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Role of Extension Services on Livestock Investment Decisions by Smallholder Farmers in Mbulu and Bariadi Districts, Tanzania

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ABSTRACT

Provision of extension services to livestock farmers ranks high on government's agricultural development agenda in Tanzania. Livestock Extension Services (LESs) are usually designed around productivity improvements to farmers and the sector at large. The purpose of this study was to assess the role of LESs on the choices of smallholder farmers commitment of resources for future expectation of returns on useful domesticated animals (Livestock Investment Decisions - LIDe) in Mbulu and Bariadi Districts. A cross sectional research design was applied to survey 333 households randomly selected among smallholder farmers. A probit regression model was employed to investigate the role of extension service attributes on LIDe by smallholder. Results suggest that market linkages, access to information, technology transfer, access to training, technical advises and competence of livestock technical staff have a positive significant effect to LIDe. Group membership and access to livestock facilities appeared to have negative influence. The study concludes that, the more access and participation in extension service packages by the smallholder farmers, the higher the contribution of the extension services on LIDe. It is recommended that, follow-up visits to farmers after joining new markets or channels is important so that sustainability of the livestock returns to farmers is sustained.

Key words: Livestock Extension Services (LES); Livestock Investment Decisions (LIDe); Smallholder farmers;

Extension services are responsible for serving more than one billion small-scale farmers in the world (Singh *et al.*, 2016). The improvement of agricultural sciences and technology has brought about dramatic changes in the livestock sector in particular through improvement of animal health, breeding procedure and processes of animal products (Kavithaa *et al.*, 2014; Patel *et al.*, 2014; Davis *et al.*, 2010) and improve lives of smallholder farmers in the rural areas (Wambura *et al.*, 2012). This has led to the increased need and opportunity for investigating the effectiveness and the contribution of extension services in various parts of the world. Also, this situation has stimulated the need for new approaches to promote the transition of new innovations into concrete benefits to poor farmers in developing countries (Hellin, 2012). East Africa is

among the places with the largest extension system, others include South Africa, Ethiopia and Nigeria (FAO, 2015). Studies however have indicated that the livestock sector in this part of Africa has not shown significant improvement in production and significant increase of livestock enterprises in rural areas (Kasie *et al.*, 2012; Kyaruzi *et al.*, 2010; Wambura *et al.*, 2012).

Researchers in livestock development has documented that Tanzania has still no substantial improvements in the livestock production amongst smallholder farmers despite extension decentralization efforts made to ensure that services are available to many farmers (Kyaruzi, *et al.*, 2010). Tanzania suffers from low livestock productivity due to a number of factors including inadequate extension system leading to ineffective dissemination of technologies, poor market

linkages, weak links between research and extension, and inadequate government support through the Ministry of Agriculture and Food Security (*Churi, et al., 2012; Mvuna, 2010; Wambura et al., 2012*). Additionally, poor organizational structure, poor administrative and institutional structure, lack of clientele involvement in the planning process, and untimely provision of extension services are said to be other issues affecting efficiency of the extension services in the country (*Rutatora and Mattee, 2001; Swanson and Samy, 2003*). Researches has been conducted to address these issues (*Abdullah and Samah, 2013; Anderson, et al., 2006; Qamar, 2005; Rutatora and Mattee, 2001*), but there is insufficient research on the role of extension services to the clients (farmers) with regards to livestock investment decisions. In their studies, *Okwoche et al. (2012)* and *Swanson (2006)* pointed out that the Farmer Advisory Committees (FACs) for example as part of extension services, have been successfully used to ensure full stakeholder involvement in program planning and to increase farmers' accountability specifically in the rural areas in Nigeria. The objective of this paper therefore, is to assess the role of extension services toward livestock investment decisions amongst smallholder farmers in Mbulu and Bariadi Districts.

Extension Services and Livestock Investment Decisions : Livestock investment and hence development of the sector is an integral part of the economic development (*Boz & Ozcatalbas, 2010*). The choices by smallholder farmers to commit resources in useful domesticated animals in expectation of future returns (Livestock Investment Decisions- LIDe) depends much on new trends both in the markets but also on the current technologies on the farming systems (*Hartwich and Scheidegger, 2010*). Governments, the private sector and livestock farmers play key role in bringing about these profitable change. The private sector often has an important role in the development of such activities however, implementation of policy guidelines are the responsibility of governments (*Bowers & Lane, 2008*). Farmers' reaction towards adoption of new livestock technologies mainly depends on economic incentives of this sector. Farmers, small scale as well as large scale react positively and quickly to attractive prices for their live animals and animal products such as milk, oils, skins and hides. However, they cannot respond appropriately and quickly unless they clearly understand the most recent technology environments in

which they operate (*Butler, Grice, & Reed, 2006*). To facilitate such understanding, most livestock farmers need continuously updated advice for increasing their livestock investment decisions and hence increased production. It is utmost necessary to increase the livestock production by using modern technologies in order to meet growing demands, rapid increase in population and to earn domestic and foreign exchange through the investments that are made (*McCown, 2002*).

On the other hand livestock extension services has been referred to the entire set of organizations that support and facilitate people engaged in livestock production to solve problems and to obtain information, skills, and technologies to improve livelihoods and well-being (*McCullough, 2015*). This can include different governmental agencies (formerly the main actors in extension), non- governmental organizations (NGOs), producer organizations and other farmer organizations, and private sector actors including input suppliers, purchasers of livestock products, training organizations, and media groups (*Neuchatel Group, 2009*). There are many definitions, philosophies, and approaches to livestock extension, and the views of what extension is all about have changed over time (*Birner, et al., 2006*).

Extension originally was conceived as a service to extend research-based knowledge to the rural sector to improve the lives of farmers. It thus included components of technology transfer, broader rural development goals, management skills, and non-formal education (*Koch and Terblanche, 2013*). The traditional view of extension in Africa was very much focused on increasing production, improving yields, training farmers, and transferring technology (*Reddy-Deva, 2007*). As time passes, understanding of extension goes beyond technology transfer to facilitation; beyond training to learning, and includes assisting farmer to form groups, dealing with marketing issues, and partnering with a broad range of service providers and other agencies (*Christoplos, 2012*). Thus many people are now using the phrase, livestock advisory services, instead of extension which can imply a top-down approach and may ignore multiple sources of knowledge (*Christoplos et al., 2012*). This paper will continue to use the term extension services with the understanding that it encompasses the broader definition as explained above.

Revitalizing extension and advisory services was the focus of a landmark conference held in Nairobi in November 2011 (*Pye-Smith, 2012*), resulting in the

Nairobi Declaration. One of the root causes of low livestock productivity in Africa according to this conference is the poor performance of the extension and advisory services, and the lack of financial support they receive (Pye-Smith, 2012). It is therefore important to formulate national policies and strategies on extension and to ensure political and functional commitment (Odongo, 2013). Extension reform requires a policy vision and determination, as well as a nationwide strategy that can be effectively implemented (CAT, 2013). Policies and strategies much depend on government priorities and the needs of clientele. However, in formulating extension policy, and thus the contribution of extension services and extension agents, it is important to note that extension agents do more than just traditional extension and technical outreach. They play a much bigger role, brokering and facilitating links and relationships within the livestock innovation system, and thus require new strategies and capacities to perform these roles (Sulaiman and Davis, 2012). For policy-makers, extension is a much needed investment in human and social capital of the rural smallholder farmers' population specifically on how the extension services role-play in decisions to livestock investment.

Delivery of quality livestock extension services in Tanzania has been a centre of attention for a long time. Given the fact that the majority of Tanzanians (more than two thirds) live in rural areas and depend on small-scale agriculture for their livelihood and employment (URT, 2013), the Government's efforts have been geared towards improving production and productivity so as to attain food security and sufficiency at household and national level. These efforts are in line with the targets of the National Development Vision 2020 which envisages achieving a high quality livelihood through, among other things, food self-sufficiency and food security (URT, 2015). The National Strategy for Growth and Reduction of Poverty (NSGRP) emphasizes the reduction of poverty levels among the majority who live in rural areas through enhancement of agricultural productivity (URT, 2010), this also is linked to achievement of the Sustainable Development Goals (MDGs) 2025. Livestock extension includes the provision of farmers with knowledge, information, experiences and technologies needed to increase and sustain productivity and for improved wellbeing and livelihoods (NRI, 2011).

The National Agriculture Policy of 2007, formed

after the review of the Agriculture and Livestock Policy of 1997, targets at developing and transforming the livestock sector in Tanzania, making it more efficient, competitive and profitable. Some areas of attention that hinder development of the livestock industry include low productivity, inadequate support services, low quality products and poor participation of private sector (NAP, 2012). Both National Agriculture Policy of 2007 and the old Agriculture and Livestock Policy of 1997 emphasize the need to deploy agricultural extension officers to work at village level. The target of the government was to employ 15082 extension officers by the end of 2015 (MAFC, 2009).

There are many development potentials for the livestock sector, but the livestock education system for example has not kept pace with the changing conditions of society to support livestock investment decisions (Oladele, 2005). The growth of rural development activities leads to the expansion of technology transfer, input supply and coordination, and credit delivery or supervision. Gautam (2000) stated that the design of the institutional structure should focus on the ability to empower farmers. The system should find means of giving farmers the ability to state their views regarding extension programs. Gautam (2000) pointed out that the indicator for a successful extension program is the farmers' awareness and adoption of the technological components delivered through extension, as this provides the framework for assessing potential economic impact in livestock investments. Mvuna (2010) also opines that extension services through various trainings are crucial in enabling producers to realize the increased livestock production and productivity through increased investments having understood of what they are doing.

Competent extension professionals are the assets of livestock extension services. Diverse and dynamic livestock systems, advancing science and technologies, changing socio-demographics, increasing globalization and growing competition for resources demand livestock extension professionals to be proficient in the technical aspects of their areas of expertise, as well as in the processes and delivery of the services (Cochran et al., 2012; Gibson and Brown, 2003; Maguire, 2012; Melak and Negatu, 2012; Rivera et al., 2013; Swanson, 2006). In other words, the need and demand for extension professionals to demonstrate a higher level of professionalism in their services are growing. As Maddy et al. (2002) stated that, extension employees should

possess the necessary competencies to anticipate and deliver quality educational programs of relevance and importance to the publics. On a similar note, *Qamar (2005)* stated that extension workers work in harsh field conditions with limited facilities and less than well- educated clients. Only trained, motivated and competent staff members can work and succeed in such difficult conditions.

Furthermore, linking smallholder farmers to markets can embrace a whole range of activities, from the very small and localized to the very large. The concept does, however, assume the development of long-term business relationships rather than support for *ad hoc* sales (*Mitchell, 2002; Yadav et al., 2011*). At the simplest level livestock extension workers in developing countries can link farmers to buyers by identifying traders and arranging for them to meet with the farmers, or small-scale traders themselves can seek out new suppliers or can work with existing suppliers to develop new or improved products (*FAO, 2015*). At a more complex level is the work carried out by NGOs and others to identify markets for particular animal products and organize farmers into groups to supply those markets (*Stone, 2010*).

Likewise, extension services are supposed to empower farmers and enable them to identify and analyze their livestock problems and be able to make the right decisions (*Kimaro et al., 2010*). *Jain (2010)* pointed out that the central task of extension is to assist rural families to be able to help themselves through application of sciences to their daily life of farming, home-making and the use of communication for valuable information, which helps people make sound investment decisions. Given the importance of the livestock sector in Tanzania, the main source of food and industrial raw materials such as milk, meat, hides and skins, there is a great need to improve the performance of the extension sector so as to increase productivity and improve peoples' well being and national income. The extension program content may comprise a particular crop or all crops, livestock, forestry, or fisheries, singly or in some combination. The coverage may include a variety subject matter such as crop production, marketing, economic and management aspects, and family and youth development programs (*SeEVERS and Graham, 2012*).

Importantly, public extension has been a crucial source for livestock information in rural areas (*Gautam, 2000*). Also, extension plays a big role in improving production efficiency by promoting technological

changes among farmers. There is a need to develop a new vision of livestock extension and view it as the core in serving the public for food security and economic empowerment given the increased external forces (*Jain, 2010*). Economic development is based mainly on production, marketing, and micro-enterprise development of poor rural people (*Qamar and Rivera, 2003*). This suggests why extension is very important, as there is a great need to help rural farmers cope with the prevailing situation in the world, in terms of technology as well as market demands. In addition, strengthening livestock extension without understanding farmers' needs and their views on extension may not help. This is because, for extension programs to succeed, farmers must participate effectively in and understand the significance of the programs. In this way, smallholder farmers will easily adopt the information delivered and hence improve productivity and income (*Karbasiun, et al., 2007*).

Improved technology transfer can improve the efficiency of extension services in livestock: management especially in the rural areas where most smallholders are (FAO, 2016). Well trained input-supply dealers as retail outlets are selling a range of products (feed, drugs, vaccines, and equipment) in local communities in response to market demand (*Hellin, 2013*). Most of these firms have limited technical and livestock management capacity upon which to advise farmers. Much of the information they pass along to customers is what they learn from input suppliers and from other progressive farmers, not what they learn from agricultural research and extension institutions (*Qamar, 2003*). However, nearly every farmer who purchases production inputs must go to these retail outlets, and in the process he or she will ask what the retail dealer recommends either to increase yields and/or to deal with specific livestock problems. Appropriate technical advice give confidence to farmers and researches has proved that this confidence motivates more investments in livestock (*Singh et al., 2016*).

Organizing or empowering farmers by building social capital within rural communities helps to improve livestock extension services in rural areas (*Christoplos et al., 2012*). This helps to organize farmers, including women farmers, into different types of groups and then help link these groups to markets for appropriate high-value animals and animal products in addition to other information, organizations and research (*Nji, 2008*). Failure to do so may result in other value chain actors

continuing to capture the majority of the profit from these high-value enterprises, while farmers continue to lose. Also at times but not as frequently, these actors are directed to help grass-roots groups and rural communities to build change projects that are relevant to their own needs and aspirations. Both situations require planning and the preparation of different types of extension services (Kavithaa *et al.*, 2014; Patel *et al.*, 2014).

Multilateral and bilateral aid have been the most common forms of financing smallholder farmers in the developing world, either as grants or loans (Okwoche *et al.*, 2012). This form of aid has come about through the recipient governments signing multilateral or bilateral agreements with aid agencies. Through these aids, smallholder livestock farmers benefit from large investments, such as dam construction, dipping site facilities, machinery and other equipment (Singh *et al.*, 2016). Farmers also benefit from the transfer of technology and other softer sides of financing, such as management and organizational skills (Patel *et al.*, 2014). Having these facilities around, indications shows that farmers have been directed to much more investments in livestock enterprises (FAO, 2015).

On the supply side however, the characteristic of extension service package is a precondition of adopting it (Mwangi and Kariuki, 2015). These could involve for example the trialability, suitability/relevance and perception of the particular technology by the farmers. In studying determinants of adopting new breeding technology to milk goats in Western Kenya, Mignouna *et al.* (2011) stated that, the characteristic of the technology play a critical role in adoption decision process. They argued that small holder farmers who perceive that the technology is consistent with their needs and compatible to their environment are likely to adopt it since they find it as a positive investment. Farmers' perception about the performance of the technologies significantly influences their decision to adopt them. It is therefore important that for any new technology to be introduced to farmers, they should be involved in its evaluation to find its suitability to their circumstances (Reardon *et al.*, 2004).

Furthermore, a study by Mshana *et al.* (2013) pointed out that it is truism to state that the effective transmission of research findings to farmers is essential if research efforts are to contribute to livestock development. They added that, this requires an effective livestock extension system that links effectively with

research and works very closely with farmers. Wambura *et al.*, (2012) mentioned that the factors that push the advancement of livestock extension in developing countries are: (a) threat of famine; which forces governments to take measures to improve food production; (b) social unrest among rural people has made it politically imperative to give assistance in bettering their levels of living; (c) newly independent countries have found that livestock modernization is a first step toward economic development and freedom from economic dependence on more powerful and advanced nations; and (d) a recognition that rural people, who constitute the majority of the population in most countries, have a right to equity for an advanced and better life. These factors provide the necessity to understand the needs of the farmers and develop means that will facilitate their participation and adoption of new and approved practices. A study by Asfaw *et al.* (2012) revealed that non adopters are more likely to be constrained by less contact with extension agents.

Social learning theory :The study is being informed by the Social Learning Theory (SLT) which propagates an assessment of an individual ability to undertake and perform a given task (Bandura, 1986). Bandura's theory illustrates explicitly how the development of cognitive components such as motivation and self-regulation assist in learning and performance achievement. The concept of self-efficacy which is part of the SLT explains that a person is the determinant of his own development and can also proactively make things happen by his evolution (Ashford & LeCroy, 2010). Self-efficacy is described as an important facet of human motivation which denotes a positive self-prophecy about ones capabilities premised on oriented outcomes. As noted by Snyder and Lopez (2007), self-efficacy is what one believes that he or she can undertake a given task using his or her own expertise or ability under a given conditions. Self-efficacy is exemplified and implicitly concerned with perception of individual capabilities and ability, as opposed to self-esteem which is focused on value perception of an individuals' worth (Woolfolk, 2007). Extension officers for example are expected to have self-direction and exhibit a sense of self-efficacy to provide farmers with opportunities to mitigate challenges and be able to exercise control over problem solving. To the other hand with the motivation by smallholder farmers to invest in livestock, the awareness, attitudes and values which an individual holds about abilities affects investment

decisions and hence performance. The perception and comments about quality extension services delivery may affect positively or negatively self- efficacy of the extension practices and investment decisions in livestock to smallholder farmers.

METHODOLOGY

The study was conducted in Mburu and Bariadi Districts in the year 2016. The districts were chosen for the study because these are areas with highest population of cattle, goats and sheep (animals of interest for the study) in the country which logically necessitates presence of serious livestock extension service (*URT, 2013*). But of great importance is the contribution of extension services on influencing smallholder farmers' livestock investment decisions. A cross-sectional research design was used for gathering information whereby an administered questionnaire was applied in collecting data. In carrying out the cross-sectional study, a survey was done for the purpose of surveying opinions of smallholder farmers on extension services attributes on their decisions to livestock investment decisions in the study areas. The sample frame involved small-holder farmers who have been keeping livestock for the past five years. The study used a sample size of 333 out of whom 175 were selected from Bariadi and 158 from Mbulu. The sample size was determined using the formula by *Fisher et al. (1991)* for population greater than 10000 (Appendix I) and was considered adequate at 95 per cent confidence interval, 5 per cent margin of error and 50 per cent skewness level. Respondents were randomly selected from five villages considered to have highest number of cattle, goats and sheep in each of the two wards in the two districts.

Data Analysis : The analysis focused on extension service attributes thought to have effect on livestock investment decisions according to the literature. The probit regression model was employed to estimate the probability that a given household will go for LIDe given the selected independent variables. In the econometric analysis, the probability that a household head said "yes" to LIDe was estimated as a probit regression model. The question on the suitability of logit or probit regression models is unresolved. However, in most applications, it seems not to make much difference (*Green, 2000*). In this study the probability for smallholder to participating in LIDe using the pobit regression model was estimated as:

$$\Pr(y=1|x) = \Phi (xb)$$

Where Φ is the standard cumulative normal probability

distribution and xb is called the probit regression score or index. Since xb has a normal distribution, interpreting probit regression coefficients requires thinking in the Z (normal quantile) metric. The interpretation of a probit regression score by b standard deviations. Based on social learning theory and previous regression, the following hypotheses were tested:

1. Education/training have significant effect on livestock investment decisions,
2. Market linkages have significant effect on livestock investment decisions,
3. Access to information have significant effect no livestock investment decisions,
4. Technology transfer has significant effect on livestock decisions,
5. Access to technical advice have significant effect on livestock investment decisions,
6. Access to livestock facilities have significant effect on livestock investment decisions,
7. Group memberships have significant effect on livestock investment decisions, and
8. Competence of livestock technical staff have significant effect on livestock decisions

The variable used in the probit equation and their description are as presented in Table 1 below:

RESULTS AND DISCUSSION

Respondents' demographic characteristics are presented in Table 2. Slightly more than one fourth (26.2%) of the respondents were aged from 41-50 years; they were in their mature age and would possibly respond positively and improve their usage and participation in extension services. Less than one-eight (14.7%) were more than 60 years of age. This latter group might resist change and be less willing to participate and improve their competence to accommodate emerging changes in livestock investment as a result of extension services. The study recorded that 4.7 per cent of the respondents had been keeping livestock for 1-5 years, 27.6 per cent for 6-10 years, 35.2 per cent for 10-15 years, and 32.4 per cent for more than 15 years. This indicates that most smallholders have experiences in livestock management problems which in turn they may easily know what extension packages to participate in. The mean number of years spent at school for the smallholder farmers and their spouse is 7.07 and 6.662 years respectively which show that most smallholder farmers either didn't go through formal education or have primary, secondary or tertiary education which may suggest that technology

Table 1. Description of Variable in the Probit Model

Variable/Attribute	Description
Livestock investment decision	Dummy: 1 = Yes to livestock investment; 0= Otherwise
Livestock market linkages	Estimated number of markets that smallholder farmers are linked to and able to trade with
Access to information	1= Yes; 0= No
Technology transfer	Estimated level of technology transferred to smallholder farmers
Technical advices	1=receive technical advice; 0= if Not
Access to livestock facilities	1=have access to facilities; 0= if no access to livestock facilities
Group membership	1=member of a group of ES package; 0= if not a member
Access to training	1= Yes; 0= No
Competence of livestock technical staff	Estimated level of competence by livestock extension technical staff

ES = Extension Service

transfer and training programmes to be customized in the levels that smallholder farmers may easily understand.

The probit regression model was used to explain livestock investment decisions using extension service attributes/variables explained in Table 1 above and was expected to determine smallholder farmer’s households’ chances of participating in LIDe. The results in Table 4 indicated that the model was highly significant, as indicated by the P-value ($P < 0.000$) of the -2 Log Likelihood and correctly predicted 85.2 per cent of the observed outcomes.

As expected, market linkage increases the probability that a household will choose livestock investment. Livestock market linkage is an attribute that explain the basic reason why smallholder farmers should invest in livestock. Being assured of prices and places where to sale live animals and animal products like milk, oils, skins and hides; and in some cases processed products completes the circle of business in livestock.

Findings show that, per every increase in one more unit of market linkage, the probability of smallholder farmers’ decision to invest in livestock increases by 0.58 units. The Wald of 4.77 signifies the strength of the predictor market linkage to influence smallholder farmers towards LIDe. Smallholder farmers in the rural areas have a minimum variety of price and income risk management tools at their disposal. These include numerous public and private sources of market information, futures and options, an increasing number of yield and revenue insurance instruments, and a new generation of cash indexing. While rural households need the value and the use of these tools, seems they place an even higher value on market availability as a source

Table 2. Demographic Characteristics of Respondents

Characteristics	No.	%
<i>Age (Years)</i>		
20-30	64	19.2
31-40	61	18.3
41-50	87	26.2
51-60	72	21.6
61 and above	49	14.7
Mean	50.8	
SD	11.783	
<i>Experience (years)</i>		
1-5	16	4.8
6-10	92	27.6
11-15	117	35.2
> 15	108	32.4
Total	333	
<i>Education level (Years)</i>		
Mean (HH)	7.07	
SD	2.336	
Mean (spouse)	6.62	
SD	2.661	

HH=Head of Household, SD= Standard Deviation

of price risk management, information and advice. Scholars in livestock development have emphasized participation, collaboration and cooperation among extension service providers in various aspects of extension services, such as information and resource sharing (Swanson and Samy, 2002; ECOP, 2002) to facilitate market linkages. In other words, market linkages has a significant influence on the use of forward pricing and hence better returns for smallholder farmers.

Likewise, access to information significantly influences livestock investment decision at $p < 0.000$. Results indicate that, for every unit increase in access

Table 4. Probit Model Parameter estimates

Yes to LIDe	B	Se	Wald	Sig.	Exp(B)
Intercept	-20.67	2.97	55.29	0.000	-
Market linkages	0.58	0.27	4.77	0.03	1.78
Access to information	0.61	0.02	9.81	0.00	0.84
Technology transfer	0.21	0.12	3.55	0.06	0.23
Technical advices	6.81	1.24	39.81	0.00	906.87
Access to livestock facilities	-2.46	0.63	68.01	0.00	0.09
Group memberships	-0.17	0.29	5.02	0.02	0.84
Access to training	0.41	0.19	4.18	0.00	1.51
Competence of livestock technical staff	0.51	0.29	4.91	0.04	1.67
-2Log likelihood	101.21	(p<0.00)			
Livestock Investment Decisions	Yes	58.6%			
	No	41.4%			
Total correctly classified		85.2%			
Dependent variable = LIDe:	Dummy: 1=Yes;				
2 Otherwise;	N= 333				

to information, the probability of smallholder farmers' decision to invest in livestock increases by 0.06. Livestock farmers need information on diseases, nutrition, treatment and control of diseases, breeding techniques and markets for their products, among many other information needs. In most cases, rural farmers largely depend on livestock extension officers as their main sources of information. These services are usually offered freely by the government through extension officers and in collaboration with the private sector. The government extension services provide relevant information for livestock management activities and most farmers still rely on indigenous methods due to lack of reliable information delivery systems. The role of extension officers is to reach out to farmers through extension services such as; visits to individual farmers, demonstration/on-farm trials, livestock exhibitions, radio and television programs and printed materials carrying livestock management messages. *Sanusi et al. (2010)* opines that, the important task of extension is the exchange and sharing of information knowledge and skills. In rural settings, social capital literature treats social networks as a means to access information, secure a job, obtain credit, protect against unforeseen events, exchange price information, reduce information asymmetries and even enforce business relationships (*Barrett, 2005*). In this study, detailed questions were asked in order to identify different social networks. Three

social networks and capital were distinguished: first, a household's relationship with rural institutions in the village, defined as whether the household is a member of a rural institution or association, such as input supply which is an element of extension service and labor sharing; second, a household's relationship with trustworthy traders, measured by the number of trusted traders inside and outside the village that the respondent knows from which it is anticipated that gets information about market trends; and third, a household's kinship network, defined as the number of close relatives that the farmer can rely on for critical support in times of need specifically on how can solve problems related to livestock management. Such classification is important, as different forms of social capital and networks may affect household decisions to invest in various ways, such as through information sharing, knowledge of stable market outlets, labor sharing, the relaxing of liquidity constraints, and mitigation of risks. Furthermore, a Wald of 9.81 indicates the strength of the variable access to information towards LIDe.

Results from this study shows that technology transfer has a positive significant influence to livestock investment decisions. Per every unit increase in technology transfer, the probability of smallholder farmers' choice to invest in livestock increases by 0.21. Technology transfer is an attribute that assist farmers to make best use of technologies and support services through capacity building. It also builds capacities and skills of farmers to empower adoption of good practices for improving production while reducing risks associated with keeping livestock productively. Research stations for example, represent a potentially effective agent for the process of the technology transfer. Research station presents an extension of the research centre maintaining all strong institutional links with the scientific works produced by the researchers absence of which reduces farmers' intentions to invest more in livestock. The end result is to empower farmers, make them productive at a minimal level of risks in livestock management as found out by *Tabana et al, (2000)*.

Technical advice is an attribute that was found to have positive significant effect to livestock investment decision in the study area. Results show that, per every unit increase in technical advice, the probability of smallholder farmers to engage in livestock investment increases by 6.81 units. A strong Wald of 39.81 indicates the strength of the predictor technical advice to the

direction of LIDe. Technical advice is an attribute that provides capacity building to smallholder farmers by providing support in the development of extension plans, use of methods and coordinates procedures for implementation. Technical advices also develop technical guidelines, extension materials and develop extension methods. More technical advices in terms of correct breeding procedures, disease control, vaccination and productivity strategies is required in order to enhance livestock investments to smallholder farmers. This would boost production and enhance food security at the household, national and regional economic levels. There is ample evidence to show that smallholder farmers use livestock and other assets just as efficiently as large-scale farmers if they are technically advices accordingly (Singh *et al.*, 2016). The results also concur with that of Patel *et al.*, (2014) in India who found that, smallholder farmers in rural areas have made much improvement in livestock investments as a result of quality technical advice in the use of livestock facilities. This justifies the role that extension services plays to smallholder farmers as far as livestock investment decisions is concerned.

Furthermore, findings indicate that access to livestock facilities reduces the probability of smallholder farmers to choose livestock investment as an economic activity. Per every unit decrease in access to livestock facilities reduces the likelihood of smallholder to choose livestock investment by 2.46 units. Access to livestock facilities like livestock laboratories, dipping cites, livestock training centres, credit facilities and animal quarantines to support extension service is an item attributed to supporting smallholder farmers to easy livestock management. It is more of a usage aspect and onsite activity that requires a practical aspect of training as a process. Access to these facilities requires planning the location of the facilities as manure storage for example maximizes the separation distance from watercourses, wetlands, and wells. This is particularly important with earthen storages and in areas where the groundwater table is shallow or where bedrock is found close to the surface of the ground to course foot and mouth diseases to animals which may increase costs in livestock enterprises unnecessarily. According to the findings of this study, seems farmers' access to livestock facilities is limited as a result it discourages decisions to livestock investments. Farmers need access to facilities to make right choices of livestock management practices

as found out by *Badodiya and Choudhary (2011)* in India, *Onuekwusi and Atasie (2011)* in Nigeria and *Zhao and Zhang (2009)* in China.

Group membership also was found to have a negative significant effect to livestock investment decision in the study area. Per every unit reduction in group membership, the probability of smallholder farmers to invest in livestock is reduced by 0.17 units. Thus a need for mobilization of smallholder farmers to join extension group packages is important. The benefit accruing out of it is that, economies of scale are maximized and cooperation amongst smallholder farmers is enhanced. Findings by *Suvedi and McNamara (2012)* in Nepal support this finding who argued that, despite having significant footprints throughout the country, Nepal's livestock extension services have not been effective in addressing the felt needs of diverse clients, and they suggested organizing farmers groups by extension workers to improve the situation. It is through group membership, technology transfer and training for example reaches many at once but also farmers get a touch of each other's help. With the number of livestock technical staff, it has been proved that group approach to extension services is cost effective and binds together smallholder farmers to support each other (FAO, 2015). When such trend does not happen, then it reduces the magnitude of extension offers to technically advice many farmers at a time accordingly and hence the multiplier effect to livestock investment also is reduced.

Furthermore, Table 4 results indicate that access to training has a significant positive influence to livestock investment decision. Per every unit increase in access to training, the probability of smallholder farmers to choose livestock investment decision increases by 0.41 units. A Wald of 4.18 signifies the strength of the variable towards livestock investment decision. Perhaps main problem facing rural smallholder farmers is that they have no, or poor, accessibility to the special training schools, professional livestock centres; and rural extension agencies that would help farmers to acquire appropriate technical knowledge. In rural communities, depending on the needs of the community, extension worker is an all-rounder, being a teacher/facilitator, problem solver, care giver, project manager, leader, middleman and above all, a role model. Extension worker is a person who is supposed to be technically knowledgeable and skilful in handling people excellently

to act as social mobilization officers, facilitators or development partners as found out by (Bichi, 2010). Moreover, extension workers link the research centres to the end users of the research findings or new innovation by staying with the community members and working with them at all facets of technology implementation to ensure maximum adoption, which are all in line with the community culture, norms and values through trainings (FAO, 2015). By this it means that farmers are able to assume a responsible and useful role within their households or to contribute to independent livestock investment operations.

Likewise, competence of livestock technical staff was found to have positive significant effect to livestock investment decisions in the study area. Per every unit increase in the competence of livestock technical staff result into an increase in smallholder farmers' option for livestock investment by 0.51 units. A Wald of 4.91 indicates that the predictor is strong enough to influence LIDe amongst smallholder farmers. Competent extension professionals are the assets of livestock extension services for diverse and dynamic systems, advancing science and technologies, changing socio-demographics, increasing globalization and growing competition for resources demands. The extension professionals need to be proficient in the technical aspects of their areas of expertise as well as in the processes and delivery of the services. In other words findings from this study indicates that, the need and demand for extension staff to demonstrate a higher level of professionalism in their services is important due to the demands of the duties supported by these professionals. The findings is supported by other scholars like Maddy *et al.*, (2002) who opines that extension employees should possess the necessary competencies to anticipate and deliver quality educational programs of relevance and importance to the public.

Theoretical Implication : Socio-learning theory has been justified by a myriad of empirical research for providing the foundation for individual learning, motivation and self-achievement (Ashford *et al.*, 2010; Gecas, 2004; and Woolfolk, 2007). This theory is relevant in this study because until individuals believe that their actions towards livestock investment decisions can harvest or bring about desirable outcomes they need, they have little or no motivation to act or to be resilience in LIDe. Extension advisors are engrossed in creating change, and as a change agent, must possess certain

qualities for enhancing the well-being of the farmers and be capable of altering the negative behavioural aptitudes of smallholder farmers towards innovation adoption and the social relationships under which farmers live. Adopting the social learning theory as a conceptual framework for behavioural change, extension advisors should thrive to improve the farmers' frame of mind and to adjust or mitigate erroneous self-belief, habits and conservatism (personal factors), enhance their skills and self-regulatory performance (behaviour) and change the negative views on investment concept that may be a barrier to livestock investment decisions and hence farm business success.

CONCLUSION

The results of the hypotheses tested showed that there was a direct and significant influence of the eight attributes of extension services to smallholder farmers' investment decisions in livestock. This implies that the more access and participation in extension service packages by the smallholder farmers, the higher the contribution of the extension services in livestock management practices and vice-versa.

Following the results of this study, access to information, technical advices, access to training, market linkages, technology transfer, and competence of livestock technical staff were found to have a positive significant influence to livestock investment decision while access to livestock facilities and group membership were found to have negative effect to livestock investment decisions. A number of policy implications flow from the results of the study as follows:

1. Measures to improve extension services by the government of Tanzania is required in access to livestock facilities and encouraging group membership to smallholder farmers as negative effect was detected in the two attributes. These measures should include setting up appropriate extension services delivery policies and plans, and improving the autonomy and accountability of the technical staff offering such extension services to smallholder farmers. More rural households are likely to engage in livestock investment as a result of group membership so that access to various attributes of extension services are received in groups and reaching many at once.
2. Higher incomes accrued from livestock investments

may not only raise the standard of living of farmers, but may also create positive multiplier effects for employment, infrastructure and economic growth in the country. In addition to raising income, livestock investment exposes smallholder farmers to new technologies in animal husbandry (which is a component of extension services). Identification of potentials of breeding technologies, studies of marketing channels and market promotion efforts will be useful. The study therefore recommends that extension organizations should consider the usefulness of market linkages and recommendation of new markets or channels to smallholder farmers. These may include the arrangement of follow-up visits to farmers after joining new markets or channels so that sustainability of the livestock returns to farmers are sustained.

3. For effective technology transfer and hence adoption by farmers, the use of facilitative methods such as farmers' field days and small herd management technique are recommended. Smallholder farmers should be given as much techniques as feasible in

managing livestock enterprises, particularly with respect to choices of extension service packages. The multiplier effects of livestock investment decisions can be maximized by encouraging projects through government authorities and the private sector to plan for the development of livestock investment opportunities into which smallholder farmers can channel their new income.

4. As for technical advices, extension services should be designed to provide learning effects that go beyond production of livestock but as far as value addition and market option strategies. It is also difficult to assess the trade-off between the technical superiority that comes from specialization and the efficiency in delivery that comes from extension technical staff. However, livestock investment studies tend to give more support to the latter. Smallholder farmers seem to prefer the livestock management approaches provided by multi-specialized extensionists, and it could be argued that specialized extension services are often not feasible in very poor communities.

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