and still believe that the old technologies are best than the new technologies. Moreover, the smallholder farmers had an average of 19 years in cattle husbandry, implying that they are used to the traditional way of cattle production and health wise issues, thus the negative perception towards using the ARC infrastructural facilities. From figure 4.3: there was 27.9% of the

beneficiaries that never went to school, thus actually resulting in the perception of farmers being skewed to the left (negative). Because from the study conducted by Luvhengo et al (2015) revealed that farmers that never went to school are not resource efficient compared to farmers that went to school and that affects their decision-making.

4.2.7 Average Gross Margin of the smallholder cattle farmers'

Table 4.4: Average Gross Margin of smallholder cattle farmers

Measure	Total Revenue		Total Costs		Gross Margins	
	Participants	Non-participants	Participants	Non-participants	Participants	Non-participants
Mean	9126.03	6283.0	3776.86	5061.82	5482.44	845.09
Std. Deviation	7783.82	3301.57003	3886.0	3802.97	6309.01	4101.46
Skewness	0.810	0.276	2.057	-0.14	0.15	0.55
Std. Error of Skewness	0.22	0.24	0.22	0.24	0.22	0.24
Kurtosis	0.52	1.02	4.62	1.28	-1.09	-0.64
Std. Error of Kurtosis	0.43	0.48	0.43	0.48	0.43	0.48
Minimum	0	0	120	5061.82	-6950.0	-6200
Maximum	34000	15000.0	19740.0	6283.0	18750.0	10600

Table 4.4 shows the total average Gross margin of the beneficiaries and non-beneficiaries of the ARC infrastructural facility. For the profitability of the smallholder cattle farmers, the gross margin is equal to total revenue minus the total variable costs.

The beneficiaries (participants) of the Animal Health Wise Project had a total variable cost mean of R3776.86, a total revenue mean of R9126.03 and also a gross margin mean of R5482.44. The maximum total variable cost was R19740, maximum gross margin of R18750, maximum total revenue of R34 000 and the minimum values of R0, smallholder cattle farmers' households that had a minimum total revenue of R0 was as a results of cattle farmers not selling their cattle either that the cattle were still small and they would not bring the desired revenue or income that farmer wanted. The non-beneficiaries (non-participants) group had a total revenue mean of R6283.0, Gross Margin mean of R845.09 and also a total variable cost mean of R5061.82. The same group had a maximum total variable cost of R6283.0, maximum gross margin of R10600, maximum total revenue of R15000 and the minimum values 0, R5061.81 and -R6200 gross margins.

The results show that non participants tended to incur a lot of cost compared to the beneficiaries as the results show that the mean value of the total variable costs of non-participants is larger than the mean value of the beneficiaries' total variable costs implying that the non-participants tend to incur more variable costs than the participants, as they have access to the infrastructural facilities and they contribute to buying variable inputs together as to that their costs are minimal than compared to the non-participants.

The mean value of the total revenue for the beneficiaries is bigger than the non-participants and also the mean value of the gross margin of the beneficiaries is bigger than the non-participants mean value of the gross margin. This could be because beneficiaries tend to sell their cattle at a higher price compared to the non-participants and as a result, the selling prices for cattle in two municipalities are different thus making farmers from Fetakgomo Municipality to gain higher total revenue than the smallholder cattle farmers at Makhuduthamaga Municipality. A possible reason for higher revenues for beneficiaries could be that the smallholder cattle farmers that are actually beneficiaries tend to use the infrastructure and through that, their cattle productivity improved resulting in higher prices and total revenue than compared to the non-participates.

In conclusion, the results show that beneficiaries realise much larger gross margin relative to non-beneficiaries. This could be because they use the infrastructural facility scheme to the best, their cattle production increase as this facilities helps to minimise diseases and parasites on their cattle thus their gross margin is better than that of the non-beneficiaries.

4.3 Empirical results

To assess the impact of ARC infrastructural facilities on profitability of cattle farming, a Multiple Linear Regressions was run with the gross margin as a dependent variable. Results from the Multiple Linear Regression indicated that three out of eleven independent variables included in the model considered when running the regression have significant effect on the gross margins of cattle production at household level. These variables are significant at 1% and 5% significant level.

4.3.1 Multiple Linear Regression results

According to table 4.5, the model has an F-value of 13.103. The coefficient of determination (R^2) was 0.622, meaning that approximately 62.2% of variability of the dependent variable (Gross Margin) was accounted for by the explanatory variables in the model. Gujarati (2004) states that, in determining model adequacy, we look at some broad features of the results, such as the R^2 value and *F*-value, which were both statistically significant in this study

Table 4.5: Multiple Linear Regression results

Variables	B	Std. Error	T-ratio	Sig
(Constant)	-4649.37	1985.031	-2.342	0.020
Age of the farmer	14.25	20.699	0.689	0.492
Gender	593.66	538.948	1.102	0.272
Household size	-3.39	98.303	-0.035	0.973
Level of experience in cattle husbandry	24.77	22.152	1.118	0.265
Participate in the project	2546.58	616.242	4.132	0.000*
Total herd size	80.16	29.362	2.730	0.007*
Type of labour	13.55	592.353	0.023	0.982
Access to extension services	479.27	619.357	0.774	0.440
Access to market	7808.76	527.964	14.790	0.000*
Marital status of the farmer	-470.60	488.34	-0.96	0.336
Education level	142.97	281.076	0.509	0.612

Dependent variable: Gross Margin R^2= 64.20 Adjusted R^2= 62.2 F = 13.103

Significant level: 1% = * and 5% = **

4.3.2 Discussion of results

Total herd size:

Total herd size of the farmer was significant at 1% significant level and has a positive effect on the level of gross margin of the farmer. This means that the relationship between the total herd size and the gross margin of the farmer is positive. The implication of this is that gross margin of the smallholder cattle farmer will increase with an increase in the total herd size, total herd size has a coefficient of 80.16 meaning that

one-unit increase in the number of cattle to the farmers' herd size thus would result in an increase in the level of gross margin by 80.16. Weber (2010), found similar results of herd size having a positive impact on gross margin, implying that farmers with higher herd size tend to enjoy higher contributions of gross margin in their cow operations. Bahta *et.al.,* (2013), also found similar corroborating results of total herd size towards the gross margin of the smallholder cattle farmers in Botswana. This implies that farmers who own large cattle herds are more efficient in terms of profit, suggesting economies of scale and also that they implement sound management practices that helps them to reduce calf losses and cattle mortality.

Project participation:

Participating in a project was significant at 1% significant level with a positive effect on the level of gross margin of the farmer. This means that the relationship between the project participation and the gross margin of the smallholder cattle farmer is positive. The implication of this is that gross margin of the cattle farmer will increase if the farmer is participating in the project (Animal Health Wise Project). Project participation had a coefficient of 2546.58, meaning that the level of gross margin of the smallholder cattle farmer would increase by 2546.58 units when the farmer takes part in the project and other variables being constant. Farmers that participate in the project stand a better chance of their gross margin being better than those that do not participate in the project at all. Implying that smallholder cattle farmers that use the ARC infrastructural facility scheme or participate in the Animal health wise project, stand a better chance of the cattle having to be bought at a higher price than the non-participants mainly because smallholder farmers cattle that have access to the ARC infrastructural facility scheme their cattle is being treated well to remove the ticks and thus their production in better than those that do not have access to the facility at all.

Access to market:

Access to market was significant at 1% significant level and has a positive effect on the level of gross margin of the farmer. This means that the relationship between the access to market by the smallholder cattle farmer and the gross margin of the farmer is

positive. The implication of this is that gross margin of the cattle farmer will increase with an increase in accessibility to market. Market access had a coefficient of 7808.76, implying that gross margin of the farmer will increase by 7808.76 units when the farmer has access to the market. The gross margin of the farmer will increase if the farmer has access to the market, as to that total the farmers gets to sell his/her cattle. Smallholder cattle farmer in the study are of Fetakgomo Municipality they normally sell their cattle to their villages, as to that they reduce the so many cost associated when a farmer takes their cattle's to a far market. Furthermore, Bahta *et.al.,* (2013) report that when farmers sell their animals near to their villages, they prefer to sell to individuals (other farmers, consumers) as price is agreed by mutual negotiation and payment is immediate and in cash.

4.4 Chapter Summary

The chapter indicated the socio-economic results from the study. The chapter further presented the gross margins of the smallholder cattle farmers in the two municipalities which were beneficiaries and the non-beneficiaries gross margins. The regression results of the factors affecting the smallholder cattle farmers' profitability and lastly, the perceptions of the smallholder cattle farmers that were using the infrastructural facilities provided by ARC in Fetakgomo only which Makhuduthamaga Municipality was used as a control group because they had no facilities there.

CHAPTER FIVE

SUMMARY, CONCLUSION AND POLICY RECOMMENDATIONS

5.1 Introduction

This chapter summaries the study, indicating the conclusions drawn from the results of the study. This chapter further discusses the policy recommendation that would be suitable for the smallholder cattle farmers in Fetakgomo Municipality and also the smallholder cattle farmers in Makhuduthamaga to enhance their production and Profitability. Moreover, also helping the Agricultural Research Council to make more informed decision on revamping old Cattle Infrastructural Facilities in other Municipalities and Provinces. Sections included in this chapter are; section 5.2 summary of the study, section 5.3 conclusions of the study and section 5.4 policy recommendations.

5.2 Summary of findings

The aim of the study is to analyse the profitability and perception of smallholder cattle farmers using ARC's cattle infrastructural facility scheme in the study area. The study had four objectives and they were to Identify and describe the socio-economic characteristics of smallholder cattle farmers in Fetakgomo Municipality, to assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area, to determine and analyse the profitability of smallholder cattle farmers in study area and lastly, to assess the effect of cattle farmers' socio-economic characteristics on the gross margin in the study area.

There were different analytical techniques that were being employed to address each objective. The first objective which was to identify and describe the socioeconomic characteristics of smallholder cattle farmers in the study was addressed by using the descriptive statistics. The perception index score was used to address the second objective which was to assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area. Gross margin was used to address the third objective which was to determine and analyse the profitability of smallholder cattle

farmers in the study area. The last objective which was to assess the effect of cattle farmers' socioeconomic characteristics on the gross margin in the study area was addressed using the Multiple Linear Regression Model.

The study was conducted in two Municipalities, one Municipality which was Fetakgomo Municipality and the other being Makhuduthamaga Municipality. Fetakgomo Municipality was the Municipality were the ARC's cattle infrastructural facilities scheme was and the smallholder cattle farmers residing in the municipality had full access to it. Makhuduthamaga Municipality was chosen on the basis that they do not have the infrastructural facilities and also to check the comparison of their gross margin compared to the farmers that have access to the facility scheme. 224 smallholder cattle farmers were purposively in Fetakgomo Municipality and Makhuduthamaga Municipality, were by 124 were participants and 100 were no-participants. Therefore, in total comprising of 224 smallholder cattle farmers.

The socio-economic characteristics analysis results revealed that there were more female headed household with (57.1%) being non beneficiaries, and 42.9% female-headed household being beneficiaries and also that there were more male-headed households with 60.9% being beneficiaries and 39.1% male-headed households being non-beneficiaries. The results also indicated that large proportion of the sample were married (72.8%), followed by single farmers that were 17% and lastly, widowed farmers were 10.2%. Lastly, the socio-economic characteristics showed that majority of the smallholder cattle farmers prefer using family labourer or household labourer in their cattle farming. As the results depicts that beneficiaries of the animal health wise project have 76.2% of family labour and 23.8% of hired labourer for beneficiaries where else for the non-beneficiaries is 68.7% of family labour and 31.3% of hired labourer. Smallholder cattle farmers in the study area mainly used family members as labourers so as to minimise costs of labour.

The perception index score was used to assess the perception of smallholder cattle farmers on the facilities provided by ARC in the study area. The results indicated that the mean value or average value of the smallholder cattle farmers' perception on the facilities provided by ARC was 0.7, with a minimum value of 0.3 implying that at the

minimum it is the negative perception and a maximum value of 1 was the positive perception. The results revealed that the smallholder cattle farmers had a negative perception towards the project as the skewness value of the perception index score showed that its skewed to the left with the value being -0.428.

The gross margin analysis was used to determine and analyse the profitability of smallholder cattle farmers in the study area. For the profitability of the smallholder cattle farmers, the gross margin is equal to total revenue minus the total variable costs. The results were discovered and the study indicated that the beneficiaries had a total variable cost mean of 3776.86, a total revenue mean of 9126.03 and also a gross margin mean of 5482.4363 where else the non-beneficiaries had a total revenue mean of R6283.0, Gross Margin mean of R845.09 and also a total variable cost mean of R5061.82.

The mean value of the total revenue for the beneficiaries is bigger than the non-participants and also the mean value of the gross margin of the beneficiaries is bigger than the non-participants mean value of the gross margin, implying that the beneficiaries tend to sell their cattle at a higher price than compared to the non-participants as to that their total revenue being higher, reason being that the smallholder cattle farmers that are actually beneficiaries tend to use the infrastructure and through that their cattle productivity improved resulting in higher gross margin and total revenue than compared to the non-participates. In conclusion, is that beneficiaries realise much larger gross margin relative to non-beneficiaries because they use the infrastructural facility scheme to the best, as to that there cattle production increase as this facilities helps to minimise diseases and parasites on their cattle thus also their gross margin is better than that of the non-beneficiaries.

The Multiple Linear Regression Model was used to assess the effect of cattle farmers' socio-economic characteristic on the gross margin of the farmers in the study area. The results revealed that only 3 variables were significant. The total herd size was significant at 1% and had a positive effect towards the gross margin. The project participation was significant also at 1% and had a positive effect towards the gross margin and access to market was also significant at 1% and had a positive effect towards the gross margin. This means a marginal increase in these three significant variable they will be marginal

positive change on the level of gross margin of the smallholder cattle farmers. Other variables which were age of the farmer, gender, level of experience, type of labourer, access to extension and educational level of the farmer were insignificant but they had a positive relationship towards the gross margin. Such variables like the household size and the marital status of the farmer were also insignificant and their relationship towards the gross margin was negative.

5.3 Conclusion

The study had two hypotheses. The first hypothesis was; socioeconomic characteristics do not have a significant effect on the gross margin of the smallholder cattle farmers in Fetakgomo Municipality. The second hypothesis was; the perception of the smallholder cattle farmers does not have a significant effect on the usage of the infrastructural facility in Fetakgomo Municipality.

Hypothesis one: Socioeconomic characteristics do not have a significant effect on the gross margin of the smallholder cattle farmers in the study area. The hypothesis was therefore rejected since the Multiple Linear Regression Model revealed results that show that three (3) of the socioeconomic characteristics tend to affect the gross margin of the smallholder cattle farmers and the variables were namely; total herd size, access to market and project participation. All the variables had a positive effect towards the Gross Margin. Farmers' gender, age of the farmer, household size, marital status of the farmer, educational level, access to extension, level of experience in cattle husbandry and type of labourer were statistically not significant.

Hypothesis 2: The perception of the smallholder cattle farmers does not have a significant effect on the usage of the infrastructural facility in Fetakgomo Municipality. The hypothesis was rejected because the results from the perception index score showed that on average the perception is skewed to the left. Implying that the perception of the smallholder cattle farmers does have a significant relationship or effect towards the usage of the infrastructural facility scheme. And the results have shown, farmers have negative perception towards using the infrastructural facility. This was because of

certain socio-economic characteristics (age, educational level) that often lead to farmers' negative perception.

5.4 Policy Recommendations

- The study recommends that they should be more training based on the use of the cattle infrastructural facilities scheme so that farmers can use the facilities however they want.
- The study recommends that farmers should be provided with the market infrastructure and also the marketing information services. This will help the farmers in a way that the transaction cost will be minimised and farmers will not incur more cost when they participate in the markets, because they market facilities such as auctions are far from the farmers so that they tend to incur more costs.
- Government should subsidise smallholder farmers with inputs such as feeds and vaccinations so that they can produce high quality outputs. Policies on comprehensive producer support should be effectively implemented.

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Appendices:

Annexure A: Questionnaire

Questionnaire no:

School of Agriculture and Environmental Sciences

Department of Agricultural Economics and Animal Production

Gross Margin Analysis and Perception of Smallholder Cattle Farmers on the usage of ARC's Cattle Infrastructural Facility Scheme in Fetakgomo Municipality, Sekhukhune District of Limpopo Province.

This questionnaire is to be completed by the farmers with the help of the enumerators. The questionnaire is designed to collect information on behave of the non-beneficiaries of the ARC's cattle Infrastructural Facility on their gross margin in Makhuduthamaga Municipality, Sekhukhune District of Limpopo Province.

I guarantee your anonymity.

Name of the Enumerator: ……..

Name of the Municipality: ……..

Community name: ……

Section A: Demographic information

1. Gender of the farmer?

Male	1
Female	0

2. Age of the farmer? ……..……
3. How many members are there in the household (within 6 months)? ……..…..
4. Marital status:

1	2	3	4
Single	Married	Widowed	Divorced

5. Level of education?

1	2	3	4	5
Never went to school	Completed primary school	Completed secondary school	Completed tertiary	ABET (adult school)

6. How many years have you been into cattle farming? …….....
7. Are you a member of any association?

Yes	1
No	0

If yes, what is the association? ……

8. And what support do you receive from the association?

……

……

……

9. Do you participate in the Animal Health Wise Project?

Beneficiary	1
Non- beneficiary	0

Section B: Farm information

10. What is your cattle herd size? ……...
11. What type of labour do you use for cattle farming?

Family members	1
Hired labours	0

Section C: Members of the project

12. What kind of facilities are there in your area? (please tick all the available facilities in the area)

Facility	Tick all applicable	Working condition 1. Functional 2. Non-functional
Crush pen		
Dipping tank		
Handling facilities		
Other (specify)		

13. Are the facilities accessible at all times?

Yes	1
No	0

If not, why do you not access them when needed?

……

……

……..…….

14. Are these facilities brining any change to you?

Yes	1
No	0

15. If yes, how?

.....

.....

.....

16. Having these facilities in your area, would you say they contribute towards increased production?

Yes	1
no	0

17. What are the associated problems that you encounter regarding the use of the facilities?

I. ……..

II. ……..

III. ……

Section D: external support information

18. Do you have access to extension services regarding cattle farming?

Yes	1
No	0

19. If yes, what type of services do you receive?
20. ……

    ……
21. In a period of a month, how many times do the extension officials come and visit?

    ……
22. Do you receive any training on animal health?

Yes	1
No	0

If yes, from who do you receive this training?

……

23. Specify the type of training you receive.

    ……

    ……..……

    ……
24. In what way is the training useful to you?

    ……

    ……

    ……
25. Do you have access to credit facilities?

Yes	1
No	0

If yes, from who?

……

Type of credit facilities	Tick all applicable
Banks	
Micro-loans	
Stokvels	
Other (specify)	

26. Do you receive any inputs/support from the government for the cattle farming?

Yes	1
No	0

27. What kind of inputs/support do you receive from the government?

……

……

……

Section F: Cost and Benefits

28. Do you have access to the market?

Yes	1
no	0

29. If yes, where do you sell your cattle?

1	2	3	4	6
Auction pen	Middleman	Wholesalers	Other farmers	Other (please specify) ……..

30. What is the distance to the nearest market? ……..……..

31. What 3 main problems do you encounter regarding marketing your cattle?

I. ……..

II. …….

III. …….

Cattle owned	=n			
	Bulls	Cows	Oxen	Calves
2015				
2018				
Died in recent year				
Calves born in recent year				
No. slaughtered				
No. sold (2018)				
Selling price				
Sales				

32. How much do you spend on the following for cattle?

Costs for :	The specified amount in Rands:
Vaccination/medicine	
Water	
Feed	
Hired labourers	
Transport to market	

Section G: Smallholder cattle farmers' perception on the infrastructure facilities

	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
	5	4	3	2	1
a) Using these facilities helps to minimise disease and parasites on the cattle					
b) The facilities have a positive effect on gross margin					
c) The facilities are easy to use and accessible at all times.					
d) The facilities allow easy handling of cattle					
e) The facilities brought a positive impact on cattle production					
f) There should be an improvement on these facilities					
g) Because of these facilities, would you say the cattle get a higher price when selling					

<<<<<<<<<<<<<<<<<<< THE END OF QUESTIONNAIRE >>>>>>>>>>>>>>>>>>>