

Doi: 10.21059/buletinpeternak.v45i4.62099

Preference of Goat Farmers to Agricultural Extension as a Source of Information and Knowledge in Banjarnegara Regency

Mochamad Sugiarto^{1*}, Yusmi Nur Wakhidati¹, and Dyah Gandasari²

¹Faculty of Animal Science, Jenderal Soedirman University, Purwokerto, 53123, Indonesia

²Bogor Agriculture Development Polytechnic (POLBANGTAN Bogor), Human Resource Development and Extension Agency, Ministry of Agriculture, Bogor, 16730, Indonesia

ABSTRACT

Increasing knowledge of farming is essential in increasing goat production in the rural areas of Banjarnegara Regency. Increased knowledge come from many sources, such as extension and non-extension services (other farmers, books, and other government officials). Systematic efforts continue to increase agricultural extension workers' role in providing information and knowledge to goat farmers. This study aims to identify farmers' preference for the agricultural extension as a source of knowledge and analyze the factors that influence the selection of sources of information and knowledge. One hundred sixty goat farmers in Banjarnegara Regency were selected as respondents using a multistage sampling method. The data collected were analyzed using descriptive statistics and logistic regression. The analysis results showed that most of the goat farmers in Banjarnegara Regency (74.37 percent) preferred obtaining knowledge from non-extension sources. In other words, only a small proportion of goat farmers (25.63 percent) prefer to get information and knowledge from agricultural extension workers. Based on the logistic regression analysis, it was found that goat farmers' education and age of farmers were essential factors ($P < 0.05$) in making decisions related to source in obtaining knowledge on raising goats from the agricultural extension or non-agricultural extension workers. Goat farmers in Banjarnegara Regency who have lower education prefer to get information related to goat farming from non-agricultural extension workers. Meanwhile, younger goat farmers tend to get information from non-agricultural extension workers. Therefore, agricultural extension workers have a more strategic role for goat farmers who have higher education and are more mature with adequate goat farming knowledge.

Keywords: Farmers' age, Farmers' education, Source of knowledge

Article history

Submitted: 10 December 2020

Accepted: 17 November 2021

* Corresponding author:

Telp. +62 812 2914 2833

E-mail:

mochamad.sugiarto@unsoed.ac.id

Introduction

Goat farming in Banjarnegara Regency is one of the economic modes in developing rural areas. In 2019, the goat population in Banjarnegara Regency reached 191,032 heads and showed an increase compared to the previous year of 189,164 heads (BPS Kab Banjarnegara, 2020). However, farmers only have a limited number of goats with an average of 4 heads. The limited scale of goat farming is one of the reasons why farmers have not widely used the technology. Low entrepreneurial capacity and business perspective also cause farmers not to be profit-oriented and unwilling to increase the number of goats. dos Santos Souza *et al.* (2019) stated that goats are an effective mechanism for economic revival in rural areas even though they are categorized as marginal or subsistence businesses, low productivity, low income, limited use of technology, and carried out by poor

farmers. Smallholder goat farmers in Banjarnegara Regency face many problems to increase their productivity and sustainability. The role of agricultural extension workers is becoming more strategic in disseminating knowledge and improving the skills of goat farmers in rural areas. The challenge of increasing the productivity of goat farming must be responded by strengthening the role of agricultural extension workers. Biswas *et al.* (2021) emphasize that extension services must be improved to respond to the challenges of increasing agricultural production and efficiency.

Goat farming has been able to absorb several rural workers to carry out economic activities, increase the flow of money into the village from the sale of livestock, and strengthen social values by enhancing goat farmers' groups' activities. Goat farming can control poverty in rural areas despite facing challenges in sustainability and difficulties in increasing production and developing goat populations. Consolidation of

farmer groups and related stakeholders, including extension workers, is significant to respond to challenges and obstacles caused by changes in the environment, market, and technology (Manirakiza *et al.*, 2021; Paas *et al.*, 2021). Goat farming continues to be an important part of the family's economic development, which is indicated by the commitment of the goat farmers to continue and maintain it. Goat farming is suitable for rural development because it can provide additional family income, maintain local ceremonies and village culture. However, the loss or decline in goat production can affect the dynamics of the rural economy. Therefore, it is crucial to formulate many alternative strategies and actions in maintaining the resilience and sustainability of goat farming (Visser, 2019).

Goat production has contributed to the economic development of families and rural development, especially in developing countries. The sustainability of goat farming is closely related to the ability of farmers to run more efficient and innovative agriculture. Increased production of goats also contributes to the achievement of food security, especially in rural areas. Related to this, increasing knowledge becomes a solid basis for realizing efficient, productive, and innovative livestock production (Daramola *et al.*, 2021). Expanding the understanding of goat farmers is a systematic effort to continuously provide information and assistance in carrying out goat production. The availability of adequate knowledge is indicated by the ease with which farmers face and resolve technical and economic problems. The knowledge possessed by farmers can make them more competent and, subsequently, more confident in doing goat farming. It is believed that the goat farming business in the future will face more complexities and challenges, both economically and technologically. Knowledge is one of the factors of production in agricultural enterprises that serves to encourage the creation of innovation and product creation. Knowledge can also accelerate farmers in the use of technology to increase agricultural productivity. Adequate knowledge of farmers results in farmers' ability to evaluate technology and apply it in agricultural activities to increase agricultural productivity (Floriańczyk *et al.*, 2012). Knowledge will be felt to be more critical in preparing goat farmers to face such situations, solving problems with new methods. Innovations that arise in society are caused by the ownership of knowledge by each human being in society. Agricultural extension plays an essential role in defining a set of knowledge to practice agricultural science. Agricultural workers must become a source of knowledge for farmers in practicing farming activities (Bursten and Kendig, 2021).

Various sources of knowledge are available in the social environment of farmers, both in writing and in words. Agricultural extension workers, including livestock officers, are sources of information for farmers to increase knowledge

related to goat farming. Apart from sources of information from agricultural extension workers, farmers also get information from fellow farmers, private companies, non-government organizations, and universities. Each farmer prefers accessing some sources of knowledge to strengthen his ability to manage goat farming. Maina *et al.* (2021) stated a farmer group, a collection of farmers and other information media, is an essential source of information for farmers in increasing knowledge. However, many factors influence farmers in choosing sources of information or knowledge. For example, the farmers' social and economic conditions, including the farmers' age, the education of the farmers, the experience of raising livestock, the farm size, affect the preference of the farmers to the sources of information used. Likewise, the number of family members of farmers who tend to be more than two people per family also affects family income, social network, and opportunities for family members to continue their education. Therefore, family income, family social network, and formal education of family members also may determine the type of information source selected for increasing knowledge of farming (Sheng Tey *et al.*, 2018).

Agricultural extension has a strategic role in helping farmers obtain information/knowledge and make decisions on using the right technology to get the best results in sustainable goat production. Agricultural extension has many functions and roles in agricultural development by disseminating information and knowledge to farmers. However, many farmers do not get the information, assistance, and training they need (Raimi and Kabit, 2019). Many agricultural extension workers cannot meet farmers' expectations and needs, resulting in farmers looking for alternative sources of knowledge. Many goat farmers in Banjarnegara Regency began to seek information and knowledge of goat farming from the surrounding social environment. The presence of agricultural extension workers is also not much but is considered sufficient by farmers. These conditions indicate that farmers do not want the presence of extension workers to increase their knowledge and farming skills. On the other hand, extension workers convey knowledge to goat farmers to maintain the sustainability of goat farming in Banjarnegara Regency. Özçatalbaş *et al.* (2017) stated agricultural extension workers are an important source of information for farmers. The number and quality of extension workers greatly affect the success of agriculture development. The target of extension workers to disseminate info is very varied, and the characteristics of the farmers determine the desired source of information.

The desire of goat farmers in Banjarnegara Regency to seek other sources of information is an exciting issue to develop goat production in rural areas. This study aims to analyze the preferences of goat farmers on sources of information to improve the farmer's knowledge. In

addition, this study describes the characteristics of goat farmers who still prefer information sources from agricultural extension workers. Furthermore, it is necessary to identify the influence of farmers' education, age, farming experience, number of family members, and farm size to the differences in goat farmers' preferences in obtaining information and knowledge.

Materials and Methods

A study on goat farmers' preferences for access to sources of knowledge in Banjarnegara Regency was conducted using a survey method, and 160 goat farmers respondents were selected using multistage sampling. The goat farmers in Banjarnegara Regency are categorized as smallholder farmers and have farm sizes of less than five heads. Farmers are more likely to care for Kacang and Jawarandu goats using minimal technological intervention. The first stage set sub-districts using a stratified random sampling of 20 percent of districts in the high zone (> 1000 meters above the sea level, medium (500 – 1000 meters above the sea level, and low area (< 500 meters above the sea level). Eight sub-districts were selected, and then in each selected sub-district, 20 goat farmers were taken using accidental sampling. Thus, primary data were obtained directly from goat farmers' preferences in choosing sources of knowledge (agricultural and non-agricultural extension workers) and goat farmers' characteristics.

The collected data were analyzed using a descriptive statistic to obtain a socio-demographic picture of goat farmers in Banjarnegara Regency regarding their preference for information and knowledge sources. They prefer accessing knowledge sources from extension and non-extension officers (books, learning from other farmers, and other government officials). Logistic regression analysis is used for modeling the relationship between the independent variable (factor) and the dependent variable, where the dependent variable is categorical data (two responses). In contrast, the independent variable can be interval and ratio data (Hair *et al.*, 2010). Logistic regression analysis is highly recommended if the independent variable data is a metric that does not meet the assumptions of multivariate normal distribution and homogeneity of variance between groups.

In this study, logistic regression analysis is used to identify the main factors that influence the preference of goat farmers to access sources of information and knowledge (X_1 = farmer education, X_2 = goat farming experience, X_3 = farmer age, X_4 = number of family members, and

X_5 = number of goats owned). The analysis generates a model of logistic regression $Y = a + b_1X_1 + \dots + b_nX_n$, where a is the constant, and b_1 through b_n are the coefficients. This study uses hypotheses written in H_0 and H_1 . The null hypothesis (H_0) states that the independent variables have no significant effect on farmers' preferences in choosing sources of information and knowledge at a confidence level of 0.05. At the same time, H_1 states that the independent variables significantly affect farmers' preferences in choosing sources of information and knowledge at a confidence level of 0.05.

The model test is performed with the G test or what is commonly called the log-likelihood ratio test. The log-likelihood ratio of this test has a Chi-Square distribution with degrees independent variable included in the model. Test Statistics Log-Likelihood Ratio Test or G test follows a Chi-Square distribution with degrees of freedom p and $= 5\%$. The decision criterion is to reject H_0 when the p -value of Chi-Square is less than $\alpha = 5\%$.

Results and Discussion

Goat farmers have an essential role in increasing the productivity of goat farming in rural areas. Intellectual, social, and physical assets are a compilation of main assets for farmers to accelerate goat farming development. The commercialization efforts of goat farming are an essential issue that affects goat farmers' human resources. The commercialization of goat farming will target all demographic structures of farmers, including young, female, and educated groups (Byaruhanga *et al.*, 2015).

Characteristics of goat farmers

Farmers have individual characteristics related to the goat farming activities in Banjarnegara Regency, including the farmers' age, farmers' education, farmers' experience in raising goats, number of family members, and number of goats owned, which described in Table 1.

The age of goat farmers is one of the individual characteristics that shows a person's productivity. Farmer productivity is closely related to farmers' physical condition due to age (Andarwati *et al.*, 2018). Based on Table 1, the goat farmers in Banjarnegara Regency have 46.53 years and are in the productive age category. Farmers with productive age can encourage goat farmers' involvement to increase activities in raising goats. On the other hand, the older generation will reduce the activity of farmers in being involved in goat farming activities. As a result, the older farmers reduce their participation

Table 1. Individual characteristics of goat farmers in Banjarnegara Regency

Variables	Mean	Standard of deviation
Age of farmers (year)	46.53	8.37
Farmers' education (year)	6.74	3.44
Family members (person)	3.71	0.94
Goat farming experience (year)	9.45	4.89
Number of goats owned (heads)	6.13	7.44

in several goat-raising activities (Kumar *et al.*, 2019). Farmers' education is a description of the knowledge and maturity of thinking possessed by goat farmers. A higher farmer's formal education is expected to contribute to developing a mindset to solve problems. This formal education can encourage farmers to share knowledge and be able to solve problems in different ways. As a result, goat farmers more trust each other, share their knowledge, and generate more ideas on their business development (Kmieciak, 2021). However, the educational attainment of goat farmers is still relatively low, namely only elementary school graduates, even though education can encourage farmers to have the ability to accept innovation and business development ideas. Sixty-five percent of goat farmers in Banjarnegara Regency only have a maximum formal education of elementary school. The higher education of farmers is believed to increase business productivity, especially in adopting modern technology to develop businesses (Paltasingh and Goyari, 2018).

Goat farmers' experience in raising goat farming has been quite long (average 9.45 years). The ease of raising goats and the culture of raising goats owned by farmers are becoming essential variables that can illustrate goat farmers' commitment to remain involved in goat farming for a long time. In addition, the availability of production facilities, including land owned by themselves, is one of the incentives for farmers to continue their goat farming. Long experience in goat production makes farmers able to solve the problems of their goat production. They are confident that solving problems in raising goats can be a source of knowledge to survive and develop their business. They also use their experience in raising goats as a source of knowledge for other farmers in starting and maintaining their goat farming. The use of basic knowledge synchronized with individual experiences in farming is beneficial for formulating new agricultural designs (Toffolini *et al.*, 2017).

Based on Table 1, it can also be seen that the number of goats owned by the farmers is an average of 6 heads. The increasing number of goats owned can increase the farmer family's cash and other economic benefits. Cash receipts from selling more goats are the primary goal of developing goat farming (Byaruhanga *et al.*, 2015). An adequate number of goats owned can cause profits to increase. The perception of growing earnings in raising goats can lead to farmers' family's confidence to continue maintaining the business (Adams and Ohene-Yankyera, 2014).

Farmers preferences on sources of knowledge

Increasing knowledge of goat farmers in Banjarnegara Regency is carried out through several sources of knowledge, including agricultural extension officers, books and magazines, farmer friends, and other government officials. Agricultural extension is the process of providing information to farming communities from some sources of knowledge. The more farmers have the information they need, the stronger their resources will be in agricultural development. In addition, information related to new technical innovations in agricultural development can strengthen rural human resources (Wulandari, 2015).

Based on Table 2, it can be seen that most of the goat farmers in Banjarnegara Regency (74.37 percent) prefer to gain additional information and knowledge from non-agricultural extension officers. This large percentage illustrates that farmers prefer books/magazines, farmers, and other government officials to obtain information and knowledge about goat farming. Meanwhile, a small proportion of goat farmers in Banjarnegara Regency (25.63 percent) prefer agricultural extension officers as additional information and knowledge sources. Farmers with a smaller business scale and shorter goat farming experience prefer to get knowledge and information from other farmers. The most popular source of knowledge for beginner farmers is from other farmers (Brislen *et al.*, 2016). This condition illustrates that the interaction between farmers is a fair learning process to achieve goat farming goals. Strengthening techniques and better methods for raising goats are more comfortable discussing and exchanging information with other farmers. The exchange of knowledge between farmers is purposed to interpret and apply innovations with other farmers, including increasing farming skills. Visits between farmers in pens and at home and group meetings are effective means for goat farmers to increase knowledge (Thomas *et al.*, 2020).

Goat farmers with higher education prefer agricultural extension workers as a source of knowledge. Besides, farmers of younger age and less farming experience learn from non-agricultural extension workers, namely farmer friends, books, and other government personnel. Goat farmers who do not have much experience with small livestock numbers prefer to access information from other farmers who have much experience. Among other farmers, the head of the farmers' group has an important role in discussing and asking questions for farmers (Gandasari *et al.*, 2020). Farmers like getting information from other farmers because it does not require

Table 2. The characteristics and preferences of goat farmers in accessing the source of knowledge and information

Sources of information and knowledge	Total	Age of farmers (years)	Farmers' education (years)	Number of family members (heads)	Farming experience (years)	Number of goats owned (heads)
Agricultural extension	41	48.11	8.5	3.7	10.05	5.70
Non-agricultural extension	119	46.33	6.5	3.7	9.37	5.05

complicated and expensive communication infrastructure. However, farmers do not only rely on data from friends / other farmers. Information from the private sector, professionals, and books is also needed in completing farmer information needs (Gebu *et al.*, 2017).

Influencing factors of farmer preferences on sources of knowledge and information

Goat farmers in Banjarnegara Regency were dichotomized into two preferences in obtaining livestock information and knowledge. The first group is goat farmers who prefer agricultural extension officers as sources of information and knowledge. Farmers who want to raise goats and learn from agricultural extension workers tend to be fewer, namely only 25.63 percent. This relatively small percentage is partly because agricultural extension workers are less intensive in training and visiting goat farmer households in Banjarnegara Regency. Extending workers' limited visits has made goat farmers seek other alternatives to gain additional knowledge and information. Extension workers see farmers only once a month and sometimes do not systematically transfer knowledge and technology. This condition is in line with the opinion that agricultural extension services and electronic media play an important role in adopting new agricultural technologies. However, many in developing countries' extension services are not very impressive. Most farmers do not know the type of extension services and how to benefit from the extension services. Farmers tend not to visit local agricultural offices, and only a small proportion of farmers report the visit of extension workers to their farm sites, most of whom are prominent and influential farmers. Agricultural extension workers should visit farmers more and use a variety of approaches to deliver information and knowledge to farmers (Ahmad *et al.*, 2007; Maulu *et al.*, 2021). Goat farmers in Banjarnegara Regency recognize and adopt goat farming technology, mainly from relatives and other farmers. Sources of information and knowledge from informal and formal personalities can encourage the intention to adopt goat farming technology through the usefulness perceived by farmers (Caffaro *et al.*, 2020).

The initial assumption used to perform logistic regression analysis is multicollinearity. Therefore, the first step that must be seen is to look at the multicollinearity between the independent variables (Hair *et al.*, 2010). SPSS issued an output correlation matrix to know the degree of correlation between the independent variables. Based on Table 3, it can be seen that there is no relationship between the independent variables with a correlation coefficient of more than 0.9. This fact shows that there is no high multicollinearity symptom. SPSS has also automatically issued the likelihood ratio value (statistical G) in the output of Table 4. Based on the table, the likelihood ratio value in the Chi-square column obtained a significance level (0.007) less than = 5%. Overall, the independent variables included in the model (farmer's education, livestock experience, farmer's age, number of families, and farm size) can explain the variability in choosing sources of knowledge from or other than extension workers and is described in the following equation model.

$$\ln\left(\frac{p}{1-p}\right) = 0.410 * \text{Farmer's education} - 4.845 + 0.080$$

- * Farmer's experience + 0.087
- * Farmer's age - 0.283
- * number of family members - 0.091
- * number of goats owned

Based on logistic regression analysis in Table 5, it can be seen that differences in the preferences of goat farmers in getting/accessing sources of knowledge are caused by the level of education and age of the farmers. The higher the goat farmers' education, the more likely they chose agricultural extension workers as a source of knowledge ($P < 0.01$). Goat farmers' education has a logistic regression coefficient of 0.410 and a Wald statistic of 12.150 with a significance value of 0.000 ($P < 0.01$). Therefore, H_0 is rejected, which means that goat farmers' education significantly affects the choice to obtain knowledge sources (agricultural extension workers or non-agricultural extension workers). Furthermore, the increasing age of goat farmers can lead to a preference for accessing information/knowledge from agricultural extension officers. The age of goat farmers has a logistic regression coefficient of 0.87 with a Wald statistic of 4.362 and a significance value of 0.037.

Table 3. Correlation of independent variables

	Constant	Farmers' education (X ₁)	Goat farming experience (X ₂)	Farmers' age (X ₃)	Number of family members (X ₄)	Number of goats owned (X ₅)
Step 1 Constant	1.000	-.681	-.025	-.798	-.144	-.072
Farmers' education (X ₁)	-.681	1.000	.264	.481	-.281	-.184
Goat farming experience (X ₂)	-.025	.264	1.000	-.335	-.016	-.311
Farmers' age (X ₃)	-.798	.481	-.335	1.000	-.248	.038
Number of family members (X ₄)	-.144	-.281	-.016	-.248	1.000	.024
Number of goats owned (X ₅)	-.072	-.184	-.311	.038	.024	1.000

Table 4. Likelihood ratio value (omnibus tests of model coefficients)

		Chi-square	df	Sig.
Step 1	Step	16.122	5	.007
	Block	16.122	5	.007
	Model	16.122	5	.007

Table 5. The influencing factors on preferences of goat farmers towards knowledge sources

Variables	Coefficient of regression	Wald	Significance (p)
Farmers' education (X_1)	0.410	12.150	0.001**
Goat farming experience (X_2)	0.080	1.511	0.219
Farmers' age (X_3)	0.087	4.362	0.037*
Number of family members (X_4)	-0.283	0.882	0.348
Number of goats owned (X_5)	-0.091	1.018	0.313

** The regression was significant at the 0.01 level (2-tailed).

* The regression was significant at the 0.05 level (2-tailed).

This condition states that H_0 is rejected, which means that the age of the goat farmers has a significant effect on the choice of knowledge sources preferred by goat farmers in Banjarnegara Regency.

The above mention is synergistic with other researchers who show that more educated farmers, older farmers, and larger farm sizes tend to choose sources of knowledge and information from agricultural extension (Velandia *et al.*, 2009). Estimates in the future, after goat farming moves towards commercialization and goat farmers have higher education, information sources from information technology will be the primary choice. Income, education, and the innovation-based farmer were determining factors in using information communication technology as sources of knowledge and information (Ali, 2012).

Conclusions

A small proportion of goat farmers in Banjarnegara Regency prefer to obtain information and knowledge from agricultural extension officers. Meanwhile, most goat farmers access information and knowledge from fellow farmers, relatives, books/magazines, and other government officials. Agricultural extension is preferred as a source of information and knowledge for farmers is favored by goat farmers with higher education, older age, more size of goat farming, and more extended farming experience. The education and age of goat farmers are essential and influencing factors of farmers in selecting sources of information and knowledge.

References

- Adams, F. and K. Ohene-Yankyer. 2014. Determinants of factors that influence small ruminant livestock production decisions in northern Ghana: application of discrete regression model. *J. Biology, Agriculture and Healthcare* 4: 310–321.
- Ahmad, M., M. Akram, R. Rauf, I. A. Khan, and U. Pervez. 2007. Interaction of extension worker with farmers and role of radio and television as sources of information in technology transfer: a case study of four villages of district Peshawar and Charsadda. *Sarhad J. Agric.* 23: 515–518.
- Ali, J. 2012. Factors affecting the adoption of information and communication technologies (ICTs) for farming decisions. *Journal of Agricultural and Food Information* 13: 78–96. DOI: 10.1080/10496505.2012.636980.
- Andarwati, S., T. Haryadi, B. Guntoro, E. Sulastris, R. A. R. S. Putra, and Gunawan. 2018. Relationship Between Farmer's Characteristics with the Motivation of Goat Milking in the Girikerto Village Turi District Sleman Regency. *Buletin Peternakan* 42: 256–261. doi: 10.21059/buletinpetermak.v42i3.32771
- Biswas, B., B. Mallick, A. Roy, and Z. Sultana. 2021. Impact of agriculture extension services on technical efficiency of rural paddy farmers in southwest Bangladesh. *Environmental Challenges*. Elsevier 5: 1–10. DOI: 10.1016/j.envc.2021.100261.
- BPS Kab Banjarnegara. 2020. Kabupaten Banjarnegara dalam Angka Tahun 2020. BPS Kabupaten Banjarnegara.
- Brislen, L., K. Tanaka, and K. Jacobsen. 2016. Preferred knowledge sources for beginning farmers: The case of Kentucky. *Journal of Extension* 54: 1–8.
- Bursten, J. R. S. and C. Kendig. 2021. Growing knowledge: Epistemic objects in agricultural extension work. *Studies in History and Philosophy of Science*. Elsevier 88: 85–91. DOI: 10.1016/j.shpsa.2021.03.002.
- Byaruhanga, C., J. Oluka, and S. Olinga. 2015. Socio-economic Aspects of Goat Production in a Rural Agro-pastoral System of Uganda. *Universal Journal of Agricultural Research*. 3: 203–210. DOI: 10.13189/ujar.2015.030604.
- Caffaro, F., M. M. Cremasco, M. Roccato, and E. Cavallo. 2020. Drivers of farmers' intention to adopt technological innovations in Italy: The role of information sources, perceived usefulness, and perceived ease of use. *Journal of Rural Studies*. Elsevier 76: 264–271. DOI: 10.1016/j.jrurstud.2020.04.028.
- Daramola, J. O., M. O. Abioja, O. S. Iyasere, O. E. Oke, B. C. Majekodunmi, M. O. Logunleko, E. O. Adekunle, E. U. Nwosu, O. F. Smith, I. J. James, T. J. Williams, and J. A. Abiona. 2021. The resilience of Dwarf goats to environmental stress: A review. *Small Rumin. Res.* 205: 1–8.
- Floriańczyk, Z., K. Janc, and K. Czapiewski. 2012. The importance and diffusion of knowledge in the agricultural sector: The Polish experiences. *Geographia Polonica* 85: 45–56. DOI: 10.7163/GPOL.2012.1.4.
- Gandasari, D., S. Suwardi, R. R. S. Wihansah, Wardani, and O. A. Taopik. 2020. Analysis

- of agribusiness communication network among beef cattle farmers: Case study at sarimulya Mandiri as the beginner's farmers group. *Int. J. Adv. Sci. Tech.* 29: 5339–5347.
- Gebru, B., M. Yared, and N. Gebremichael. 2017. Sources of information and information-seeking behavior of smallholder farmers of Tania Abergelle Wereda, central zone of Tigray, Ethiopia. *J. Agricultural Extension Rural Development* 9: 47–52. DOI: 10.5897/jaerd2016.0850.
- Hair, J. F., W. C. Black, B. J. Babin, and R. E. Anderson. 2010. *Multivariate Data Analysis* (7th edn). Prentice-Hall, New Jersey, USA.
- Kmieciak, R. 2021. Trust, knowledge sharing, and innovative work behavior: empirical evidence from Poland. *European Journal of Innovation Management* 24: 1832–1859. DOI: 10.1108/EJIM-04-2020-0134.
- Kumar, R., M. C. Sharma, M. L. Gurjar, and R. Kumar. 2019. Socio-economic characteristic of tribal goat keepers of Dungarpur district of Rajasthan state. *J. Entomology Zoology Studies* 7: 1101–1104.
- Maina, C. M., H. T. Nyang'anga, J. I. Mburu, J. M. Kasina, M. M. Guantai, J. H. Nderitu, and V. N. Gathaara. 2021. Determinants influencing farmers' use of macadamia nut information sources in central Kenya. *J. Agric. Food Res.* 5: 1-6. doi: 10.1016/j.jafr.2021.100184.
- Manirakiza, J., N. Moula, J. Detilleux, G. Hatungumukama, and N. Antoine-Moussiaux. 2021. Socioeconomic assessment of the relevance of a community-based goat breeding project in smallholding systems. *Animal Elsevier* 15: 1-10. DOI: 10.1016/j.animal.2020.100042.
- Maulu, S., O. J. Hasimuna, B. Mutale, J. Mphande, and E. Siankwilimba. 2021. Enhancing the role of rural agricultural extension programs in poverty alleviation: A review. *Cogent Food and Agriculture*. *Cogent* 7: 1-13. DOI: 10.1080/23311932.2021.1886663.
- Özçatalbaş, O., M. Imran, G. Gurkan, H. Durmus, and T. Unlu. 2017. The role of agricultural extension and agricultural education for sustainability. *Proceedings of the 23rd European Seminar on Extension and Education*. (July), pp. 1–4.
- Paas, W., C. S. Martin, B. Soriano, M. K. Van Ittersum, M. P. Meuwissen, and P. Reidsma. 2021. Assessing future sustainability and resilience of farming systems with a participatory method: A case study on extensive sheep farming in Huesca, Spain. *Ecological Indicators* 132: 1-18. DOI: 10.1016/j.ecolind.2021.108236.
- Paltasingh, K. R. and P. Goyari. 2018. Impact of farmer education on-farm productivity under varying technologies: case of paddy growers in India. *Agricultural and Food Economics* 6: 1–29. DOI: 10.1186/s40100-018-0101-9.
- Raimi, E. and H. Kabiti. 2019. A Review of The Role of Agricultural Extension and Training in Achieving Sustainable Food Security: A Case of South Africa. *S. Afr. J. Agric. Ext.* 47: 120–130.
- dos Santos Souza, M. F., L. C. G. Passetti, T. S. Gonçalves, R. A. C. Passetti, and G. R. de Arruda Santos. 2019. Characterisation of goat product consumers and goat farming systems in the Brazilian Northeast region. *Small Ruminant Research* 179: 7–13. DOI: 10.1016/j.smallrumres.2019.08.017.
- Sheng Tey, Y., M. Brindal, E. Li, G. Gill, J. Bruwer, A. M. Abdullah, A. Radam, M. M. Ismail, and S. Darham. 2018. Factors affecting the selection of information sources of sustainable agricultural practices by Malaysian vegetable farmers. *J. Agricultural Food Information*. Taylor Francis 19: 162–175. DOI: 10.1080/10496505.2017.1328310.
- Thomas, E., M. Riley, and J. Spees. 2020. Knowledge flows: Farmers' social relations and knowledge sharing practices in "Catchment Sensitive Farming". *Land Use Policy* 90: 1-9. DOI: 10.1016/j.landusepol.2019.104254.
- Toffolini, Q., M. Jeuffroy, P. Mischler, J. Pernel, and L. Prost. 2017. Farmers' use of fundamental knowledge to re-design their cropping systems: situated contextualisation processes. *J. Life Sci.* 80: 37–47. DOI: 10.1016/j.njas.2016.11.004.
- Velandia, M., D. M. Lambert, A. Jenkins, R. K. Roberts, J. A. Larson, B. C. English, and S. Martin. 2009. Factors Influencing Selection of Information Sources by Cotton Producers Considering Adoption of Precision Agriculture Technologies Presented at Agricultural & Applied Economics Association Conference, Milwaukee, Wisconsin, pp. 26–29.
- Visser, C. 2019. A review on goats in southern Africa: An untapped genetic resource. *Small Ruminant Research*. Elsevier 176: 11–16. DOI: 10.1016/j.smallrumres.2019.05.009.
- Wulandari, R. 2015. Information needs and source information of agricultural extension workers in DIY. *J. Agribusiness Rural Development Research* 1: 85–87. DOI: 10.18196/agr.1212.