



Research Paper

Determinant of Pastoralist Participation in Dry Fish Agribusiness Value Chain Activities: An Implication for Employment Opportunities

Chuol Bor

Department of Rural Development and Agricultural Extension, Gambella University, Gambella, Ethiopia

Abstract

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Dry fish agribusiness offers pastoralist communities a valuable source of income during the dry season when livestock productivity declines. This study examined pastoralist participation in the dry fish agribusiness value chain in the Akobo district. Akobo was chosen through simple random sampling to eliminate selection bias and ensure a representative sample. Sample kebeles were selected using a systematic approach, while respondents were chosen through stratified sampling to ensure the representation of both participants and non-participants in the dry fish agribusiness. Data were collected via structured interviews and questionnaires and then analyzed using descriptive, inferential statistics, and a binary logistic model. Findings revealed that pastoralists are involved in production, processing, transportation, and marketing. Key challenges include low education levels, poor infrastructure, limited training, underdeveloped markets, and high transport costs. The binary logistic model indicated that education level, market access, and household size positively influenced their participation. Enhancing dry fish agribusiness is crucial for improving livelihoods in Akobo, highlighting the need to better equip pastoralists for active participation.

1. Introduction

Pastoralist communities, traditionally reliant on livestock, have increasingly adopted dry fish agribusiness to diversify income due to climatic changes, market demand, and potential profitability (Dong, 2016; Deng, 2020). This shift provides supplementary income during low livestock productivity in dry seasons and meets rising domestic and international demand (Kirui et al., 2022; Schilling & Werland, 2023). Climate

challenges have further necessitated this move towards alternative livelihoods (Abdulkadr, 2019). Understanding the factors influencing their participation in this value chain is crucial for policy and research.

Dry fish agribusiness is a vital economic activity for pastoralist communities in Sub-Saharan Africa, providing essential income and food security (Chan et al., 2021). Despite its

Author email: nyanuer874@gmail.com

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importance, various challenges hinder their full participation in this value chain. Key obstacles include limited access to credit and markets, which prevent these communities from obtaining necessary resources such as boats, nets, and preservation techniques. Additionally, restricted market access limits their ability to sell products competitively and reach broader customers. As a result, their economic potential remains untapped, jeopardizing their livelihoods (Pomeroy et al., 2020). In Ethiopia, dry fish agribusiness offers pastoralist communities additional income opportunities, yet participation is influenced by market access, infrastructure, processing facilities, traditional skills, and financial resources (Abdulkadr, 2019; Filho et al., 2020). Cultural practices also play a role, making it essential to understand these factors for effective support strategies (OECD, 2021).

Dry fish agribusiness plays a vital role in the economic livelihoods of pastoralist communities in the Gambella region, which is abundant in fish resources. Engaging in this sector allows communities to generate income and improve their living standards (Deng, 2020). By

leveraging traditional knowledge of fish preservation and utilizing available processing facilities, pastoralists can enhance their economic potential (Rasekhi et al., 2022; Piria et al., 2024). However, cultural practices and beliefs surrounding fish consumption and fishing significantly impact engagement and success in this business (Lacio et al., 2022). Understanding the determinants of pastoralist participation in the dry fish value chain is essential for fostering sustainable economic development and creating employment opportunities in rural areas (Food and Agricultural Organization, 2017; Upadhyaya et al., 2017). By examining the social and cultural dimensions of these communities, interventions can be designed to be both culturally appropriate and economically viable. Additionally, addressing challenges related to access to credit

and markets can further enhance pastoralists' involvement in dry fish agribusiness (Pradhan et al., 2023).

Several factors significantly affect participation in agribusiness value chains, including dry fish. While the literature does not directly address gender's impact, studies suggest it plays a crucial role. Dey et al. (2024) emphasize women's significant position as processors in the dry fish sector, noting wage disparities that reflect economic inequalities influencing participation. Ngugi (2017) reports that mobile schools in Turkana County enhance educational access for nomadic pastoralists, yet engagement in activities like dry fish remains low, indicating that education alone may not boost participation. Additionally, Mocellin and Foggin (2007) suggest that health impacts from a semi-nomadic lifestyle may indirectly affect economic participation, though no direct link to education level is established. Insights into fishing experience are scarce, but research highlights constraints faced by recreational fishers in Queensland (Sutton, 2007) and factors affecting women's involvement in Bangladesh (Mamun-Ur-Rashid et al., 2023). Income serves as both a motivator and constraint for participation; in Bangladesh, women's roles in dry fish processing are closely tied to personal income, while the dried fish industry in Bengkulu City showcases significant economic potential (Sumantri et al., 2023).

The dry fish industry in rural India faces challenges like inadequate storage, poor infrastructure, and lack of product-standard testing, which may deter pastoralist participation (Giri & Biswas, 2018). While the media's role is not explicitly mentioned, the lack of government marketing support suggests media could enhance market access and information flow. Mamun-Ur-Rashid et al. (2023) suggested that family size is a significant determinant of women's participation in dry fish processing activities,

implying that larger family sizes may necessitate greater economic contributions from family members.

Previous studies have been limited to pastoralist participation in agribusiness value-chain activities. Mandal (2021) conducted a value chain analysis of dry fish in the coastal belt of Bangladesh. Mohamed (2019) examined the relationship between pastoralism and developmental policies. Gatdet (2023) studied the pastoralism system in southwestern Ethiopia: the practices, constraints, and determinants in the Itang Special District, Gambella region. Deng (2020) assessed the factors affecting fish production and marketing in the Gambella region, Ethiopia.

However, there was a lack of research specified on determinants of pastoralist participation in dry fish agribusiness value chain activities. Closing this empirical gap is essential to understanding the barriers and incentives for pastoralists to engage in the dry fish agribusiness value chain. Therefore, this study aims to fill this knowledge

gap by examining the determinants of pastoralist participation in dry fish agribusiness value chain activities in the Akobo district.

2. Materials and Methods

2.1. Area Description

This study was conducted in Akobo district, which is situated in the Gambella region of Ethiopia. The district has a total population of 35117 individuals, including 14,789 females and 20,328 males (Zekaria, 2008). The district covers an area of 2080 km² and is located between 7°55 °E and 33°45 °E. It is situated on the western edges of the Nuer and Gambella regions. Akobo district is bordered to the south and west by the Akobo and Pibor rivers, which separate it from South Sudan. On the Ethiopian side, it is bordered by the Wantawo District of the Nuer Zone to the north and the Jor District of the Anuak Zone to the east. Its land is often marshy, and its elevation is approximately 410 m above sea level, surrounding the Akobo and Gilo Rivers (Wikipedia, 2024).

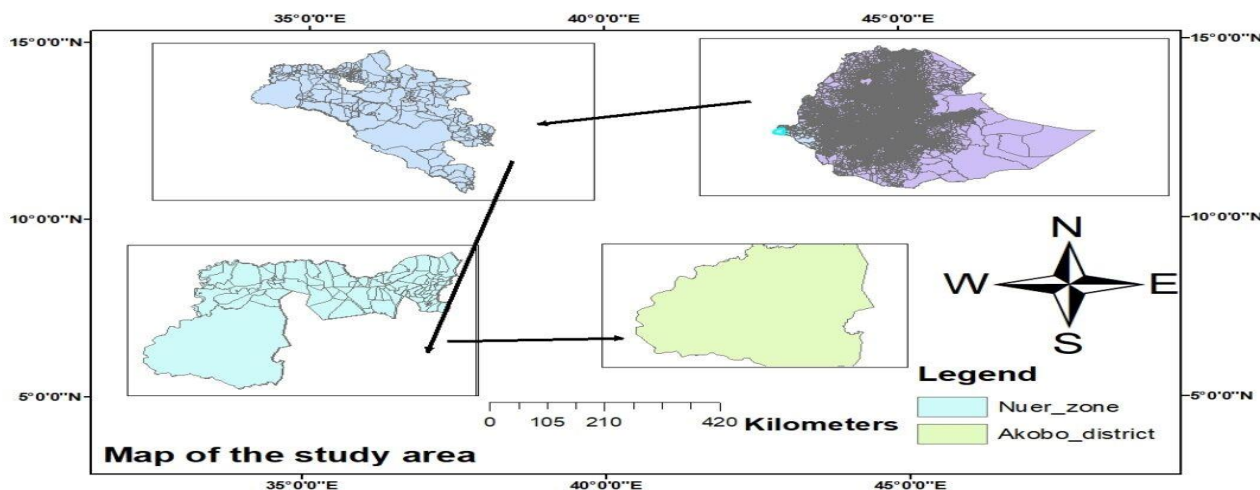


Figure 1: Map of the study area

Source: ArcGIS (2024)

2.2. Research Design

This study employed a mixed methods design. The mixed research design combined both quantitative and qualitative data collection methods, allowing for a comprehensive understanding of the determinant factors

influencing pastoralist participation in dry fish agribusiness value chain activities.

2.3. Sampling Technique and Sample Size

Determination

2.3.1. Sampling Technique

The population in this study consisted of pastoralists who participated or did not participate in dry fish agribusiness value chain activities. A four-stage sampling technique was used to select the sample respondents. In the first stage, the Nuer zone was purposively selected from three zones in the region. This zone was selected because it has a high concentration of pastoralists engaged in dry fish agribusiness value chain activities compared to the other zones in the region. In the second stage, the Akobo district was selected from the Nuer zone using simple random sampling. This is because the Akobo district is known to have a large number of pastoralists involved in dry fish agribusiness. In the third stage, a systematic sampling technique was used to select two kebeles (Yir-yir and Gangrial) within the Akobo district. This systematic sampling technique was used to ensure a representative sample of the different kebeles within the district. By systematically selecting these two kebeles, the researchers aimed to gather diverse perspectives on the dry fish agribusiness industry in the area. Finally, in the fourth stage, stratified sampling was employed to select respondents from each kebele. This stratified sampling technique involved dividing the sample respondents into subgroups (participant and non-participant households) based on certain characteristics, such as age or occupation. This allowed researchers to ensure that a cross-section of the population was included in the study, providing a more accurate representation of the community's views on the dry fish agribusiness industry.

2.3.2. Sample Size Determination

The sample size was 90 respondents from Yir-yir Kebele and 52 from Gangrial Kebele. A total of 142 sample households (90 households from

participants and 52 households from non-participants) were drawn from this sample population. Therefore, the total population size of 142 respondents provided a sufficient representation of the population under study. The sample size was determined using Yamane's formula (1967), with a 95% confidence level and 5% margin of error. Thus, the sample size of 142 adequately represents the population of 218, providing sufficient data while maintaining statistical reliability and precision within the desired margin of error.

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

$$n = \frac{218}{1 + 218(0.05)^2} = 142$$

Where: n is the total sample size, e is the margin of error, and N is the total population.

2.4. Sources of Data

Both primary and secondary data sources were used in this study. Primary data were collected through questionnaires and structured interviews administered to the sample respondents. Secondary data were obtained from existing databases and a literature review. This combination of primary and secondary data allowed for a comprehensive analysis of the research objectives.

2.5. Data Collection Tools

The data were collected through questionnaires and structured interviews. The structured interviews were used to get the primary data from sample respondents to determine pastoralist participation in dry fish agribusiness value chain activities in the Akobo district. On the other hand, the closed-ended questionnaire was used to gather both quantitative and qualitative data from the target population. This dual approach ensured that a wide range of data was collected, allowing for a more in-depth analysis of the study.

2.6. Methods of Data Analysis

Quantitative data were analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation) and inferential statistics (chi-square for categorical variables and

t-test for continuous variables). Additionally, an econometric binary logistic regression model was utilized. Qualitative data were analyzed using thematic analysis.

Table 1: Definition of variables

Variable	Nature	Measurement	Expected sign
Dependent variable	Dummy	0=Non-participant, 1=Participant	-/+
Independent variable			
Gender	Dummy	0=Female, 1=Male	-/+
Educational level	Dummy	0=No, 1=Yes	+
Market access	Dummy	0=No, 1=Yes	+
Media access	Dummy	0=No, 1=Yes	+
Age	Continuous	Number of years	+
Household size	Continuous	Total family member	+
Fishing experience	Continuous	Number of years in business	+
Household income	Continuous	Ethiopian Birr	+

Source: Related Literatures (2024).

3. Results and Discussion

3.1. Statistical Analysis

3.1.1. Analyses of Dummy Variables

The study considered four (4) dummy variables that may or may not be associated with the dependent variable. These variables included gender, education level, market access, and media access. The researcher described their associations with pastoralist participation.

The gender of pastoralist households indicates that 29% of females participated in the dry fish agribusiness value chain, while 29% did not participate. Additionally, 71% of males participated in the dry fish agribusiness value chain, and 71% of males were non-participants in these activities. The chi-square test showed a significant association between pastoralist household gender and participation in dry fish agribusiness, with a P-value of 0.099. This suggests that gender is a key determinant of pastoralist participation in dry fish agribusiness value chain activities. Karmebäck et al. (2015) support this study, stating that gender norms and

roles within pastoralist households play a significant role in determining the level of participation in various economic activities. Addressing gender inequalities and promoting gender equity within pastoralist communities could potentially increase overall participation and success in dry fish agribusiness value chain activities.

Based on the respondents' ability to read and write, they were classified into two groups: literate and illiterate. Participants who could read and write were categorized as literate, while those who could not were classified as illiterate. According to this classification, 68% of participant households were illiterate, while 32% were literate. In non-participant households, 56% were illiterate, and 44% were literate. The results of the chi-square test indicated a significant relationship between literacy level and participation in dry fish agribusiness activities, with a P-value of 0.082. This means that the literacy level of pastoralists plays a role in determining their involvement in dry fish agribusiness activities. Literate pastoralists may

have a better understanding of market trends, business management, and technological advancements, making them more likely to participate in such ventures. Dyer (2016) supports the notion that education is a key factor

influencing pastoralists' engagement in agribusiness, suggesting that investing in education and training programs for pastoralists could potentially increase their involvement and profitability in this sector.

Table 2: Result of dummy variables (n=142)

Variable	Data set	Participant		Non-participant		χ^2	p-value
		Frequency	%	Frequency	%		
Gender	Female	26	29	15	29	2.714 ^{bbb}	0.099
	Male	64	71	37	71		
Literacy level	No	61	68	29	56	3.028 ^{bbb}	0.082
	Yes	29	32	23	44		
Market access	No	54	60	24	46	0.226	0.635
	Yes	36	40	28	54		
Media access	Yes	22	24	36	69	4.521 ^{bb}	0.033
	No	58	64	19	37		
	Yes	32	36	33	63		

Source: Field Data (2024). bb and bbb indicate significance at 5% and 10% precision levels, respectively.

The study indicated that 60% of the participants had no access to the market, whereas 40% had market access. In contrast, 46% of the non-participant sample respondents had no access to the market, while the remaining 54% did. The chi-square test showed a non-significant association between market access and dry fish agribusiness value chain participation, with a P-value of 0.635. This result indicates that market access does not significantly impact pastoralists' engagement in the dry fish agribusiness value chain. Furthermore, 64% of pastoralist households had no access to media, while 36% had access.

Additionally, 37% of non-participant households had no access to media, while 63% had access in the study area. The chi-square results showed significant associations between information

access and participation in the dry fish agribusiness value chain, with a P-value of 0.001. This finding indicates that access to information is a key factor in determining pastoralists' involvement in the value chain. Roba et al. (2017) found that pastoralists with access to information are more likely to be profitable in the dry fish agribusiness value chain than those without access. This highlights the importance of providing pastoralists with the necessary information to succeed in this sector.

3.1.2. Analyses for Continuous Variables

The study examined four continuous variables that may exhibit mean differences: age, household size, fishing experience, and household income. The differences among these variables are discussed below.

Table 3: Result of continuous variables (n=142)

Variable	Participant (n=90)		Non-participant (n=52)		t-test	p-value
	$\bar{x}$	Σ	$\bar{x}$	Σ		
Age	38.14	10.732	10.32	6.241	0.525	0.601
Household size	3.93	1.662	1.35	0.999	-3.281	0.079 ^{bb}
Fishing experience	3.17	1.805	1.98	0.871	5.409	0.007 ^b
Household income	3181.27	1744.857	1621.80	962.351	-0.0773	0.441

Source: Field Data (2024). b and bbb indicate mean variances at the 1% and 10% levels, respectively.

The average age of participant households was 38.14 years with a standard deviation of 10.732, while the average age of non-participants was 10.32 years with a standard deviation of 6.241. The analysis indicated no significant difference in age between the two groups ($P = 0.601$). This suggests that age did not significantly impact the profitability of the dry fish agribusiness value chain. Consequently, both younger and older pastoralist households are equally likely to succeed in this sector. These findings imply that factors other than age may be more critical for determining profitability in this area.

In terms of household size, participant households averaged 3.93 members with a standard deviation of 1.662, while non-participant households had an average size of 1.35 members and a standard deviation of 0.999. A significant mean difference was observed ($P = 0.079$), indicating that larger households in the dry fish agribusiness value chain are more likely to achieve higher profitability. This could be attributed to the increased labor force available in larger households, enabling more efficient production and distribution processes. Furthermore, larger households may possess more resources and capital to invest in their businesses, leading to greater success in the industry (Adunga, 2013). Policymakers and stakeholders should consider strategies to support larger households within the dry fish agribusiness value chain to enhance overall profitability and sustainability in the sector.

The average fishing experience for participant households was 3.17 years, with a standard

deviation of 1.805, compared to 1.98 years and 0.871 for non-participant households. This indicates a significant difference in fishing experience ($P = 0.007$). Households with greater fishing experience likely possess more knowledge and skills, contributing to higher incomes in the dry fish agribusiness sector. This aligns with findings by Ayilu et al. (2023), which show that households with more fishing experience tend to have higher income levels and overall success in agribusiness.

Regarding household income, the average income for participant households was 3181.27 Ethiopian Birr with a standard deviation of 1744.857, while non-participants averaged 1621.80 Ethiopian Birr with a standard deviation of 962.351. The results indicated no significant difference in household income ($P = 0.441$). This suggests that household income may not significantly influence the success of the dry fish agribusiness sector among pastoralist households. Other variables, such as fishing experience and skills, may play a more prominent role in generating higher incomes within this specific industry.

3.2. Types of Dry Fish Agribusiness Value Chain Activities

Production Activities: A majority of the pastoralist respondents were actively involved in site selection (98.5%), purchasing inputs (87.3%), and fishing operations (95.8%). This involvement indicates a strong commitment to the various stages of the dry fish agribusiness value chain.

Transportation Activities: All pastoralist households participated in every stage of the transportation process, including the transportation of dry fish to the fishing gate (100%), rural market (100%), and urban market (100%). This level of involvement allows pastoralists to access job opportunities not only within their villages but also in nearby rural and urban areas. Their participation in transportation generates income for pastoralist households and contributes to the overall success and sustainability of the dry fish agribusiness value chain.

Processing Activities: Most pastoralist households engaged in processing activities, including slaughtering fish (99.3%), drying fish (97.7%), weighing dry fish (93%), and storage (91.5%). This high level of participation ensures that products are adequately prepared and preserved for sale, providing employment opportunities for households and contributing to economic growth in the rural and urban markets.

Marketing Activities: The study found that pastoral households were involved in marketing dry fish, selling at fishing gates (96.5%), to retailers (97.2%), and wholesalers (81.7%). This demonstrates their significant role in the distribution and sale of dry fish. Selling at fishing gates allows them direct consumer engagement, while sales to retailers and wholesalers expand their market reach. Pastoralist households' active participation across all supply chain activities- from production to distribution- boosts their incomes and livelihoods. Their involvement reflects the resilience and adaptability of pastoral communities in leveraging resources and traditional knowledge to meet market demands and secure economic stability. Van et al. (2018) found that pastoral households engaged in the dry fish supply chain were able to generate higher incomes compared to those focused solely on production. Similarly, Watete et al. (2016) noted that these households diversified income sources, reducing dependency on livestock and enhancing their economic resilience amid environmental and market uncertainties.

Table 4: Dry fish agribusiness value chain activities (n=142)

Activity	Frequency	Percentage
Production activities		
Site selection	140	98.5
Purchase of inputs	124	87.3
Operation of fishing	136	95.8
Transportation activities		
Transportation of dry fish to the fishing gate	142	100
Transportation of dry fish to the rural market	142	100
Transportation of dry fish to the urban market	142	100
Processing activities		
Slaughtering fish	141	99.3
Drying fish	139	97.9
Weighing dry fish	132	93
Storage	130	91.5
Marketing activities		
Selling dry fish at fishing gate	137	96.5
Selling dry fish to retailers	138	97.2
Selling dry fish to wholesalers	116	81.7

Source: Field Data (2024).

3.3. Constraints Faced by Pastoralists

A cutoff point of 3 ($5+4+3+2+1 \div 5=3$) was used to categorize the identified constraints into major and minor constraints. Constraints with a mean value of ≥ 3 were classified as major, while those with a mean value of <3 were considered minor. Constraints affecting pastoralist participation in dry fish agribusiness value chain activities were assessed based on reactions to 12 statements.

The results in Table 5 reveal that the major constraints limiting pastoralist household participation in dry fish agribusiness activities include low levels of education (mean = 4.93), lack of modern storage facilities (mean = 4.01),

poor rural infrastructure (mean = 3.08), lack of external training (mean = 3.82), poor rural market conditions (mean = 4.75), and high transportation costs (mean = 3.42). Okeowhor et al. (2019) found that low education levels, lack of modern storage facilities, and poor rural infrastructure were significant challenges faced by pastoralist communities. Similarly, Bonfoh et al. (2016) identified poor rural infrastructure, lack of external training, poor market conditions, and high transportation costs as constraints influencing pastoralist communities. Addressing these constraints through targeted interventions and support programs could enhance pastoralists' participation and success in this sector.

Table 5: Constraints faced by pastoralist households (n=142)

Constraint	Ranked Mean
Low level of education	4.93
Lack of credit facilities	1.90
Lack of technology	2.64
Economic instability	1.43
Lack of modern storage facilities	1.01
Poor rural infrastructure	3.08
Lack of training	3.82
Poor rural market	4.75
High cost of transportation	3.42
High rate of corruption	2.97
Unfavorable government policies	2.31
Lack of information sources	1.67

Source: Field Data (2024).

3.4. Determinant Factors that Influence Pastoralist Participation

The results of the binary logit model indicate that out of nine independent variables examined, only three significantly influence pastoralist household participation in dry fish agribusiness value chain activities. These variables are educational level, market access, and household size.

Educational Level (EDLVL): Educational level is a demographic variable that influences pastoralist household participation in dry fish agribusiness value chain activities in the Akobo district. As expected, this variable demonstrated

a positive association with the dependent variable ($P = 0.072$). This indicates that as the educational level increases, the likelihood of pastoralist households participating in dry fish agribusiness activities also rises by a factor of 1.936. Households with higher education levels tend to possess more knowledge and skills necessary for successful engagement in these activities. This finding underscores the importance of investing in education for pastoralist communities to enhance their participation and success in agribusiness. Lutta et al. (2021) noted that educated members of pastoralist households are more likely to adopt

innovative practices and technologies, which can further boost their productivity and profitability in agribusiness. They emphasized that promoting education within pastoralist communities can increase participation in value-chain activities and contribute to overall economic development and poverty reduction in these marginalized regions.

Market Access (MRKTACS): Market access is an institutional variable that influences participation in the study area. Consistent with expectations, the variable exhibits a positive relationship with pastoralist household participation in dry fish agribusiness value chain activities ($P = 0.086$). This suggests that as market access improves, the probability of pastoralist households engaging in dry fish agribusiness activities increases by a factor of 1.868. Thus, enhancing market access for pastoralist communities can significantly benefit their involvement in dry fish agribusiness ventures. Mohamed et al. (2020) supported this notion, stating that improved market access for marginalized communities can lead to enhanced livelihoods and economic empowerment. Conversely, Christian et al. (2024) argued that market access alone is insufficient for ensuring successful participation in agribusiness value chain activities; other factors such as access to

information, resources, and support services are also crucial.

Household Size (HHLSZ): Household size is a demographic variable that influences participation in the Akobo district. As anticipated, household size positively impacted participation in dry fish agribusiness value chain activities ($P = 0.082$). This positive association indicates a strong influence on pastoralist household participation; for every one-unit increase in household size, the probability of participation in dry fish agribusiness activities increases by a factor of 1.000. This suggests that larger households are more likely to engage in dry fish agribusiness activities in the Akobo district, possibly due to greater manpower and resources available for investment. Endalew et al. (2020) revealed that household size significantly affects participation in these activities, as households with more members can divide tasks and responsibilities, allowing them to undertake additional ventures like dry fish agribusiness. However, Hardy et al. (2016) found that smaller households might still participate by forming partnerships or cooperatives with other small households in the community. By pooling their resources and skills, smaller households can take advantage of the opportunities available in the value chain.

Table 6: Binary logit result

Variable	B	S.E	Wald	Df	P-value	Exp(B)
GNDR	-.253	.390	.421	1	.516	.776
EDLVL	.661	.367	3.242	1	.072 ^{bbb}	1.936
MRKTACS	.625	.363	2.956	1	.086 ^{bbb}	1.868
MDACS	.010	.363	.001	1	.979	1.010
AGE	-.004	.021	.029	1	.864	.996
HHLSZ	-.060	.109	.300	1	.584	.942
FSNEPR	.066	.112	.349	1	.555	1.068
HHLICM	.000	.000	2.435	1	.119	1.000
HHLSZ	.000	.000	3.031	1	.082 ^{bbb}	1.000

Source: SPSS Output (2024). bbb indicates significance at a 10% level of precision.

4. Conclusion

Dry fish agribusiness value chain activity is vital for improving the livelihood of pastoralist inhabitants of the Akobo district. The four types of dry-fish agribusiness value-chain activities in which pastoralist households actively participate are production, transportation, processing, and marketing. The major constraints that limit pastoralists' participation in dry fish agribusiness are a low level of education, a lack of modern storage facilities, poor rural infrastructure, a lack of external training, poor rural markets, and high transportation costs. Educational level, market access, and household size were significant variables influencing pastoralist household participation in dry fish agribusiness value chain activities. Different interventions, such as creating capacity building and training programs, access to financial services, and creating market

linkages and value chain development, are needed to address these problems in the Akobo district. Stakeholders should support each other in developing targeted solutions to each of these challenges. This could include providing training programs to improve pastoralists' educational level, investing in modern storage facilities and rural infrastructure, and implementing strategies to improve market access and reduce transportation costs. By addressing these key issues, pastoralists in the Akobo district can be better equipped to participate in the dry fish agribusiness value chain and improve their livelihoods.

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References

- Abdulkadr, A. (2019). Benefits and challenges of pastoralism system in Ethiopia. *Studia Mundi - Economica*. <https://doi.org/10.18531/studia.mundi.2019.06.03.56-67>
- Adunga, E. (2013). Factors influencing income level of (agro-) pastoral communities. *International Journal of Social Economics*, 40(3), 207-219. <https://doi.org/10.1108/03068291311291509>
- Ayilu, R. K., Fabinyi, M., Barclay, K., & Bawa, M. A. (2023). Blue economy: industrialization and coastal fishing livelihoods in Ghana. *Rev Fish Biol Fisheries* 33, 801–818. <https://doi.org/10.1007/s11160-022-09749-0>
- Bonfoh, B., Fokou, G., Crump, L., Zinsstag, J., & Schelling, E. (2016). Institutional development and policy frameworks for pastoralism: from local to regional perspectives. The future of pastoralism (J. Zinsstag, E. Schelling & B. Bonfoh, eds). *Rev. Sci. Tech. Off. Int. Epiz*, 35(2), 499-509. <https://doi.org/10.20506/rst.35.2.2537>
- Chan, C., Tran, N., Cheong, K., Sulser, T., Cohen, P., Wiebe, K., & Nasr-Allah, A. (2021). The future of fish in Africa: Employment and investment opportunities. *PLoS ONE*, 16. <https://doi.org/10.1371/journal.pone.0261615>
- Deng, G. T. (2020). Assessment of factors affecting fish production and marketing in Gambella region, Ethiopia. *The Scientific World Journal*, 260693, 1-8. <https://doi.org/10.1155/2020/5260693>
- Dey, M., Alam, M. S., & Bhowmik, S. (2024). Unlocking the fish drying process: insights from Char Patharghata in Chattagram district and its distribution channels. *Asian Journal of Medical and Biological Research*, 10(1), 42–57. <https://doi.org/10.3329/ajmbr.v10i1.70548>
- Dong, S. (2016). Overview: Pastoralism in the World. In: Dong, S., Kassam, KA., Tourrand, J., Boone, R. (eds) *Building Resilience of Human-Natural Systems of Pastoralism in the Developing World*. Springer, Cham. https://doi.org/10.1007/978-3-319-30732-9_1

- Dyer, C. (2016). Approaches to education provision for mobile pastoralists. *Revue scientifique et technique* (International Office of Epizootics), 35(2), 631-638. <https://doi.org/10.20506/rst.35.2.2525>.
- Endalew, B., Zeleke, M., Yenewa, W., & Ayalew, Z. (2020). Determinants of farm households' participation in fish production in Southwest Ethiopia. *Cogent Food & Agriculture*, 6(1), 1728107. <https://doi.org/10.1080/23311932.2020.1728107>
- FAO. (2017). Agribusiness, value chains and the rapid transformation of agrifood systems.
- Filho, W., Taddese, H., Balehegn, M., Nzengya, D., Debela, N., Abayineh, A., Mworozzi, E., Osei, S., Ayal, D., Nagy, G., Yannick, N., Kimu, S., Balogun, A., Alemu, E., Li, C., Sidsaph, H., & Wolf, F. (2020). Introducing experiences from African pastoralist communities to cope with climate change risks, hazards and extremes: Fostering poverty reduction. *International journal of disaster risk reduction*, 50, 101738. <https://doi.org/10.1016/j.ijdr.2020.101738>
- Gatdet, C. (2023). The pastoralism system in South-Western Ethiopia: The practices, constraints, and determinants in Itang Special district, Gambella Region. *Cogent Food & Agriculture*, 9(2), 2273627. <https://doi.org/10.1080/23311932.2023.2273627>
- Giri, A., & Biswas, D. B. (2018). Factors Affecting the Growth of Dry Fish Industry in West Bengal : An Empirical Study. *Arthshastra: Indian Journal of Economics and Research*, 7(5). <https://doi.org/10.17010/ajer/2018/v7i5/139923>
- Hardy, P. Y., Béné, C., Doyen, L., Pereau, J. C., & Mills, D. (2016). Viability and resilience of small-scale fisheries through cooperative arrangements. *Environment and Development Economics*, 21(6), 713-741. <https://doi.org/10.1017/S1355770X16000152>
- Karmebäck, V. N., Wairore, J. N. U., Jirström, M., & Nyberg, G. (2015). Assessing gender roles in a changing landscape: diversified agro-pastoralism in drylands of West Pokot, Kenya. *Pastoralism*, 5(1), 1-8. <https://doi.org/10.1186/s13570-015-0039-4>
- Kirui, L. K., Jensen, N. D., & Obare, G. A. (2022). Pastoral livelihood pathways transitions in northern Kenya: The process and impact of drought. *Pastoralism* 12 (23). <https://doi.org/10.1186/s13570-022-00240-w>
- Lacio, L. ., Derecho, M., Montecillo, M. J., & Inocian, R. (2022). Fishing Culture in Bantayan Island, Cebu, Philippines: Basis for the Bobo Model of Constructivist Teaching. *Magister - Journal of Educational Research*, 1(1), 1–16. Retrieved from <http://errc.ctu.edu.ph/ojs/index.php/magister/article/view/18>
- Lutta, A. I., Wasonga, O. V., Robinson, L. W., Nyangito, M. M., & Sircely, J. (2021). Determinants of livestock market participation among pastoral communities of Tana River County, Kenya. *Environment, Development and Sustainability*, 23, 7393-7411. <https://doi.org/10.1007/s10668-020-00922-8>
- Mamun-ur-Rashid, M., Sadat, N., Mahmood, M., & Musaddique, M. (2023). Women in dry fish processing activities: an in-depth study of a selected coastal region of Bangladesh. *Development in Practice*, 33, 910 - 925. <https://doi.org/10.1080/09614524.2023.2247592>
- Mandal, A. K. (2021). Value chain analysis of dry fish marketing in the coastal belt of Bangladesh. *International Journal of Fisheries and Aquatic Studies*, 9, 217-222. <https://doi.org/10.22271/fish.2021.v9.i4c.2538>
- Mocellin, J., & Foggin, P. (2007). Health status and geographic mobility among semi-nomadic pastoralists in Mongolia. *Health and Place*, 14(2), 228–242. <https://doi.org/10.1016/j.healthplace.2007.06.005>

- Mohamed, A. (2019). Pastoralism and Development Policy in Ethiopia: A Review Study. Budapest International Research and Critics Institute (BIRCI-Journal) : Humanities and Social Sciences. <https://doi.org/10.33258/birci.v2i4.562>
- Mohamed Sala, S., Otieno, D. J., Nzuma, J., & Mureithi, S. M. (2020). Determinants of pastoralists' participation in commercial fodder markets for livelihood resilience in drylands of northern Kenya: Case of Isiolo. *Pastoralism*, 10(1), 1-16. <https://doi.org/10.1186/s13570-020-00166-1>
- Ngugi, M. (2017). Participation of Kenyan Nomadic Pastoralists in Non-Formal Education. *European Journal of Education Studies*. <https://doi.org/10.46827/ejes.v0i0.1126>
- OECD. (2021). Fisheries and Aquaculture in Norway. OECD Review of Fisheries Country Notes January 2021.
- Okeowhor, D., Okoh, J. O., Baakel, A., & Okolo, O. J. (2019). Poverty: A major challenge to the African rural educational system development and the way forward. *Asian Journal of Education and Social Studies*, 3(3), 1-7. <https://doi.org/10.9734/AJESS/2019/V3I330098>
- Piria, M., Suić, J., & Špelić, I. (2024). Inland Fisheries in Croatia: Historical Aspects, Fish Resources, Management, and Conservation. In *Ecological Sustainability of Fish Resources of Inland Waters of the Western Balkans: Freshwater Fish Stocks, Sustainable Use and Conservation*, 31-72. https://doi.org/10.1007/978-3-031-36926-1_2
- Pomeroy, R., Arango, C., Lomboy, C. G., & Box, S. (2020). Financial inclusion to build economic resilience in small-scale fisheries. *Marine Policy*, 118, 103982. <https://doi.org/10.1016/j.marpol.2020.103982>
- Pradhan, S. K., Nayak, P. K., & Haque, C. E. (2023). Mapping Social-Ecological-Oriented Dried Fish Value Chain: Evidence from Coastal Communities of Odisha and West Bengal in India. *Coasts* 3 (1), 45-73. <https://doi.org/10.3390/coasts3010004>
- Rasekhi, S., Sharifian, A., & Shahraki, M. (2022). Indigenous fishers' knowledge on fish behavior, fishing practices and climatic conditions in a conservation priority coastal ecosystem in the Caspian Sea. *Rev Fish Biol Fisheries* 33, 629–648 (2023). <https://doi.org/10.1007/s11160-022-09746-3>
- Roba, G. M., Lelea, M. A., Hensel, O., & Kaufmann, B. (2018). Making decisions without reliable information: The struggle of local traders in the pastoral meat supply chain. *Food Policy*, 76, 33-43. <https://doi.org/10.1016/J.FOODPOL.2018.01.013>
- Schilling, J., & Werland, L. (2023). Facing old and new risks in arid environments: The case of pastoral communities in Northern Kenya. *PLOS Climate*, 2(7), e0000251. <https://doi.org/10.1371/journal.pclm.0000251>
- Sumantri, B., I., Septria, W., Suryanti, M., & Laksmawati, W. (2023). Production and Income Analysis of Dried Fish Business in Bengkulu City. *AGRISEP*, 22 (1), 227 –248. <https://doi.org/10.31186/jagrisep.22.01.227-248>
- Sutton, S. G. (2007). Constraints on Recreational Fishing Participation in Queensland, Australia. *Fisheries*, 32(2), 73–83. [https://doi.org/10.1577/1548-8446\(2007\)32\[73:corfpi\]2.0.co;2](https://doi.org/10.1577/1548-8446(2007)32[73:corfpi]2.0.co;2)
- Upadhyay, A.D., Pandey, D.K., Dhar, B. (2017). Value Chain Analysis of Dry Fish in North-East Region of India. In: Mani, G., Joshi, P., Ashok, M. (eds) *Financing Agriculture Value Chains in India*. India Studies in Business and Economics. Springer, Singapore. http://dx.doi.org/10.1007/978-981-10-5957-5_8
- Van Duijn, A. P., van der Heijden, P. G., Bolman, B., Rurangwa, E., Meeks, J., Meijberg, A., & Rutaisire, J. (2018). Review and analysis of small-scale aquaculture production in East Africa: Summary and Recommendations. <https://edepot.wur.nl/467339>

-
- Watete, P. W., Makau, W. K., Njoka, J. T., AderoMacOpiyo, L., & Mureithi, S. M. (2016). Are there options outside the livestock economy? Diversification among households of northern Kenya. *Pastoralism*, 6(1), 1-13. <https://doi.org/10.1186/s13570-016-0050-4>
- Wikipedia contribution. (2024, February 7). Retrieved February 7, 2024, from [https://en.wikipedia.org/wiki/Akobo_\(woreda\)](https://en.wikipedia.org/wiki/Akobo_(woreda))
- Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.
- Zekaria, S. (2008). *Summary and statistical report of the 2007 population and housing census*.