

Research Article

Assessment of the Production System of Indigenous Dairy Cattle Breeds in Metekel and Some Parts of the Awi Zone, Ethiopia

Mezgebu Getnet^{1,*} , Bainesagn Worku¹ , Esubalew Shitaneh² 

¹Ethiopian Institute of Agricultural Research, Debremarkos Agricultural Research Center, Debremarkos, Ethiopia

²Ethiopian Institute of Agricultural Research, Pawe Agricultural Research Center, Pawe, Ethiopia

Abstract

This study was conducted in Mtekel and some parts of the Awi Zone to assess indigenous dairy cattle production patterns in the study area. The majority of respondents (98.3% and 53.95%) were male and literate, respectively. Land holdings varied significantly, ranging from landless households to those owning up to 280 hectares. The predominant farming activity was mixed farming (69%). Agriculture was the primary source of income for 79.3% of respondents across all districts. The trend in cattle productivity was increasing, with the main objective of cattle production being income generation. Cattle were the major contributors to household income, followed by crop production, and were considered the most important livestock species in the area. Crop residues and communal grazing lands were the primary feed resources during the dry and wet seasons, respectively. Overall, cattle production was identified as the major income source, a significant contributor to household income, and a multifunctional agricultural activity for the farming community in rural, peri-urban, and urban areas of the study area. The relevant authorities should focus on improving cattle production in terms of feed, breeding, health, and management practices to enhance productivity and improve livelihoods.

Keywords

Guba, Wombera, Income Contribution, Cattle Productivity

1. Introduction

Approximately three-quarters of the worlds extremely poor are estimated to keep livestock as part of their livelihood portfolios [1, 2]. Safeguarding and increasing the returns from their livestock assets is expected to help them escape poverty [3-7].

In Ethiopia, about 80% of farmers use animal traction to plow their fields. Livestock are integral to agriculture, accounting for approximately 45% of the total value of agri-

cultural production and supporting the livelihoods of a large portion of the population. More than 70% of households, including many poor ones, keep livestock. Approximately 12.5 million households keep cattle, which contribute 31 to 48% of total household income [8]. Livestock are the largest income contributors in pastoral and agro-pastoral (65%), dairy commercial (55%), and urban/peri-urban systems (47%) [8].

*Corresponding author: meget1212@gmail.com (Mezgebu Getnet)

Received: 27 September 2024; **Accepted:** 21 October 2024; **Published:** 18 November 2024



Copyright: © The Author(s), 2024. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

Promoting sustainable animal production that meets dietary needs requires a focus on nutrition, health, and the environment. The demand for milk, meat, and eggs at least doubles in developing countries due to population growth, urbanization, and rising incomes.

Ethiopia has the largest livestock population in Africa, estimated at approximately 60.39 million head of cattle, 31.30 million sheep, 32.74 million goats, 8.85 million donkeys, 2.01 million horses, 0.46 million mules, 1.42 million camels, 60.04 million poultry, and 6.52 million beehives [9]. Despite this large livestock population, its contribution to the national economy is below potential due to various factors, including feed shortages, poor genetic potential for productive traits, and inadequate healthcare and management practices.

In the highland agroecology of the country, where the crop-livestock system dominates, livestock are an essential component of the overall farming system and contribute up to 87% of smallholders' cash income [10].

Ethiopia produces approximately 4.96 billion liters of milk from cows, averaging 1.48 liters per cow per day over a lactation period of 7 months [9]. Although livestock play a significant role in the livelihoods of smallholder farmers in the study area, there is limited information on livestock production systems, breeding practices, and the productive and reproductive performance of cattle, as well as constraints to livestock production. Characterizing these production systems and understanding their socioeconomic implications would help in designing appropriate development interventions in the study area. Thus, the objective of this study was to assess the production patterns of indigenous dairy cattle breeds in Metekel and parts of the Awi zones.

2. Materials and Methods

The Materials and Methods section should provide comprehensive details to enable other researchers to replicate the study and further expand upon the published results. If you have multiple methods, consider using subsections with appropriate headings to enhance clarity and organization.

2.1. Description of the Study Area

The Metekel Zone, an administrative zone in the Benishangul Gumuz Regional State, covers an area of 26,272.38 km². The annual rainfall varies from 700 to 2064 mm, and the daily maximum and minimum temperatures range from 35 °C

to 42 °C and 16 °C to 25 °C, respectively, depending on the season and altitude. Similarly, the Awi Zone is an administrative zone in the Amhara Regional State, comprising 8 districts and 5 town administrations.

2.2. Selection of Study Sites and Respondents

Three representative districts (one from the Awi Zone and two from the Metekel Zone) were selected for the study, along with a total of 116 respondents. The districts were chosen based on criteria such as dairy cow population, farmer awareness, experience in dairying, and milk production potential, in consultation with zonal, district, and kebele experts. Respondents were randomly selected from a list of farmers with experience in dairy production.

2.3. Data Collection and Analysis

Data were collected through a pretested structured questionnaire, group discussions, and secondary sources. The group discussions included young people, women, village leaders, and socially respected individuals known for their knowledge of dairy production practices in the area. These discussions were held in each of the selected PAs (Peasant Associations) of the four districts. Information on the socioeconomic characteristics of the community and routine husbandry practices was assessed.

All the data were entered into a computer and analyzed using descriptive statistics with the Statistical Package for Social Sciences (SPSS) version 20.

3. Results

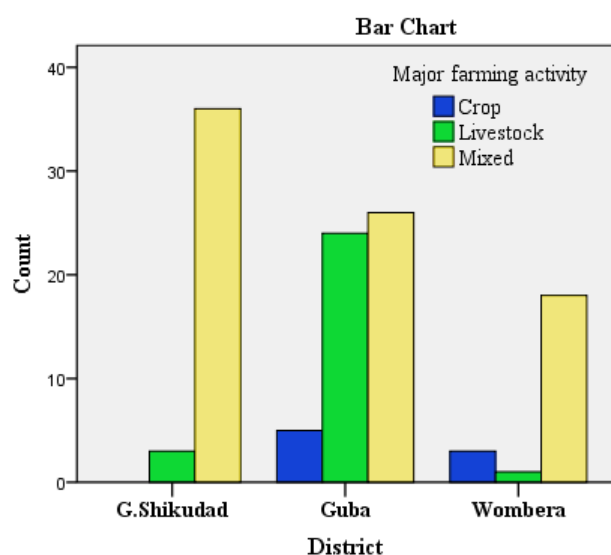
3.1. Socioeconomic Characteristics and Respondents' Profiles

The socioeconomic and respondent profiles are presented in Table 1. Most of the randomly selected respondent households were male (98.3%) during the study period. Similarly, 98.3% of the respondents were married. In terms of education, 53.9% of the respondents were literate, and 19.1% could read and write. Land holdings in the study area were highly variable, ranging from landless households to those with up to 280 hectares of land.

Table 1. Demography and landholding in Metekel and some parts of the Awi Zone.

Variable		Districts						Overall	
		Guagusa Shikudad		Guba		Wombera			
		Freq.	%	Freq.	%	Freq.	%	Freq.	%
Sex of household head	Female	0	0	0	0	2	9.1	2	1.7
	Male	39	100	55	100	20	90.9	114	98.3
Marital status	Married	39	100	54	98.2	21	95.5	114	98.3
	Divorced	0	0	1	1.8	1	4.5	2	1.7
Education level	Illiterate	8	20.5	14	25.9	9	40.9	31	27.0
	Literate	16	41.0	33	61.1	13	59.1	62	53.9
	Read and write	15	38.5	7	13	0	0	22	19.1
Age, land and household size		Max.	Min.	Mean		Std. Deviation			
Average household Age (Years)		75	20	45.98		11.99			
Total Land holding (Hectares)		280	0	11.76		36.72			
Household size (heads)		15	2	5.99		2.16			

3.2. Farming Activity

**Figure 1.** The major farming activities of the Metekel and Awi Zones.

In most Ethiopian areas, the major farming activity in-

volves a mix of both crop and livestock farming systems (69%) (Figure 1). In the Guba district, where semipastoralism is widely practiced in the Metekel Zone of the Benishangul Gumuz Regional State, livestock production is comparable to crop production. Sole crop production is not practiced in the Guagusa Shikudad district; rather, the majority of respondents confirmed that mixed farming is the dominant system. However, both sole crop and sole livestock farming are practiced in the Guba and Wombera districts.

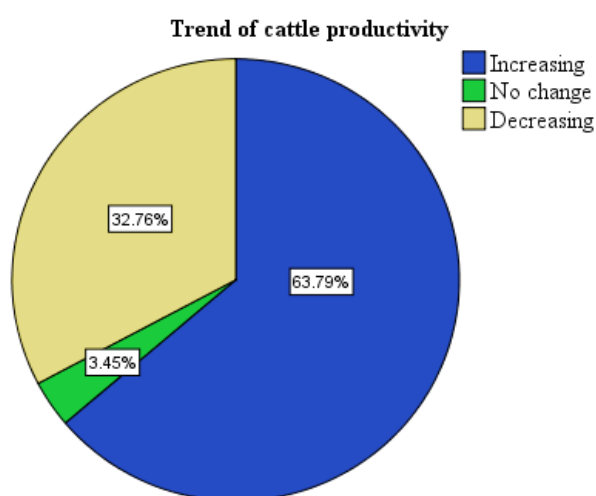
3.3. Source of Income, Urbanization and Trend of Cattle Productivity

The sources of household income and urbanization are presented in Table 2. The major source of income for the majority of respondents across all districts was agriculture (79.3%), followed by agriculture and trade. Most respondents (63.1%) who participated in this study were settled in rural areas, followed by 27.9% in peri-urban areas.

Most respondents (63.8%) in the study areas, except for the Wombera district, indicated that cattle productivity is increasing. However, 77.3% of respondents in the Wombera district reported that cattle productivity has decreased over the last five years. Overall, the trend across the study districts showed an increase in cattle productivity (Figure 2).

Table 2. Source of income and urbanization in Metekel and some parts of the Awi Zone.

Variables	Districts						Overall	
	Guagusa Shikudad		Guba		Wombera			
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Source of income								
Agriculture	38	97.4	35	63.6	19	86.4	92	79.3
Trade	0	0	1	1.8	0	0	1	0.9
Agriculture and trade	1	2.6	18	32.7	2	9.1	21	18.1
Agriculture, trade and employee	0	0	0	0	1	4.5	1	0.9
Agriculture and employee	0	0	1	1.8	0	0	1	0.9
Urbanization								
Urban	2	5.1	6	12.0	2	9.1	10	9.0
Preurban	12	30.8	16	32.0	3	13.6	31	27.9
Rural	25	64.1	28	56.0	17	77.3	70	63.1

**Figure 2.** Trend of cattle productivity in the Metekel and Awi Zones.

3.4. Objective of Cattle Production

The objectives of cattle production in the study area are indicated in Table 3. The primary objective of cattle production was as a source of income, followed by using cattle as a power source for plowing agricultural land. Milk production was the third objective of cattle production.

Table 3. Objective of cattle production in Metekel and some parts of the Awi Zone.

	1	2	3	Index	Rank
Source of income	95	13	6	0.91	1
Power	12	13	23	0.24	2
Milk	8	3	26	0.16	3
Manure	-	5	15	0.07	4
saving	-	3	11	0.05	5
Meat	-	3	6	0.03	6
Wealth	1	1	1	0.02	7
Hide	-	-	1	0.00	8

3.5. Income Contribution of Cattle Production

Table 4 presents the income contribution of cattle production in the study area. Cattle contribute the most to household income, followed by crop and goat production. Cattle provide income either through cash sales of animals or products such as milk and meat, or through consumption. The study identifies cattle as the primary contributors to household income.

Table 4. Income contribution in Metekel and some parts of the Awi Zone.

	1	2	3	Index	Rank
Cattle	69	29	14	0.80	1
Crop	25	27	26	0.45	2
Goat	14	24	12	0.29	3
Sheep	5	24	27	0.26	4
Apiculture	1	3	7	0.05	5
Vegetable	1	2	0	0.02	6
Trade	0	1	1	0.01	7
Employee	0	1	0	0.01	8

3.6. Important Livestock Species

Table 5 ranks cattle as the most important livestock species with an index of 0.87, followed by goats and sheep. During group discussions, respondents emphasized that while goats and sheep provide immediate cash income, cattle are considered more significant due to their role in drought power, milk, and butter production. Respondents ranked livestock species based on criteria such as income contribution and their functions in household agricultural activities.

Table 5. Rank of livestock species based on perceived importance by households in Metekel and some parts of the Awi Zone.

	1	2	3	Index	Rank
Cattle	88	16	7	0.87	1
Goat	13	28	6	0.29	2
Sheep	6	28	21	0.27	3
Equine	6	18	24	0.22	4
Poultry	1	8	33	0.15	5
Bee	1	5	5	0.05	6

3.7. Feed Resources for Cattle Production

In the dry season, the major feed resources included crop residues, communal grazing lands, and hay. Crop residues are known for their poor quality and palatability. Communal grazing lands perform inadequately during this season.

During the wet season, the primary feed resources consisted of communal grazing lands, private grazing lands, and grazing on fallow lands. Pasturelands were abundant with green forage grasses and browses during this period. Additionally, crop residues and supplements (excluding salt) were provided to oxen in the early morning and to lactating cows.

Table 6. Feed resources and season of availability in Metekel and some parts of the Awi Zone.

	1	2	3	Index	Rank
Feed resource in dry season					
Crop residues	27	37	8	0.47	1
Communal grazing	51	-	3	0.45	2
Hay	28	25	5	0.40	3
Privet grazing	1	-	-	0.01	
Grazing fallow lands	5	2	-	0.05	
'Attela'	-	5	32	0.12	
Grazing aftermath	-	7	10	0.07	
Cut grass and browse	-	-	2	0.01	
Improved forage	-	-	2	0.01	
Concentrate	-	-	4	0.01	
Salt	-	-	2	0.01	
Feed resource during wet season					
Communal grazing	86	10	2	0.80	1
Privet grazing	14	31	2	0.30	2
Grazing fallow lands	8	7	6	0.13	3

	1	2	3	Index	Rank
Crop residues	-	2	2	0.02	
'Attela'	-	1	17	0.05	
Grazing aftermath	-	3	2	0.02	
Cut grass and browse	2	6	8	0.07	
Improved forage	-	-	2	0.01	
Salt	-	-	2	0.01	

4. Discussion

4.1. Socioeconomic Characteristics and Respondents' Profiles

During the study period, the majority of randomly selected respondent households were male (98.3%), reflecting the prevailing gender dynamics in agricultural settings. Similarly, 98.3% of the respondents were married, highlighting the family-oriented structure of the farming community.

In terms of education, 53.9% of the respondents were literate, and 19.1% could read and write. This literacy level enables them to keep records and refer to manuals that aid in the proper husbandry of farm animals. The variability in land holdings within the study area, ranging from landless households to those owning up to 280 hectares, can be attributed to the presence of farmer investors.

4.2. Farming Activity

In most Ethiopian areas, the predominant farming activity in the study area involved mixed farming systems (both crop and livestock, 69%). Livestock production is comparable to crop production in the Guba district, where semipastoralism is widely practiced in the Metekel Zone of the Benishangul Gumuz Regional State. Sole crop production is not practiced in the Guagusa Shikudad district; instead, the majority of respondents confirmed that mixed farming is the primary agricultural system in the area. However, both sole crop and sole livestock farming are practiced in the Guba and Wombera districts.

4.3. Source of Income, Urbanization and Trend of Cattle Productivity

The primary source of income for the majority of respondents across all districts was agriculture (79.3%), with agriculture and trade ranking second. Some farmers in preurban areas engaged in small-scale trading. Of the respondents in this study, 63.1% were settled in rural areas,

while 27.9% were settled in preurban areas.

Most respondents (63.8%) in the study areas, excluding Wombera district, indicated that cattle productivity is increasing. However, 77.3% of respondents in the Wombera district reported a decrease in cattle productivity over the last five years. This decline is attributed to shrinking grazing lands, population growth, and feed shortages for livestock. Overall, the trend across the study districts showed an increase in cattle productivity, possibly due to heightened awareness of cattle production, improved health management, and an increased number of cattle per household.

4.4. Objective of Cattle Production

The primary objective of cattle production in the study area was income generation. Cattle directly contribute to household income through the sale of live animals and their products. Additionally, they serve as a form of savings (capital growth through herd expansion) and insurance, providing immediate cash for significant or unexpected expenses such as school or medical fees. Moreover, livestock can be exchanged in markets (e.g., renting bulls for plowing) and are considered a form of wealth. Livestock not only enhance social status but also facilitate access to financial services, both formal and informal [11, 12].

The findings of the current study underscore that the primary objective of cattle production is income generation, followed by their role as a power source for agricultural plowing. Milk production ranks as the third objective of cattle production.

4.5. Income Contribution of Cattle Production

Although livestock's contribution to farm income was minimal in all systems except the pastoral system, there would still be increased animal exchanges. In the current study, cattle were the primary contributors to household income, followed by crop and goat production. Cattle generate income through the sale of animals and their products such as milk, meat, and other animal products, both in cash and in kind. Therefore, cattle were identified as the most significant contributors to household income in this study.

4.6. Important Livestock Species

While all livestock species are valuable to humans, their importance varies across different areas. Among livestock, cattle were ranked highest in importance with an index of 0.87, followed by goats and sheep (see Table 5). During group discussions, respondents highlighted that although goats and sheep provide immediate cash income, cattle are considered more crucial due to their contributions in terms of drought power, milk, and butter production. Respondents based their rankings on criteria such as income generation and roles in agricultural activities within households.

4.7. Feed Resources for Cattle Production

During the dry season, the major feed resources included crop residues, communal grazing lands, and hay. Crop residues are recognized for their poor quality and limited palatability. Communal grazing lands are notably less productive during this period.

In contrast, the wet season saw communal grazing lands, private grazing lands, and grazing on fallow lands as the primary feed resources. Abundant green forage grasses and browses were plentiful on the pasturelands during this time. Additionally, crop residues and supplements other than salt were provided for oxen in the early morning and for lactating cows.

These findings align with the seasonal availability of livestock feed resources, emphasizing natural pastures as predominant during the wet season, and crop residues, hay, and improved forage being more prevalent and utilized during the dry season. Browsing trees/shrubs, agro-industrial byproducts, and 'attela' were available in both seasons [13].

5. Conclusions

The study was conducted in Metekel and Awi Zones, where the majority of respondents were literate males, including farmer investors. Mixed farming was predominant (69%), with agriculture being the main household income source (79.3%). Respondents were settled predominantly in rural (63.1%), followed by preurban (27.9%) and urban (9.0%) areas.

Cattle productivity showed an increasing trend, with the primary objective of cattle production being income generation through various direct and indirect means. Cattle contributed significantly more to household income compared to crop and goat production. Cattle were identified as the most important livestock species due to their multiple functions.

Crop residues and communal grazing lands were the primary feed sources in the dry and wet seasons, respectively. Overall, cattle production emerged as the major income source and multifunctional agricultural activity across rural, preurban, and urban areas in the study region.

We recommend that authorities focus on enhancing cattle

production through improved feed, breeding, health, and management practices to enhance productivity and livelihoods.

Abbreviations

ATSE	Academy of Technological Sciences and Engineering
CSA	Central Statistics Agency
EIAR	Ethiopian Institute of Agricultural Research
FAO	Food and Agriculture Organizations of the United Nations
ILRI	International Livestock Research Institute
LID	Livestock in Development

Acknowledgments

I thank the Pawe Agricultural Research Center for providing logistics for data collection. I also thank colleagues in the research center and selected sites who participated in data collection.

Author Contributions

Mezgebu Getnet: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing

Bainesagn Worku: Investigation, Methodology, Supervision, Writing – review & editing

Esubalew Shitaneh: Investigation, Supervision, Writing – review & editing

Funding

This research work was financed by the Ethiopian Institute of Agricultural Research (EIAR).

Data Availability Statement

The data is available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] LID (1999) Livestock in Poverty Focused Development. (Crewkerne: Livestock in Development (LID)).
- [2] FAO (2010) The State of Food and Agriculture: Livestock in the Balance. (Rome: FAO).

- [3] Brown, A. G. (ed.) (2003) The livestock revolution: a pathway from poverty? Proceedings of a conference held at the ATSE Crawford Fund, Parliament House, Canberra. (Canberra: ATSE Crawford Fund).
- [4] Catley, A. (2008) The growing demand for livestock. Will policy and institutional changes benefit poor people? ID21 Insights, 72, pp. 1-2.
- [5] Delgado, C., Narrod, C. and Tiongco, M. (2008) Determinants and Implications of the Growing Scale of Livestock Farms in Four Fast-Growing Developing Countries. Research Report 157. International Food Policy Research Institute (IFPRI), Washington D. C.
- [6] ILRI (2003) Livestock, a pathway out of poverty: ILRI strategy to 2010. (Nairobi: International Livestock Research Institute (ILRI)).
- [7] ILRI (2007) ILRI Annual Report 2007 – Markets that Work (Nairobi: International Livestock Research Institute (ILRI)).
- [8] Food and Agriculture Organization of the United Nations Rome, 2019. The future of livestock in Ethiopia Opportunities and challenges in the face of uncertainty.
- [9] CSA. (2021). Agency Agricultural Sample Survey 2020 / 21 [2013 E. C.] report on livestock and livestock characteristics. II (February).
- [10] Alary, V., Corniaux, C., Gautier, D., 2011. Livestock's contribution to poverty alleviation: how to measure it? World Development 39, 1638–1648.
- [11] Moll, H. A. J., 2005. Costs and benefits of livestock systems and the role of market and nonmarket relationships. Agricultural Economics 32, 181–193.
- [12] Moll, H. A. J., Staal, S. and Ibrahim, M. N. M. (2007) Smallholder dairy production and markets: A comparison of production systems in Zambia, Kenya and Sri Lanka. Agricultural Systems, 94(2), pp. 593-603.
- [13] Fentahun S, Urge M, Mekuriaw Y (2020) Assessment of Seasonality Availability of Livestock Feed Resources and Feeding System in Bahir Dar Zuria District of Amhara Region, Ethiopia. J Fisheries Livest Prod 8: 293.