

Original Research Article

Assessment of Extension Service Delivery on Small Ruminants (Sheep and Goat) Production in Tonkolili, Falaba, and Koinadugu Districts Northern Sierra Leone

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Abstract

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The study assesses the extension service delivery on small ruminants' production in three districts North of Sierra Leone. A mix method design was adopted to assured triangulation, the sample size is 350 in the three selected districts from which; 250 came from Tonkolili, 50 each from Koinadugu and Falaba Districts. A multistage stage sampling was used to select respondents from each of the districts. Analysis of the data was done using excel, and SPSS and the result were presented in tables. The findings of the study show that; the dominants ruminants' farmers are males, and most of the farmers are married, their yearly income in the enterprise is within Le500-1000.00. they are into other livelihood activities apart from small ruminants' production, and non-formal form of education is the most prolific among respondents in the districts. Majority of the farmers had knowledge on health of animals and could use certain techniques to detect disease in small ruminants. Most livestock farmers talked on the availability of forage and browse plants year-round though they were challenged with labour shortage. Small ruminants' farmers are aware of extension services, though they had no source of information and extension services. It is concluded that though farmers are aware of extension services, but they find it hard to access extension services, since most of the extension work is focused on crops. The recommendation is extension wing in Ministry of Agriculture and Forestry (MAF), NGOs and Private bodies need to start looking in to small ruminants raising.

Keywords: Production and Herd size, Ruminant, Status, Tethered

INTRODUCTION

In developing countries, small ruminant is one of the key enterprises done by farmers to reduce poverty, economic dependency, and improved social cultural beliefs and practices among rural farmers. Small ruminants comprise of goats and sheep, and the two species of animals have proven to contribute to geographical distribution among rural households. Thornton (2010) infers that 1.3 billion people in livestock products (small ruminants) are employed in 30% land area accounted for in the world, and this land area support 600 million livelihoods worldwide. In some communities, goat and sheep have proven to support women, disabled and less privilege,

which in most cases are not considered. Goats and sheep are among the domesticated animals that have little or no taboos in developing countries. These livestock can either be managed in the form of intensive, semi-intensive or extensive care system of management.

Tropical Africa has about a reasonable number of global sheep and goat population estimated at 1,028 million and 765 million respectively as argued by (Tibbo, 2006). Small ruminant production is predominantly practiced among rural farmers, because of the little investment it requires and the short generation interval

(Otte and Chilonda, 2005). It was observed that livestock and livestock products particularly from small ruminants accounted for 56% in value terms (income) in typical smallholder mixed farming settings (Ingawa, 1986). Other renowned writers also reaffirmed the valuable contribution of small ruminants as income generating assets among small-holder livestock farmers (Verbeek et al., 2007). In Africa, small ruminants provide almost 30% of the meat consumed and around 16% of the milk produced. This ranks small ruminants as the second most important suppliers of meat protein to the population after cattle (Ajala et al., 2008). The recently released poverty map by Ireland Livestock Research Institute 2006 indicates that livestock types are key indicators where families sit on the poverty scale, sheep and goats being considered poor-man's species.

In Sierra Leone, sheep and goats is a matter of choice that result in to either farmers facing household burden or demand and unequal distribution of local resources. Morton and Matthewman (1996) asserted that African dwarf goats and Djallonke sheep are the main breeds reared in Sierra Leone in respective of the Sahelian goats and cross-breed of the West African Dwarf (WAD) reported. These are kept under different ecological and climatic conditions because of their unique socio-cultural values in the promotion of traditional and religious practices. Small ruminants fulfill undeniable and neglectable economic, nutritional and social functions in all corners of Sierra Leone more so in the rural areas. sheep and goats are mainly raised by smallholder farmers for immediate cash income, ceremonial rites and related purposes and as a major source of meat. Small ruminant farming plays an important and secured form of agricultural investment to the Sierra Leonean farmers in both the rural and urban sectors. In 1985, it was estimated by David-West that sheep and goats contribute about 35% of the total animal meat production in Sierra Leone. Small ruminants are kept for the purpose of income generation, meat, milk and wool production. Small ruminants are important animals in subsistence agriculture because of its unique ability to adapt and maintain themselves in harsh environments. Skin and manure are valuable by-products of sheep and goat. Owing to their ability to thrive and reproduce faster even in harsh environments, they used as source of risk mitigation during crop failures, property security, monetary saving and investment in addition to many of other socio-economic and cultural function (Tibbo, 2006). Sheep and goats constitute a good source of family income and livelihood, assets and agricultural resources for smallholder farmers (IFAD, 2004).

The productivity of small ruminants in Sierra Leone is low but there is ample opportunity for improvement. Such improvement can be achieved through extension, education and training for small ruminants' producers. However, extension education and training can only be effective if the training needs of the small ruminant

producers are properly identified. Extension educators are responsible for helping farmers to accurately identify their educational needs. Programmes are most often successful when they focus on clearly defined needs of the target group (Harris, 2011). Thornton (2010) defined training programs as skills, knowledge and attitude which an individual requires in overcoming problems as well as avoiding problem situations.

Statement of Problem

The sustainable livelihood and quality of life of rural population is consistently linked to the performance of agriculture sector. Agriculture Extension services, as an important development intervention, focuses on increasing the growth potential of agriculture sector and promotes sustainable, inclusive and pro-poor agriculture development and hence economic development. Small ruminants are important in functioning as a buffer for crop failure and crop surpluses and as a provider of manure, higher production efficiency, easier marketability and lower risks, broader adaptability to different environments, and smaller absolute feed requirements per animal. Despite these economic potential opportunities of small ruminants, it has become a neglected resource in Sierra Leone. Extension service delivery is more focus on crops production, leaving the small ruminants farming in the hands of the rarer in terms of knowledge, information source and other service deliveries.

AIM OF THE RESEARCH

The purpose of this study is to examine the effect of extension delivery services on small ruminants' production in Tonkolili, Falaba and Koinadugu District Northern Sierra Leone.

Objectives of the Research

1. Assess the extension delivery services access by farmers, and the status of small ruminant production
2. Identify the issues faced by small ruminants' farmers

METHODOLOGY

Non-experimental design, which was a mix method (quantitative and qualitative) type of survey so as to ensure credibility and reliability in the research findings (triangulation). The study was done in Tonkolili, Falaba and Koinadugu Districts North of Sierra Leone.

The population of the study is made up of all farmers engaged in small ruminants' production in the three districts. The sample size selected was 350 small

ruminant farmers from the three districts; Tonkolili was 250, Koinadugu and Falaba Districts were 100 (50 from each of the district). Krej and Morgan (1970) formulae was used to calculate the sample with equation:

$$X^2 \cdot NP(1-P) \div Z^2 (N-1) + X^2P(1-P).$$

In the sampling technique, probability and non-probability sampling techniques were used; purposive sampling was used as a non-probability type to focus on only farmers engaged in small ruminants (sheep and goat) farming; while for the probability sampling technique, simple random sampling was used to select samples from the population of sheep and goats' farmers in each of the three districts.

The researcher used three instruments to collect primary data which includes: questionnaire, Focus Group Discussion (FGD) and Key Informant Interview (KII); the instruments were pretested before using them for actual data collection. The questionnaire was designed to collect quantitative data, while the FGD AND KII were done to get the qualitative data. Two enumerators were used to administer the questionnaire, while the researcher focused on collecting the FGD and KII data. The researcher conducted nine FGD, five of which were done in Tonkolili District and the other four were done in Koinadugu and Falaba Districts. The KII was done for; village head men, youth leaders, women's leaders, extension personnel and other key representatives. In the secondary data gathering, sources were got from archived data in the Ministry of Agriculture, Statistics Sierra Leone, and Njala University (Animal Science Department). The secondary data gathered comprised of; population and housing census done in 2015, Socio-economic impact of pest des petit ruminant (PPR), and the contribution, management and practices of small ruminant production.

The collection of both the secondary and primary data went through the ethical consideration protocol in which participants were not forced to participate, but they involved into the exercise willingly. In addition, validity and reliability of the research work were also considered as the research instrument were developed and pretested under the supervision of a research supervisor and other expert in the field.

Data were analyzed using the Statistical Product and Service Solution (SPSS), and Excel. Excel was used to explore the data, clean and do data manipulation, while the SPSS was used to analyze descriptive statistics in the form of frequencies and percentages, and inferential statistics in the form of; binary logistic regression and principal component analysis. The result obtained from this analysis are presented in tables and charts. Also, the FGD and KII data got were transcribed to ensure agreement between the quantitative and qualitative information of the small ruminants.

RESULTS AND DISCUSSIONS

Demographic and Socio-economic Characteristics of Small Ruminants

The result in 'Table1' shows the demographic and socio-economic characteristics of small ruminants' farmers in three districts; from the results, the sex of small ruminants' farmers indicates that majority 56.4% in Tonkolili district 52.0% in Falaba district, and 64.0% in Koinadugu district are males. This result shows that most of the small ruminants' farmers in rural areas are males. Most of the improved resource services are accessed by men such as; land, and services got from extension workers, and also looking at the laborious work required might have made men to dominate the small ruminant's production. Conteh et al (2020) supported in livestock research that tradition demands, men to be the breadwinners and therefore, it is obligatory for them to attend to the needs of their family members. In corroboration, Adams and Yankyera (2014), said male household were dominant among small ruminant households. FAO (2012) also argued in support of this study that majority in the livestock survey were males. Also, most men buy and own the animals, but women and children take care of the animals (Suluk, 2022). In a traditional home in Sierra Leone, everything belongs to the husband. In contrary, Sow et al. (2021), opined that a greater number of goat farmers in rural areas of Senegal are females.

The age category of small ruminants' farmers opined that most 44.4% in Tonkolili district, 42% in Falaba district and 56% in Koinadugu district are adults; the result indicates that adults are more in to small ruminants farming. Having energetic farmers engaged in small ruminants' production support poultry farming for more and better poultry enterprise. Young people are active in participating in extension services like; training, adoption of new practices etc. than aged farmers. Duku et al. (2011) asserted that small ruminants farming is dominated by active force population.

Marital status of poultry farmers posited that 75.2% in Tonkolili district, 64% in Falaba district and 78% in Koinadugu district are married; it proposed that majority of the small ruminants' farmers are married. This implies that most of the livestock farmers are responsible in taking up such enterprise. This category of farmers may have easy access to community resources such as land, and they can also be focused in delivering extension services. Conteh et al. (2020) asserted that, most farmers are married couples, which makes community members to perceived them as being responsible.

Educational level shows that 32.8% in Tonkolili district, 40% in Falaba and 28% in Koinadugu district have secondary education. It can be deduced that secondary education supersedes among small ruminants' farmers in the three districts. This implies that farmers may be ready

Table 1. Demographic and Socio-economic Characteristic of small ruminants n=350

Personal characteristics	Tonkolili		Falaba		Koinadugu	
	Fre.	%	Fre.	%	Fre.	%
Sex						
Male	141	56.4	26	52.0	32	64.0
Female	109	43.6	24	48.0	18	36.0
Age						
18-35	79	31.6	20	40.0	12	24.0
36-55t	111	44.4	21	42.0	28	56.0
56years and above	60	24.0	9	18.0	10	22.0
Marital Status						
Single	32	12.8	12	24.0	5	10.0
Married	188	75.2	32	64.0	39	78.0
Separated	6	2.4	0	0.0	1	2.0
Divorced	5	2.0	2	4.0	2	4.0
Widow	11	4.4	2	4.0	2	4.0
Widower	0	0.0	0	0.0	0	0.0
Co-habited	8	3.2	2	4.0	1	2.0
Education Level						
Informal	19	7.6	2	4.0	5	10.0
Non-formal	73	29.2	10	20.0	11	22.0
Primary	30	12.0	5	10.0	10	20.0
Secondary	82	32.8	20	40.0	14	28.0
Tertiary	32	12.8	13	26.0	5	10.0
Part of Farming Org.						
CBO	100	40.0	21	42.0	21	42.0
FBO	36	14.4	15	30.0	7	14.0
Rotatory	70	28.0	9	18.0	11	22.0
None	31	12.4	5	10.0	7	14.0
Others	13	5.2	0	0.0	4	8.0

Source: Field Survey 2022

to take decision in accepting new practices, and also seek for more capacity building in small ruminant production. In dissemination of extension services in the form of; information, ideas or technologies, extension agents find it easier, since most of this category of farmers can either be innovators or early majority in the adoption levels. Conteh et al. (2021) claimed that most of the farmers in livestock production have non-formal education.

The sources of livelihoods argued that majority 53.8% in Tonkolili district, 49.5% in Falaba district and 55.0% in Koinadugu district get their livelihood from crop production. Most of the extension efforts in farming is drive towards crop production leaving livestock production having little or no attention. In corroboration to this study, Kozat and Sepehrizadeh (2017), argued that Crop production is identified as the main source of income for farmers in Sierra Leone. Livestock revenues were used to establish small businesses, pay dowries, and build and repair dwellings

Belonginess to farming organization shows that 40% in Tonkolili district, 42% in Falaba district and 42% in Koinadugu district determined that most of the farmers are part of Community Base Organizations. Farmers can have easy access to information, new ideas, credit facilities subsidies, loan, and other extension services.

Maass et al. (2012) pointed out that one major benefit of group is that farmers can support each other to learn and adopt improved technologies.

The result in Table 2 shows a binary logistics test conducted on extension contact to small ruminant farmers. This test is done so as to see variables in the result that are more likely to influence extension contact to sheep and goat farmers. In the analysis; the coefficient (B), standard error, Wald test together with the P-value, and the exponentiated coefficient (odds ratio) values are given. The result shows that at the 5% probability level, the model use for the analysis fit the data at chi square value of 62.141 and probability value of 0.000, while the Hosmer Lemeshow also show that the model use fit the data at probability value of .513. The classification table predicts that the overall accuracy of the percentage prediction of extension contact is 72.0%.

The variables in the equation table shows that sex (.000), income (.012), and being a member of small ruminant organization (.000) are more likely to be contacted by extension at a probability value of 0.05 confidence interval. In the sex variable, the value 1.200 shows a positive regression coefficient in which men are more likely to be contacted by extension than females, also, the result further revealed that a 1.200 unit increase in sex has an odds ratio of 3.321 unit increase in

Table 2. Binary logistic regression of small ruminant farmers on contact of extension workers

Variables	Coefficient (B)	S.E.	Wald	df	P - value	Exp(B)
Sex	1.200	.267	20.281	1	.000 ^{***}	3.321
Age	.010	.008	1.529	1	.216 ^{NS}	1.011
Marital status	-.191	.125	2.358	1	.125 ^{NS}	.826
Income	.000	.000	6.356	1	.012 ^{***}	1.000
Member of organization	-1.114	.263	17.938	1	.000 ^{***}	.328
Type of specie rear	-.184	.344	.287	1	.592 ^{NS}	.832

Source: Computed from Field Data (2022)

Note: *** shows significant at 5% level of probability. NS indicates not significant.

extension contact. In addition, the income variable also depicts that the value .000 show a positive regression coefficient, which means farmers with high income are more likely to be contacted by extension. The odds ratio for the income is 1.000, this means a .000 increase in income of farmers leads to a 1.000 increase in extension contact.

However, -1.114 indicates a negative regression coefficient for farmers' membership in organization, which implies that farmers who are not part of organizations are more likely to be contacted by extension. The odds ratio is .328, this means that a decrease in membership of farming organization leads to an increase in extension contact. Conteh et al. (2020) infers that as tradition demands in rural communities, men are the breadwinners and therefore, it is obligatory for them to attend to the needs of their farming households. Therefore, extension effort is propelled through men's dominance in extension activities as extension workers well understood that most community resources are access and owned by men. They continue to lament that men are also engaged in different traditional practices that most times demand the need to keep goats and sheep.

Agricultural Extension Services Accessed by Small Ruminants' Farmers

The result on access to extension services proposed that most of the farmers are having access to extension services in relation to the production of small ruminants. Koinadugu had the highest with 58%, followed by Falaba with 56%, and Tonkolili with 54%. Access to extension services may be as a result of the farmers being engaged in both crop and livestock farming, since crop farming is the main source of livelihood in rural communities. Extension visitation to small ruminant farmers opens many doors to this enterprise as farmers may have access to; new ideas, improved feeding and disease management practices etc. for better livelihood. This study is in line with Adama et al. (2011) who in their study infers that majority of livestock farmers are contacted by extension agents.

In addition, the sources from which extension services

are received opined that government and farming organization are the major source from which small ruminants source their extension services. Social farming organizations like; FBOs and CBOs shows that farmers in these organizations can support each other in terms of loan, credit facilities, information etc. for the betterment of its members. In Sierra Leone the public extension service is mainly practice, and these services are got either from Ministry of Agriculture, university and research institute. These public institutions have help support farmers in given; inputs, trainings, advice etc. to farmers, which later leads to increase in number of flocks, more income and improve household living.

Also, in the frequency of extension contact, majority; 54% in Falaba, 46% in Koinadugu and 54% in Tonkolili Districts claimed that they are contacted once in every three months. This shows that most of the farmers are met once in every three months by extension agents. The lack of logistics, extension farmer ratio etc. may have cause the dominance of this category of visitation. In adequate contact by extension agents decrease access to extension services like trainings, improved practices etc., which will later result to unproductive livestock enterprise and frustrate farmers from small ruminants' production. Extension field staff should visit farmers on regular basis to encourage and facilitate them for the solution of their problems related to agricultural practices (Ahmad, 2013).

Sex of extension agents in Figure 4 claimed that; majority of the extension agents across the three districts were males. Tonkolili District has 71.6%, followed by Koinadugu with 68% and Falaba with 55%. The unequal representation of the female extension agents may be as a result of not much train female staff in extension work, and even the trained ones are sometimes not willing to work in hard-to-reach communities. Women farmers are more comfortable around female extension agents in explaining issues pertaining to their farming enterprise since they are of the same sex. Female extension workers may support women farmers in accessing extension services and also contributing in key decision making in communities that push women to the kitchen. The unequal sex representation in extension work have serve as one main supporting factor in which men still

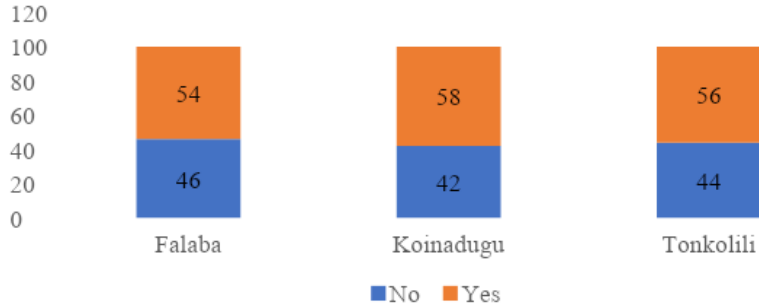


Figure 1. Access to extension services in small ruminant production

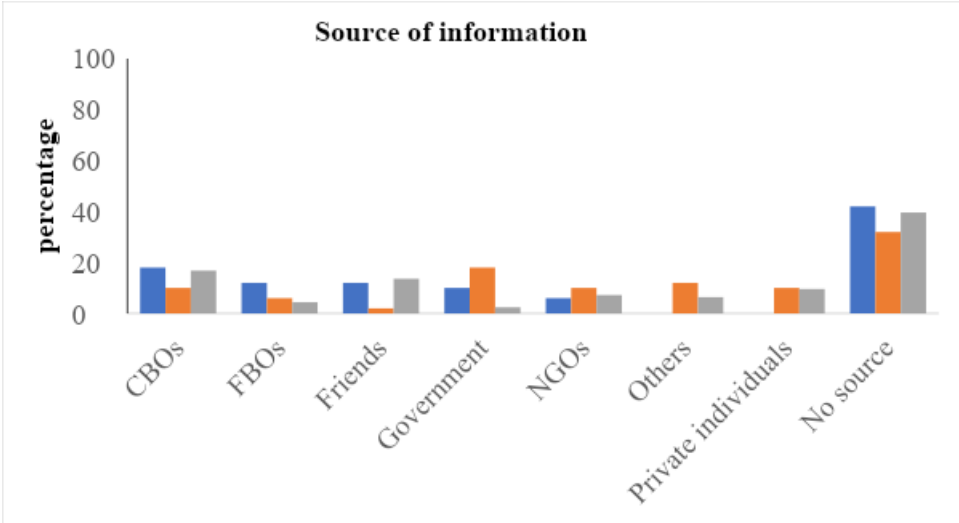


Figure 2. Source from which Extension Service Information is accessed

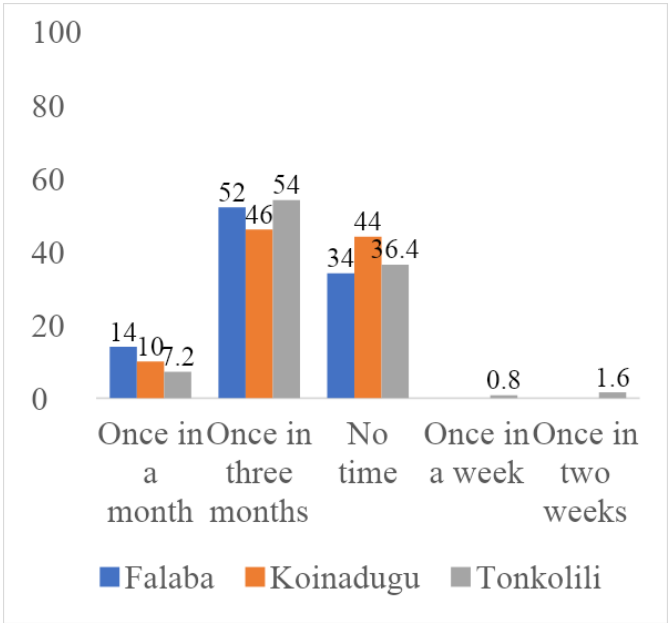


Figure 3. Frequency of extension contact

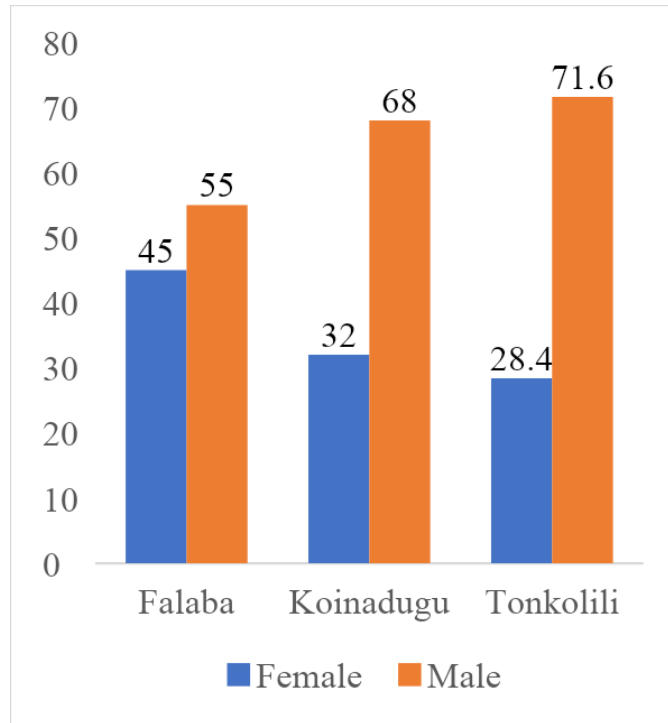


Figure 4. Sex of Extension Agents

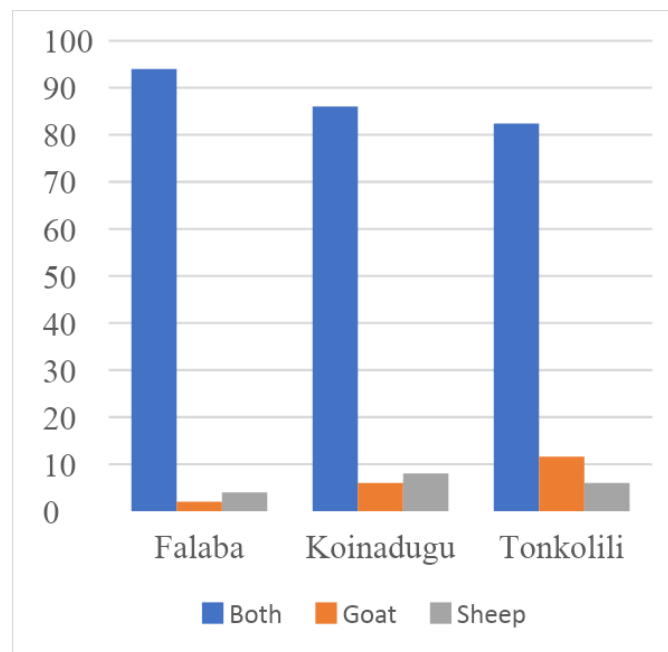


Figure 5. Types of small ruminant reared

feels that they are to control all resources owned by the family. According to Herrero (2012) said women who have access to information on their farming enterprise from female extension workers are more likely to increase their household income, which in turn lead to better livelihood. Figure 1-4

Status of Farmers in Small Ruminant Production

Figure 5 shows the type of small ruminant reared in the three districts, from the result; majority of the farmers argued that they are rearing both sheep and goats with percentages of 94% in Falaba, 86% in Koinadugu and

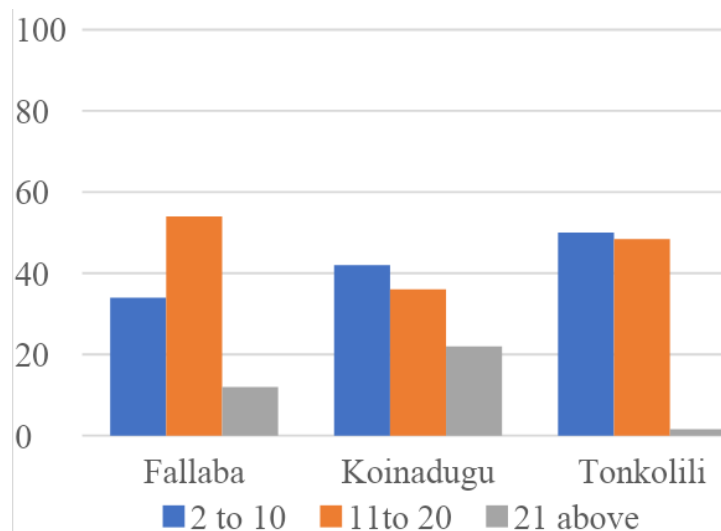


Figure 6. Scale of production of small ruminant

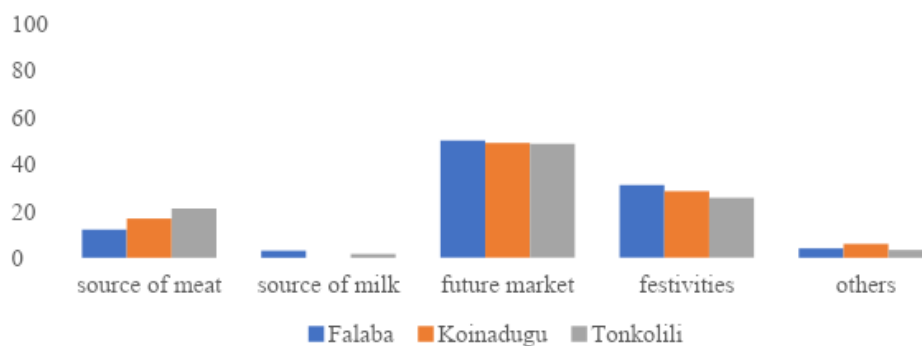


Figure 7. Reasons of rearing small ruminants

82.4% in Tonkolili Districts respectively. Rearing of both goat and sheep may be as a result of either religious or cultural purposes, since cultural and religious practices is so common among rural household, they prefer domesticating both of the species. Rearing these species can support in the fulfillment of farmers religious and cultural ceremonies apart from using them as source of income and protein.

In addition, the number of small ruminants in farming household was studied and from the result, it is depicted that the herds of most farming household are between 2-10 at a percentage of 34% for Falaba, 42% for Koinadugu and 50% for Tonkolili; and 11-20 at a percentage of 54% for Falaba, 36% for Koinadugu and 48.4% for Tonkolili. This indicates that most of the herds are 2-20 animals (sheep and goats). The rearing of goat and sheep is not really the main livelihoods of farmers in rural areas, in fact most farmers see it as an auxiliary to their main livelihood, because of this the flock size is small. Extension contacts mainly focus on productive farmers as a result most livestock farmers are hardly contacted by extension workers. The little or no contact by extension workers have frustrated small ruminants'

production because of lack of extension services like; veterinary services, improved management and feeding practices etc., and this has put more pressure on household sustainability. In contrary to this study, Adams and Yankyera (2015), infers that majority of small ruminant farmers rear animals with flock size not more than ten.

The result in Figure 7 proposed that majority of the farmers; 50% in Falaba, 49% in Koinadugu and 48.6% in Tonkolili districts rear small ruminants (goat, sheep) for sale. This predict that majority of the farmers are rearing small ruminant for market. Small ruminant is a supporting livelihood from which farmers can take care of other bills like paying children's school fees, hospital bills and other emerging issues farm farming families are faced with. Figure 5-7

Constraints Militating Against Small Ruminant Production

The result in Figure 8 revealed that, small ruminants farming production is derailed by; weather/climate at

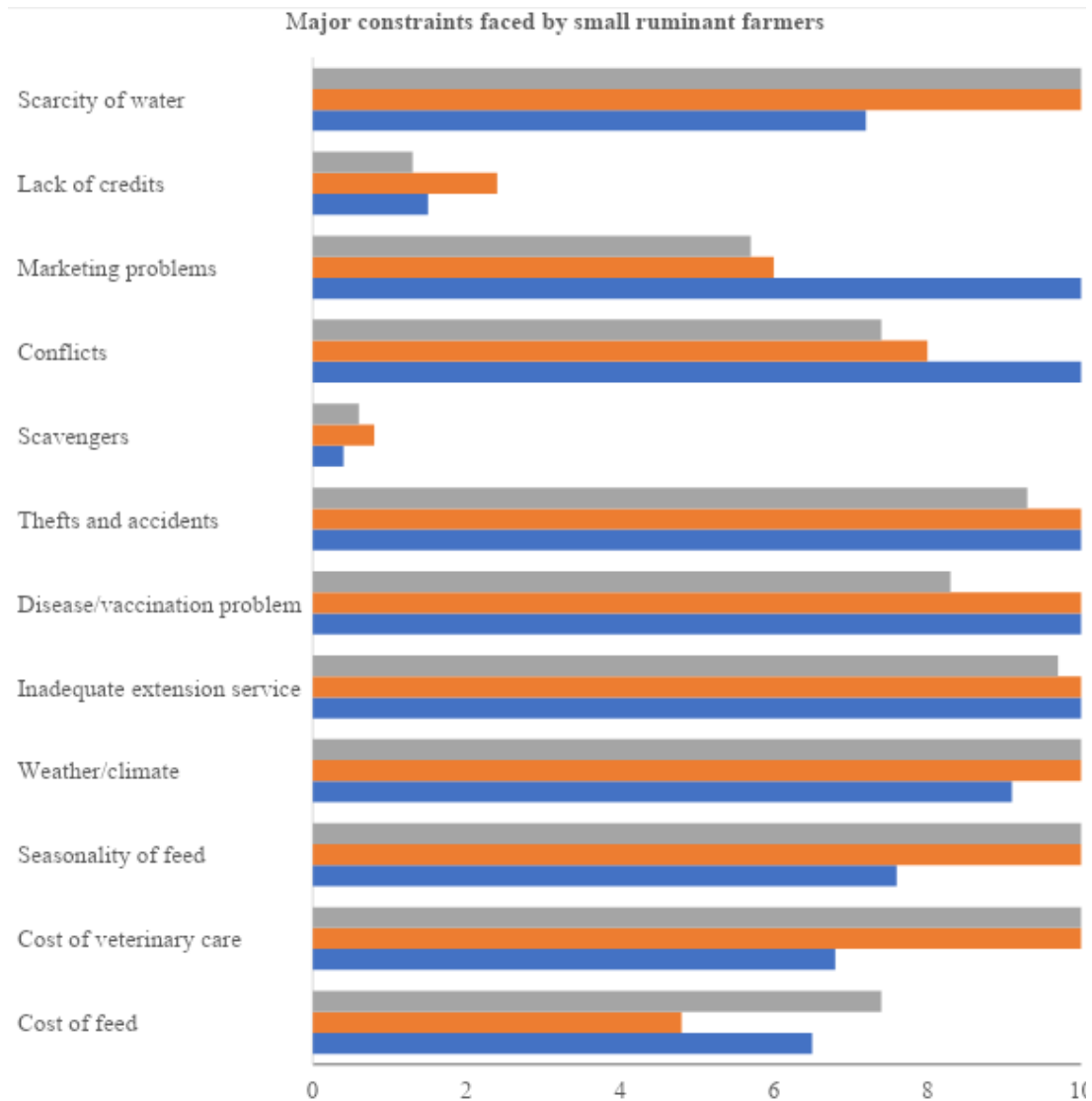


Figure 8. Constraints faced by small ruminant farmers

35.1%, inadequate extension services at 34.6%, thefts and accidents at 33.1%, disease vaccination at 30.9%, cost of veterinary service at 30%, scarcity of water at 29%, and conflicts at 27.6%. This indicates that sheep and goat production in rural communities struggles with many issues which are debarring its growth. The implication of this is that most farmers in this enterprise may not realize much dividend, and as a result it may collapse small ruminant farming in rural households. Also, energetic farmers whose involvement may boost small ruminants farming business may not be inspired in undertaking this type of farming. Various studies (Baah et al., 2012; Dossa et al., 2007; Fakoya and Oloruntoba, 2009; Naadam and Mbilla, 2010) across sub-Saharan Africa reported similar findings in their studies. These constraints either partially or wholly determine the health and general welfare of the animals and may limit

production or cause high mortality rates thereby reducing the overall economic benefits of the animals. Recruitment of more extension staff; trainings in the form of demonstrations, field trips and radio programs; may support in reducing these issues. Conteh et al. (2020) corroborated that high mortality rate especially in young animals, weak extension services, poor market system, lack of modern treatment and credit facility, feed scarcity, poor housing, theft, and neighbor conflict were the main challenges reported in their study. Recruitment of more extension personnels; provision of logistics such as fuel, top-up and good remuneration of staff; training in the form of demonstration and radio program; conducting adult literacy program; provision of loan and credit facilities or subsidizing for veterinary cost and disease management may contribute in subsidizing these numerous challenges encountered.

Table 3. PCA on Factors Militating Against Small Ruminant (sheep and goat) Farming

Major constraints faced by small ruminant farmers	Component	
	One (1)	Two (2)
Cost of feed	-.713	-.022
Cost of veterinary care	-.802	.273
Seasonality of feed	-.857	-.133
Weather/climate	-.784	-.251
Scarcity of water	-.913	.095
Inadequate extension service	.625	.360
Disease/vaccination problem	.942	-.075
Thefts and accidents	.940	-.003
Scavengers	.255	-.500
Conflicts	.896	-.128
Marketing problems	.759	-.045
Lack of credits	.252	.768

Source: Computed from Field Data (2022)

The Principal Component Analysis (PCA) was used to reduce the number of factors serving as constraints militating against small ruminants' production. From the analysis, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value .910 is good since it is above .80; also, the PCA model reduce the twelve factors in to component one and component two with values of 7.011 and 1.156 respectively. The pattern matrix is used to read the loading of the factors in component one loading; Inadequate extension service, Disease/vaccination problem, Thefts and accidents, Conflicts, Marketing problems are the ones that are well loaded in the model. In the study of Turkson (2008), Turkson and Amakye-Ansah (2005) and Turkson and Naandam (2003) reported two main constraints which includes; diseases and pest of small ruminant. Also, Adesehinwa et al. (2004) in Nigeria also observed that disease and pest posed the biggest threat to small ruminant production. In addition, Turkson (2003) raised an issue of the inadequacy of livestock health service stations and health professionals, which has almost put the veterinary services to a standstill in Ghana. Table 3

CONCLUSION AND RECOMMENDATIONS

The study of the research concluded that; extensive system is the major system of raising small ruminants, and the male farmers in rural communities are more involved in the rearing of small ruminants. The results, also indicates that the Illiteracy rate among small ruminant farmers is relatively high. They have little or no knowledge in managing small ruminant diseases, and extension service have not been effective in small

ruminant production. Issues that were predominant in small ruminant production include; Inadequate extension service, Disease/vaccination problem, Thefts and accidents, Conflicts, and Marketing. It is recommended that; Government, NGOs Private organizations should make extension more effective by; recruiting more extension personnels; provision of logistics such as fuel, top-up and good remuneration of staff; training in the form of demonstration and radio program; conducting adult literacy program; provision of loan and credit facilities or subsidizing for veterinary cost and disease management. Extension staff should be upgraded through extension related courses either in universities, training colleges or other platforms use in capacity building. In addition, formation and strengthening of farmer groups by extension workers, and also conducting extension education programs for community members

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