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Assessment of Crop Production System and Agricultural Technology Adoption in Afalech Watershed, Shishonde District

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Abstract

In a developing country like Ethiopia, agriculture plays an active role in determining the economic, social, and political systems of a society by forming the basis for every economic activity. Methods: The objectives of this study were to identify and examine the major crop production systems and agricultural technology adoption in the Afalech Watershed, Shishonde District of Southwest Ethiopia. Results: The results of this study indicate that enset, coffee, maize, barley, sorghum, teff, wheat, common bean, faba bean, and fruit crops, including avocado and banana, were produced in the watershed, while enset, coffee, and maize are the majorly produced crops. The common agronomic management practices applied in the area were plowing, row, and broadcast planting methods, weeding, intercropping, crop rotation, and chemical fertilizer applications. In the 2022–2023 production year, a very small percentage of households used improved varieties and chemical fertilizers for crop production. The main reasons for not using improved varieties and fertilizers were the unaffordable price of seed and fertilizer, supply problems, the lower productivity differences, and the lack of awareness and information. Conclusion: Training, awareness creation, and demonstration of improved agricultural technology and timely inputs delivery by district agricultural offices are needed in the area.

Keywords: Adoption, Afalech Watershed, chemical fertilizer, improved variety, productivity

INTRODUCTION

In developing country like Ethiopia agriculture plays an active role in determining the economic, social, and political system of a society by forming the basis for every economic activity. Agricultural sector is an employer of large amount of population, source of income for cash and subsistence and supplies food for living [1]. In Ethiopia, its majorities of economy based on agriculture by employing 85% of population, supplying 70% industrial raw material, country's GDP 41%, foreign exchange 90% and supplied majorities of consumable foods for its population [1]. The agricultural sector of Ethiopia dominated by smallholder farmers still takes a large share in Ethiopia's economy, as evident from its contribution to national GDP are 33.3%, export earnings are 87% and total employment 72.7% [2]. Over the last four decades, the country's agricultural and rural development policies and strategies have changed to keep pace with the economic development and rural transformation goals of regimes. However, agricultural production and productivity of smallholder farmers have been very low and insufficient to feed the growing population [3].

As the country's economy, social, and political system are highly dependent on agriculture, the

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growth of agricultural sector is the major driver for other sector and the country as whole development. Based on the above philosophy, many supporting projects and government of Ethiopia are actively working for growth of agricultural sector through adoption and demonstration of agricultural technologies and expanding production areas. However, at smallholder farmers level the practical implementation of demonstrated technologies on agriculture were lower compared to the efforts of supporting projects and governments of Ethiopia. According to [4], the utilization of agricultural technology was limited; less than 10% of area covered by improved seed, only 50% of the land is covered by fertilizers, nearly 20% of land area cultivated by using pesticides and the utilization of irrigation water was nearly 1%. Agricultural technologies that improved production and productivities supply are increasing from time to time, but still now the demand of technology is more than its supply, and which indicates more effort is needed for further development [4]. Crop production system in Ethiopia was subsistence based and less market-oriented production system. The majorities 95% of cropped land was cultivated by smallholder farmers and supply more than 90% of agricultural output of the country, which indicates mechanized and large-scale production in the country was lower [1].

Many smallholder farmers in Ethiopia are subsistence-based farming systems; their participation in subsistence farming does not ensure their food security and household welfare [5]. Strategies for adoption of crop productivity improvement technology are to increase the supply of smallholder farmers' crop products beyond their consumption for market. Thus, in the study area, the production system of household, type of crops cultivated by households, the types of agronomic practices, and the types of improved crop seed and fertilizer adopted in the area are not investigated by prior research studies, as no research has been conducted on the issues. There is insufficiency of information indicating the crop production system applied in the area, application of improved crop management practices and adoption agricultural technology by smallholder farmers. Therefore, it is crucial to assess and identify the types of crop cultivated, agronomic practices applied, and improved seed and inorganic fertilizer adopted in the area. The objectives of this study were as follow:

- To identify the major types of crops produced in the study area.
- To examine the productivity of major crops in the area.
- To identify and examine major agronomic practices applied in the area.
- To identify and examine improved crop varieties and inorganic fertilizer adopted in the area.

METHODOLOGY

Description of Study Area

This study was undertaken in the Afalech watershed, which is in Dahara Kebele in Shishoende Woreda of Kaffa Zone is known for its dense forest coverage, and the agro-ecology is 70% mid altitude, 20% high altitude, and 10% low altitude. Kaffa zone comprises twelve Woreda, including Shishoende. Shishoende is located at 56 km from Zone center Bonga, 556 km away from the Capital Addis Ababa. Its location lies in 7020′ N and 35086′ E at an altitude range of 1350 up to 2200 meters above sea level. Shishoende Woreda was composed of 31 Kebele, from which 29 were rural Kebele and 2 urban kebele. The total population of Woreda is 142,600 (73,580 male and 69,020 female) with a family size ratio of 5 persons. The total number of household in the district was 28,520 of these, 3418 were female-headed and 25102 were male-headed households. Agricultural farming system is mixed with coffee and Enset production-based farming system with major crops Enset, coffee, maize, barley, Teff, sorghum, and wheat. Types of livestock reared in the district include cattle, sheep, goat, poultry, and apiculture.

Sampling Techniques and Sample Size Determination

The study area was selected with Climate Action through Landscape Management (CALM) project interest that support with financial resources. Representative sample households for this study were

determined using the formula, which was developed by Yamane [6], by taking the precision level at 93% and error level at 7%. The sample households was selected by simple random sampling methods from list of households in the study kebele.

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

Where, n is the sample households taken for this study; N is the total households of target kebele, based on this formula a total of 73 households were interviewed using by structured questionnaire .

Data Sources and Methods of Collection

The two data sources; primary and secondary sources of data were used for gathering relevant information for this study. Key informant interview and focus group discussion of primary data collection method was conducted by semi-structured questionnaire that supplement data collected from sample households. Individual household survey interview conducted by structured questionnaire on selected sample households (Annex I). The type and amount of crop produced, area cultivated, improved crop seed and fertilizer used by farmers, agronomic practices applied by farmers, and other necessary data were collected. Secondary data collected from published and unpublished material, annual reports of some government offices, and other source of information was used .

METHOD OF DATA ANALYSIS

Descriptive Statistics

Data was analyzed using descriptive statistics like mean, standard deviations, frequency, and percentage was used to indicate the finding of by using SPSS and STATA packages [7]. The type of crop produced, household participation, demographic, and socio-economic condition of sample household, amount of crop produced, productivity, application of improved varieties, fertilizer, and agronomic practice were analyzed by using descriptive statistics and presented in tables and narration.

RESULT AND DISCUSSION

Demographic and Socio-economic Condition of Household

About 80.8% of the sample respondents were male-headed, and only 19.2% were female-headed. The sample households have a maximum age of 80 years and minimum of 22 years with an average age of 45.85 years (Table 1). The marital status of the sample households indicates that 9.6% were single, the majority, 80.8% were married, 2.7% were divorced, and 6.8% were widowed. Out of the sample households, 34.2% had not joined formal education, 46.6% were attending primary school, and 19.2% had joined secondary school and no one had joined college and above. The minimum and maximum family size of sample households was 2 and 18, respectively, with a mean of 7 family members. The average land size of the sample household was 1.54 hectares, with a minimum of 0.13 hectare and a maximum of 6.00 hectares (Table 1). The major source of income from the sample household was farm activities, and the average total annual income of the sample household was 37,033.57 ETB, with a minimum of 4000 ETB and a maximum of 150,000 ETB.

Livelihood Income Sources

Households in the study area depend on limited types of economic activities. The livelihood activities of the sample households include crop production, livestock rearing, and off-farm activities. This finding showed that crop production and livestock rearing are the two main sources of livelihood income in the study area.

Table 1. Socio-economic characteristics of the sample households.

Variables	Mean ± Std. Deviation	Minimum	Maximum
Age of household head	45.85±15.25	22	80
Family size	6.79±3.2	2	18
Total land size	1.53±1.15	.13	6.00
Total income	37,033.57± 31,204.56	4,000	150,000

Source: Own survey (2023)

The sample households generate a total annual income of 37,033.57 ETB with maximum of 150,000 ETB and minimum of 4,000 ETB. Crop production contributes 27,917.80 ETB or 75.38% of the sample households' annual income with maximum of 130,000 ETB and minimum of 2,000 ETB (Table 2). The secondary contributor to the sample household was livestock rearing and generating a mean income of 7,753.42 ETB with a maximum of 45,000 ETB and a minimum of 0 ETB and contribute 20.94% of their annual income. Off-farm activities are conducted by small member of the sample households and contribute only 3.68% of their annual income. The sample households generate a mean income of 1,362.35 ETB, with a maximum of 12,000 ETB from off-farm activities. The finding of this study was agrees with earlier study in Kaffa zone southwest Ethiopia, found that the majorities of farming households income was generated from crop production and livestock rearing [8].

Major Crop Produced in the Afalech Watershed

Diversified crop was produced in the watershed, the finding of this study indicates Enset, coffee, maize, barley, sorghum, Teff, wheat, common bean, faba bean, and fruit crops, including avocado and banana and it was similar with finding at Melokoza District of Southern Ethiopia [9]. The major crop produced by more than half of the sample households are only three crops, which include Enset, coffee, and maize, and most households depend on perennial crops by allocating a significant area of land (Table 3), which was in line with earlier finding in southwest Ethiopia [10]. The result indicates that the communities depend on limited types of crop, and the habits of production of diversified crops were limited. The main reason for households' dependency on limited crop was agro-ecological factor, soil type, culture of community and feeding practices. The mean area of land allocated for crop production by the sample household was 1.305 hectares from their total holdings, which was more than the finding of [11].

Table 2. The mean incomes of sample households from different sources.

Variables	Mean ± Std. Deviation	Minimum	Maximum
Crop income	27,917.80 ±26820.78	2000.00	130,000.0
Livestock income	7,753.42 ± 9818.88	0.00	45,000.00
Off-farm income	1,362.35 ±1374.61	0.00	12,000.00
Total income	37,033.57 ±31204.56	4000.0	150,000.0

Source: Own survey (2023)

Table 3. Crops produced in the Afalech watershed.

Crop	Response for Producing crop (%)		Area (ha)	Productivity (qt/ha)	Trend of production (% respondents)			Trend of productivity (% respondents)		
	Yes	*No*			*Increasing*	*Decreasing*	*The same*	*Increasing*	*Decreasing*	*The same*
Enset	93.2	6.8	0.24	625	34.3	43.8	21.9	17.8	64.4	17.8
Coffee	89	11	0.26	13.1	39	40.7	20.3	25.4	72.9	1.7
Maize	84.9	15.1	0.40	13	36.9	52.6	10.5	1.4	76.7	21.9
Teff	42.5	57.5	0.13	4.6	13.8	75.9	10.3	10.4	89.6	0
Barley	26	74	0.06	7.6	20	66.7	13.3	13.3	80	6.7
Wheat	4.1	95.9	0.005	3	66.7	33.3	0	33.3	66.7	0
Sorghum	11	89	0.03	12.66	66.6	16.7	16.7	33.3	50	16.7
Common bean	41.1	58.9	0.10	8.1	48.1	40.7	11.2	37	63	0
Faba bean	20.5	79.5	0.05	8	35.7	57.1	7.2	7.2	92.8	0
Avocado	32.9	67.1	0.02	100	77.3	0	22.7	75	25	0
Banana	20.5	79.5	0.01	150	84.6	7.7	7.7	84.6	15.4	0

Source: Own survey (2023)

About 84.74% of their total holding was allocated for crop production, and only a very low area of their holding is allocated for other purposes. The mean size of land allocated for major crops was 0.4 ha for maize, 0.26 ha for coffee, and 0.24 ha for Enset production; these three crops cover 69% of crop land.

The annual average yield of each crop produced by the sample households was very low. The three high-yielding crops in the area are enset, maize, and coffee, which yield 14.5, 5.2, and 3.4 quintal per year from their respective mean allocated lands (table 3). The productivity of major crops was 13.1 quintals per hectare for coffee, 13 quintals per hectare for maize and 12.66 quintals per hectare for sorgum, and 8.1 quintals per hectare for common bean. The productivity of major crops was lower than the findings of [10], said that it was close to the national average productivity. The sample households were asked about their production trend of the crop produced in the area in the last five years. Most households responded that the production trend of enset, coffee, maize, teff, barley, and faba bean were decreasing due to disease, mole rat, and insect pest attack. While the production trend of wheat, sorghum, common bean, avocado, and banana is increasing high productivity and low disease attack. It is like the finding of [12] that the trend of production of those crops was increasing at the farming household level. Also, the sample households responded to the productivity trend of crops produced in the area in the last five years. Most of the respondents responded that the productivity of all crop produced in the area is decreasing except avocado and banana. The main reason for crop productivity decreasing was frequent crop disease occurrence, soil fertility declining, inflated chemical fertilizer price, and lower adoption of improved agricultural technology in the area

Major Agronomic and Management Practices

The sample households were interviewed about the tillage frequency of the crops they produce. The average tillage frequency of Enset was 4 times, maize was 3 times, Teff was 3 times, barley was 3 times, and wheat was 4 times (Table 4). Tillage frequency of seasonal crop was almost similar by using oxen, which was similar with finding in Melokoza district of southern Ethiopia [9]. Almost all the sample farmers plant avocado and banana without plowing. Also, 68.5% of the sample households plant coffee seedlings without plowing, and 31.5% of the sample households plant coffee by plowing 2 time. The mean tillage frequency of the major crop produced in the area is 3 times (Table 4).

Table 4. Response to major agronomic management practices applied.

Crop	Tillage frequency	Planting method		Weeding method			Weeding frequency	Intercrop		Crop rotation	
		Broadcast/ Random (%)	*Row (%)*	*Hand (%)*	*Slashing (%)*	*Herbicide (%)*		*Yes (%)*	*No (%)*	*Yes (%)*	*No (%)*
Enset	3.6	3	97	86.3	13.7	0	2	68.5	31.5	2.7	97.3
Coffee	na	12.3	87.7	0	89.23	10.76	2	61.5	38.5	0	100
Maize	3.27	91.9	8.1	96.8	0	3.2	2	51.6	48.4	53.4	46.6
Teff	3.12	100	0	12	0	88	1	0	100	74.2	25.8
Barley	2.89	100	0	38.9	0	61.1	1	0	100	47.4	52.6
Wheat	3.67	100	0	66.7	0	33.3	1	0	100	66.7	33.3
Sorghum	3.1	100		75	0	25	2	0	100	62.5	37.5
Common bean	3	100	0	100	0	0	1	30	70	80	20
Faba bean	2.8	100	0	100	0	0	1	0	100	93	7
Avocado	0.02	32	68	0	100	0	1	66.7	33.3	0	100
Banana	0.01	28	72	23	77	0	2	73.3	26.7	0	100

NB: na means not applied, Source: Own survey (2023)

The results of the analysis indicate that almost all the seasonal crops, including maize, Teff, barley, wheat, sorghum, common bean, and faba bean, produced in the study area are planted by broadcasting. This indicates that the adoption rate of row planting practices in the watershed was very low. While most of the sample households plant perennial crops like Enset, coffee, avocado, and banana in rows. Most of the sample household's control weed effects from enset, maize, wheat, sorghum, common bean, and faba bean by hand weeding. Perennial crops like coffee, avocado, and banana weed are controlled by slashing and while some farmer mainly use chemical for Teff, barley, and rarely for wheat. The mean weeding frequencies of the major crops, Enset, coffee, and maize were twice a year. Weed is one of the nutrient competent pest for the crop, as the weeding frequency is too long and reduces the productivity of crops.

Out of the sample households, 68.5% of Enset producers, 61.5% of coffee producers, 51.6% of maize producers, 30% of common bean producers, 66.7% of avocado producers, and 73.3% of banana producers intercrop with other crops. All the sample households produce Teff, barley, wheat, faba bean, and sorghum solely. The majority of seasonal crop-producing farmers practice crop rotation for different reasons, including efficient land utilization and soil fertility improvement. Out of the sample households, 53.4% of maize producers, 74.2% of Teff producers, 47.4% of barley producer, 66.7% of wheat producers, 62.5% of sorghum producer, 80% of common bean producer, and 93% faba bean producer rotate a crop they produce on a unit area. While 97.3% of enset producers and all of coffee, avocado, and banana producers do not rotate these crops due to their permanent nature.

Improved Crop Varieties and Inorganic Fertilizer Utilization

The sample households were interviewed about the utilization of improved crop varieties. About 26.3% of the respondents used improved crop varieties, which was like earlier findings of [11,13], about 29% of households were adopters of improved varieties, and most households in the area utilize local land races (Figure 1). It is also like [6] in that most households have many types of crop varieties of their local landraces. About 34.6% used inorganic fertilizer for crop production in the production year of 2022/2023 (Figure 1). The findings were more than findings of [14] that only 17.85% were adopters of chemical fertilizers, while it is less than the findings of [15], said 57.04% of the sample household were adopters of chemical fertilizers. The main reason for lower adoption of chemical fertilizer in the area was due to higher price of fertilizer and lower availability in the area.

In 2022/2023 production year, out of the sample households, 16.4% used improved maize variety and 83.6% did not use it. However, 22.6% utilized improved maize varieties in their entire farming period. Which is more than the finding in central Ethiopia, only 12% were adopter of improved maize, and the rest rely on their local landrace [10].

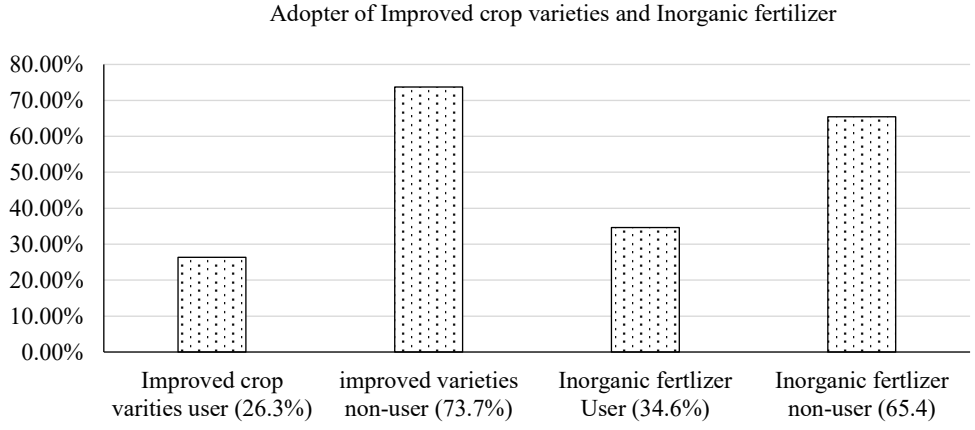

Figure 1. Adoption rate of improved crop varieties and chemical fertilizer.

Maize varieties distributed in the area are BH-540, BH-661, Shone, and Limmu. The average lands covered by improved maize by adopters is 0.356 hectare. The total amount of improved maize varieties utilized by the sample household was 169.56 kg with a rate of 42.50 kg per hectare. The total amount of maize output produced from improved maize is 8.4 tons, and its productivity is 1.8 tons per hectare, which indicates its productivity were very low in the area.

There is nobody using improved barley and wheat varieties, and nobody is applying inorganic fertilizer for barley and wheat production in the area. Out of the sample households only 2.8% of the sample households used improved common bean and applied NPS fertilizer for it. The area covered by improved common bean was 0.75 hectares, and the amount of improved seed used was 90 kg. The total output of produced by the adopter are 0. 635 tons and the productivity of the area are 0.8467 tons per hectare. In the study area from the sample households, not a single person is using improved faba bean varieties and applying chemical fertilizers to the faba bean. Out of the sample households, 12.6% had utilized improved coffee varieties, and 5.5% used 2022/2023 production year, and the distributed improved variety was 74110, it was the most popularized coffee variety in southwestern Ethiopia [16]. Out of improved coffee varieties adopters, 50% use herbicides as weed control and others control weed by hand weeding and slashing.

Out of the sample households, 32.9% have taken training on improved crop utilization, and the rest haven't taken any training. The training is about the rate of application, management practice, and quality seed. The finding indicates that access to training have positive effect on adoption of improved crop varieties and chemical fertilizer. The respondent farmer was interviewed about the trend of improved crop varieties, inorganic fertilizers and pesticides utilization. The majorities of respondent said that the trend of improved crop varieties and inorganic fertilizers was decreasing and no change on trend of pesticide utilization.

Access to Improved Crop Seed and Inorganic Fertilizer

The findings of this study indicate that most of the respondents said that there is a problem on access, availability, and timely delivery of improved crop seed and chemical fertilizers in the Afalech watershed, as indicated in Table 6.

Challenges in the Adoption of Improved Crop Varieties and Chemical Fertilizers

The main challenges in the adoption of improved crop varieties, ranked by the farmers were

- Unaffordable price of improved crop seeds and fertilizers: it was the primary challenge for adoption of those technologies in the areas and are ranked as primary problem by 54.7% of the sample households [7].
- Supply problem: it is secondary problem identified in the study area for adoption of improved crop varieties and chemical fertilizers related to timely delivery and unavailability in required amount. It was raised as the main challenge by 35.6% of the sample households, which is similar with earlier finding in southwest Ethiopia [7, 8].
- No difference in productivity with local landrace identified as the third challenge for adoption of improved varieties and chemical fertilizers and was indicated by 5.5% of the sample households as the main challenge.
- Lack of awareness and information on improved crop varieties and chemical fertilizers are the main challenge for 4.1% of the sample households (Table 5).

Table 5. Response to the trend of improved varieties, fertilizer, and pesticide utilization.

No.	Type	Trend of utilization		
		Increasing (%)	*Decreasing (%)*	*No change (%)*
1	Improved crop varieties	13.7	50.7	35.6
2	Inorganic fertilizer	10.9	53.4	35.7
3	Pesticides	15.1	27.4	57.5

Source: Own survey (2023)

Source of Improved Crop Varieties and Chemical Fertilizers

The main supplier of improved crop varieties' seed was the district agricultural office, and only 3.6% of the sample households got it from NGOs or supporting projects. The finding was in line with earlier finding in southwest Ethiopia, agricultural office are the main supplier of improved crop varieties [7]. Inorganic fertilizers are supplied to farmers in many ways, 80.8% supplied by the district agriculture office, 13.7% by cooperative, and 5.5% supplied by NGOs or supporting projects.

Farmers' Perception on Improved Crop Varieties

The sample respondents have interviewed their perception on improved crop varieties distributed in the area in 2022/2023 production year compare by evaluating from very poor to very good by comparing with local varieties. The majorities of respondent said improved maize varieties distributed in the area were good in yield, early maturity and consumer demand. While it is ranked medium interims of easy threshing, disease, and pest resistance. According to their perception of farmers even if it has some drawback the varities are good compared to local. Improved coffee varieties distributed in the area were good interims of yield, fast growth, early cherry maturity and very good interims of consumer demand. The majorities ranked for improved coffee varieties are medium in disease resistance. Common bean varieties distributed in the area were good interims of yield advantage, early maturity, consumer demand, easy threshing, and disease and pest resistance as compared to local seed (Table 7).

Table 6. Response to accessibility and supply of improved varieties and chemical fertilizers.

No.	Improved crop seed and inorganic fertilizer access	Farmer response	
		Yes (%)	No (%)
1	Access to improved crop varieties	11	89
2	Timely delivery of improved crop varieties and inorganic fertilizer	8.2	91.8
3	Availability of improved crop varieties	11	89
4	Availability of required amount of inorganic fertilizer	9.6	90.4

Source: Own survey (2023)

Table 7. Response to improved crop varieties comparison with local landraces.

Crop type	Comparison criteria of improved variety	Farmers rank of improved varieties				
		Very good (%)	Good (%)	Medium (%)	Poor (%)	Very poor (%)
Maize	Yield	49.3	50.7	0	0	0
	Early maturity	35.72	64.28	0	0	0
	Consumer demand	28.5	42.85	28.6	0	0
	Easy threshing	0	42.85	57.15	0	0
	Disease resistance	0	21.4	57.15	14.3	7.2
	Pest resistance	28.5	21.4	50	0	0
Coffee	Yield	18.2	62.9	11.6	7.3	0
	Fast growth	38.4	62.6	0	0	0
	Early maturity of cherry	46.3	53.7	0	0	0
	Consumer demand	65.9	34.1	0	0	0
	Disease resistance	6.6	11.5	53.6	22.1	6.2
Common bean	Yield advantage	20.3	65.4	14.3	0	0
	Early maturity	43.1	51.2	5.7	0	0
	Consumer demand	38.3	59.6	2.1	0	0
	Easy threshing	47.2	52.8	0	0	0
	Disease and pest resistance	25.4	57.5	17.1	0	0

Source: Own survey (2023)

CONCLUSION AND RECOMMENDATIONS

Enset, coffee, maize, barley, sorghum, Teff, wheat, common bean, faba bean, and fruit crop, including avocado and banana, are produced in the watershed shed, but maize, enset, and coffee are produced by most households, and large areas are allocated for them. The productivity of crops produced in the Afalech watershed was below the country's average potential. The major agronomic management practices done by the sample households were plowing, planting, weeding, crop rotation, and intercropping, but the adoption of improved management practices is lower in the area.

The adoption rate of improved crop varieties and inorganic fertilizers was inferior. The most accessible and utilized improved crop varieties are maize, common bean, and coffee. The majority said that the trend of improved seed and fertilizer utilization is decreasing due to their inflated price, timely delivery problem and lower productivity difference. Household in the area perceive that improved crop varieties are good interims of yield, consumer demand, early maturity and easy threshing but medium in disease and pest resistance compared with local varieties.

District agricultural office and respective bodies must support the production of diversified crops in the area and the adoption of improved crop technologies like better management practices and improved varieties. The adoption of better-yielding crop varieties and inorganic fertilizer is critical for better productivity of crops produced, so awareness creation, timely inputs delivery and demonstration of improved agricultural technology are needed.

REFERENCES

1. Leykun D, Jemma H. Econometric analysis of factors affecting market participation of smallholder farming in Central Ethiopia. Munich Personal RePEc Archive. 2014. Available from: https://mpra.ub.uni-muenchen.de/77024/
2. Ayele T, Goshme D, Tamiru H. Determinants of cereal crops commercialization among smallholder farmers in Guji Zone, Ethiopia. Cogent Food Agric. 2021;7(1):1–15.
3. Gerba L, Girma K, Veltmeyer K, Spies T, Hildebrand AK. Rhetorics and realities of participation: the Ethiopian agricultural extension system and its participatory turns. Crit Policy Stud. 2019;13(4):1–20.
4. Shita A, Kumar N, Singh S. Agricultural technology adoption and its determinants in Ethiopia: a review. Asia Pac J Res. 2018;1(XX):1–10.
5. Regasa G, Negash R, Eneyew A, Bane D. Smallholder market participation and its associated factors: evidence from Ethiopian vegetable producers. Cogent Food Agric. 2020;6(1):1–14.
6. Yamane T. Statistics: an introductory analysis. 2nd ed. New York: Harper and Row; 1976.
7. Afeto A, Tesfaye Y. Contribution of forest products to rural households' income and factors determining forest income in Masha District of Sheka Zone, Southwest Ethiopia. Int J Agric Res Innov Technol. 2022;12(2):46–52. doi:10.3329/ijarit.v12i2.64084.
8. Afeto A, Kassa K, Belay T, Gebremchael A. Spice production and marketing in Kaffa Biosphere Reserve, Ethiopia. Int J Agric Res Innov Technol. 2023;13(2):22–30. doi:10.3329/ijarit.v13i2.70850.
9. Lema M, Mensa A, Hazo H, Markos S. Identification and prioritization of major constraints of crop productivity and production system: the case of Melokoza District, Southern Ethiopia. Int J Res Agric For. 2017;4(12):38–43.
10. Tadesse B, Tilahun Y, Bekele T, Mekonen G. Assessment of challenges of crop production and marketing in Bench-Sheko, Kaffa, Sheka, and West-Omo zones of southwest Ethiopia. Heliyon. 2021;7(XX):eXXXXX.
11. Tarekegn K, Mogiso M. Assessment of improved crop seed utilization status in selected districts of Southwestern Ethiopia. Cogent Food Agric. 2020;6(1):1816252. doi:10.1080/23311932.2020.1816252.
12. Bekele W. Analysis of production, yield, and cultivation area trends in major cereal crops in Ethiopia. Agric For Fish. 2021;10(4):123–126. doi:10.11648/j.aff.20211004.11.

13. Kifle T, Tolossa D, Shibru A, Alemu D. Determinants of adoption of improved varieties of wheat (Triticum aestivum), teff (Eragrostis teff), and maize (Zea mays L.) in Central Ethiopia. J Agric Ext. 2023;27(2):1–14. doi:10.4314/jae.v27i2.1.
14. Beshir H, Emana B, Kassa B, Haji J. Determinants of chemical fertilizer technology adoption in north-eastern highlands of Ethiopia: the double hurdle approach. J Res Econ Int Financ. 2012;1(2):39–49.
15. Birhanu A, Kalkidan Y, Alelign A. Determinants of inorganic fertilizer adoption: the case of smallholder farmers in Gimbo District, South West Region, Ethiopia. J Econ Sustain Dev. 2023;13(5):1–10.
16. Diro S, Erko B. Impacts of adoption of improved coffee varieties on farmers' coffee yield and income in Jimma Zone. Agri Res Tech Open Access J. 2019;21(4):556169. doi:10.19080/ARTOAJ.2019.21.556169.

