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Research Article

Adoption of the Improved Sorghum Variety (Melkame) in the West Hararghe, Mieso District

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Abstract

Sorghum bicolor, also known as sorghum, is a type of grass that is grown for its grain. This grain is used for various purposes, such as human consumption, animal feed, and ethanol production. The study aims to identify the factors that influence the adoption of the Melkam sorghum variety in the Mieso district by collecting primary data from 160 randomly selected respondents through a structured questionnaire. Econometric models were then employed to analyze the relationship and determine the adoption factors of the Melkam Sorghum variety using STATA 13 software. The study utilized frequencies, percentages, correlation, and regression to analyze the data. The findings indicated that the use of improved sorghum (Melkam) resulted in a positive correlation with the availability of an active working labor force in the household. Farmers were more inclined to adopt new technologies when they frequently interacted with extension agents. The size of the family and the frequency of contact with extension agents significantly influenced farmers' decisions to adopt the improved sorghum (Melkam) variety ($t = 5.07$, $P>0.005$) and ($t = 6.73$, $P>0.005$) at 1 percent, respectively. The study recommends that the government should increase their contact with farmers to at least once a month through extension agents to promote the adoption of improved sorghum (Melkam). Therefore, to improve communication with farmers, extension agents should utilize local community organizations and effective traditional knowledge-sharing methods in conjunction with modern extension systems. It is recommended that extension agents prioritize households with larger family sizes as potential adopters of new technologies, while also paying special attention to households with smaller family sizes.

Keywords

Adoption, Melkam Sorghum Variety, Correlation, Regression

1. Introduction

Sorghum bicolor, commonly called sorghum is a grass species cultivated for its grain, which is used for food for humans, animal feed, and ethanol production. Sorghum originated in Africa, and is now cultivated widely in tropical and subtropical regions. [4] Sorghum is the world's fifth-most important cereal crop after rice, wheat, maize, and barley, with 61,000,000 metric tons (60,000,000 long tons; 67,000,000 short tons) of annual global production in 2021. [3]

Ethiopia is the fourth top sorghum producing country in the world following the United States of America, Nigeria and Mexico. [4] In terms of geographical coverage and production, sorghum is the third most significant crop after tef and maize in Ethiopia.

The sector is the largest contributor to the overall economy

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and is fundamental to Ethiopia's overall development. The agriculture sector continues to be the most dominant aspect of the Ethiopian economy, accounting for nearly 42% of GDP, 80% of employment, and 83.9% of foreign export earnings. [5]

Despite of its contribution to the national GDP by large, agriculture in Ethiopia is subsistence. Smallholder farmers are cultivating 95% of their farmland using mostly traditional farming practices and inadequate improved technology can be found in the low productivity Ethiopian agriculture. [10]

Mieso is characterized primarily by an uneven distribution of rainfall, drought, and a lack of rainfall. soil fertility issues, environmental degradation, conflict with neighboring tribes, past and present Disease, the widespread spread of noxious weeds such as parthenium (Congress Weed), and Prosopis juliflora (exotic acacia spp.) and crop production problems in the study area. Following that, there will be input supply, marketing, agro-pastoral awareness, a lack of training, and so on. As a result, crop production has become highly unpredictable and unsatisfactory. Throwing a major proportion of the rural population into a chronic food insecurity situation [6].

The study area lacks comprehensive research on the adoption of Melkam Sorghum technology. This research aims to fill that gap by focusing on the adoption of the Melkam Sorghum variety.

1.1. Research Questions

The following questions guided the conduct of the study:

1. What is the relationship between age and melkam sorghum variety adoption in Mieso District?
2. What is the relationship between family size and melkam sorghum variety adoption in Mieso District?
3. What is the relationship between the frequency of contact with extension agents and melkam sorghum variety adoption in Mieso District?

1.2. Hypotheses

1. There is no significant relationship between age and melkam sorghum variety adoption in Mieso District.
2. There is no significant relationship between family size and melkam sorghum variety adoption in Mieso District.
3. There is no significant relationship between the frequency of contact with the extension agent and melkam sorghum variety adoption in Mieso District.

2. Research Methodology

2.1. Description of the Study Area

Mieso is a woreda in the Oromia Region, Ethiopia. Part of the West Hararghe Zone, Mieso is bordered on the south by Guba Koricha, on the west by the Afar Region, on the north by the Somali Region, on the east by Doba, and on the southeast by Chiro. The administrative center for this District is Mieso; other towns in Mieso include Bordede, Asebot, Kora, and Gololcha.

The altitude of Mieso ranges from 1107 to 3106 meters above sea level; the highest point is Mount Asabot (1523 meters). Rivers include the Beke. A survey of the land in Mieso shows that 11.5% is arable or cultivable (10.7% of the total area was under annual crops), 23.7% is cultivable if water were available, 8.9% is pasture, 28.7% is forest or brush land, and the remaining 27.3% is considered hilly, built-up, or otherwise unusable. Sesame and haricot beans are important cash crops. [7]

In this farming system, the average landholding size for cultivable land is 1.5 hectares per household. However, the proportion of total land to total rural households is also 1.5 hectares. Mieso is divided into 5 zones, each containing between 5 and 12 PAs. The 29 PAs of this farming system are scattered across four of these zones. Some PAs from these four zones are also classified under other farming systems.

2.2. Sampling Technique

To select survey sites, a purposive sampling design was used. Because of the wide differences in adoption practices between agro-pastoralists and pastoralists in the district, Meiso District is broadly divided into agro-pastoral and pastoral farming systems. The agro-pastoralists assumed they practiced crop production. As a result, agro-pastoral areas must be chosen with greater care than pure pastoral PAs. The samples were taken using a simple random sampling technique proportional to their size [9].

$$n = \frac{N}{1+N(e)^2}$$

2.3. Methods of Data Collection

Data collection was conducted from May to June 2022. Structured questionnaires were prepared, pretested, and adjusted accordingly. 12 enumerators (two from each kebeles) who speak the local language were recruited for the study. They have better qualifications and experience in data collection and have been trained on how to administer the data collection work. Field trips were taken before the actual survey to observe the overall features of the selected kebeles and to pre-test the questionnaire. For pre-testing purposes, 12 agro-pastoral households outside the sample agro-pastoral were interviewed, at the rate of one agro-pastoral by each enumerator. After pre-testing, a second meeting was held with the enumerators to discuss their field experiences, clarity of questions, language, unexpected responses, and additional response options for questions. After incorporating corrections, the final version of the questionnaire was prepared. The chief researcher provides continuous supervision to correct potential errors on the spot.

2.4. Data Analysis Method

The data from the agro-pastoral survey were examined utilizing both descriptive and econometric data processing approaches. The methods utilized to examine characteristics connected to the adoption of Melkam sorghum variety included descriptive statistics such as correlation, regression, frequencies, percentages, and tabular analysis.

3. Results and Discussions

According to the data in the table below, out of 160 respondents in the sample, 71 (44.38%) have adopted the melkam sorghum variety, while 89 (55.63%) have not. This indicates that the level of adoption of improved technology for the Melkam sorghum variety in the study area is low, which would invariably affect their productivity.

Table 1. *Descriptive result dummy variable.*

Farmer's response on the use of improved melkam sorghum variety.	Frequency	Percent
Yes	71	44.38
No	89	55.63
Total	160	100

The data in Table 2 below show that farmers are made more aware of the benefits of improved sorghum technologies thanks to extension contacts. This finding suggests that farmers' contact with extension agents is positively related to farmers' use of improved sorghum (Melkam) varieties and that frequent contact with extension agents is critical to the adoption of improved sorghum (Melkam) varieties. Therefore, contacting extension staff may help change farmers' perceptions and attitudes toward long-term investments. This implies that extension agents in the study area should improve their services, as extension plays a catalytic role in sorghum technology adoption.

Furthermore, the availability of an active working labor force in the household is defined as available to perform production activities. A large available labor force is assumed to be an indicator of family members efficiently performing more household tasks. Based on this, the availability of family labor is an important input for a crop and other agricultural production to achieve the expected outcome of the expected method of production. This study confirms a positive correlation between the use of improved sorghum (Melkam) and an active working labor force in households. Hence, the Extension agent and other concerned bodies should employ those families as promoters for the fast dissemination of technologies. Show Table 2.

Table 2. *Correlate UseofISorV sex age Fsize FconWiEX.*

	UseofsorVariety	Sex	Age	Fsize	FConWiEX
Useofsor Variety	1.0000				
Age	0.1349	-0.0422	1.0000		
Fsize	0.3087	0.1940	0.3453	1.0000	
FConWiX	0.4141	-0.0203	0.0682	-0.1139	1.0000

Household size is likely to influence the decision to adopt new technology, such as improved sorghum varieties. A larger family is more likely to adopt new technology, and as access to labor increases, adoption is expected to increase as well. Therefore, household size is an important factor to consider when assessing the potential adoption of improved sorghum varieties, as it is likely to positively impact the adoption rate. This finding is different from [1] Show Table 3.

Farmers are more likely to adopt new technologies when they frequently interact with extension agents. This is because people tend to embrace innovations when they hear about them often. Therefore, regular engagement with extension agents can have a positive impact on the adoption of melkam and sorghum varieties. This finding is consistent with the research conducted by [2, 8] which

showed that farmers are more likely to adopt new technologies when extension services are easily accessible. Through these services, farmers can learn about the benefits of new technologies. Please refer to Table 3 for more information.

Table 3. *Regress UofISorV age Fsize FconWiEX.*

Variable	Coef.	Std. Err	t	P>|t|
Age	-0.0013157	0.0034824	-0.38	0.706
Fsize	0.0770269	0.0151961	5.07	0.000 ***
FConWiEX	0.2824921	0.0419561	6.73	0.000 ***

4. Conclusion

This study aimed to identify the factors that influence the adoption of improved technologies in Melkam sorghum production in the Mieso district of the Oromia regional state. The study found that family size and frequency of contact with extension agents are the main factors that affect the adoption of improved technologies among Melkam sorghum farmers. However, the age of the farmer does not seem to be a limiting factor in the adoption of the Melkam sorghum variety in the study area. Additionally, a significant percentage of farmers still use traditional methods of production, indicating that extension agents should expand their services to include technology packages, in addition to disseminating new sorghum varieties that are ready to adopt the technologies. Therefore, adoption rates may increase if extension agents frequently contact households with larger family sizes. The study also revealed that extension services play a crucial role in adoption. However, the extension service in the study area was inadequate, with contacts occurring mostly once every six months.

5. Recommendation

Based on the findings of the study, the following recommendations were made:

The government, through extension agents, should increase the frequency of their contact with farmers to at least once a month. This is because farmers tend to adopt new technologies more readily when they receive frequent updates about new technologies. Moreover to increase the contact with farmers extension agent should use local community organization and effective traditional way of knowledge sharing.

Extension agents should prioritize households with larger family sizes as promoters of new technologies. They should also pay special attention to households with smaller family sizes.

Author Contributions

Samson Moges is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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