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RESEARCH ARTICLE

Value Chain Analysis of Korarima (*Aframomum Corrorima*) in South Omo Zone, SNNPR Ethiopia

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Abstract: Korarima is a known cash crop in the South Omo zone and provides a wide range of economic and socio-cultural benefits. Even though its economic and socio-cultural importance the development of the Korarima sector along with the value chain is hampered by several constraints. Hence, the study aimed to analyze the Korarima value chain in the South Omo zone. Using a two-stage sampling technique, 120 Kororima producers were selected to collect primary data through structured questionnaires. Descriptive statistics and econometrics model (multivariate probit model) were used for data analysis. The study identified three major Korarima market outlet choices such as collectors, retailers, and wholesalers as alternatives to Korarima producers to sell the majority of their products. Thus, collectors accounted for 82.2%, wholesalers (73.6%), and retailers (35.5%) of the total sold. The results of a multivariate probit model indicated that sex of household, credit access, family size, price information, market distance, and extension contact of farmers significantly affected the market outlet choice decisions in one or another way. Furthermore, no brand indicating this crop, inadequate infrastructural development, and market accessibility, weak extension services regarding improved varieties were major problems identified. Therefore, it is better to work on the brand name of this particular crop to trace up to the end market, infrastructural development and market accessibility, extension services provided regarding the improved Korarima variety, and accessing formal market information from the concerned body are essential to enhance Korarima producers' benefit and bargaining power through avoiding information asymmetry.

Keywords: Value chain; Market outlet; Multivariate; Korarima; South Ari

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1. Introduction

Agriculture remains the main activity in the Ethiopian economy. Agricultural growth is not only required to feed the country but is also the driving force to generate foreign exchange. About 80% of Ethiopia's foreign exchange is derived from agricultural exports [1]. Enhancing agricultural production and export trade is the current strategy followed by the country to curtail the critical capital shortage and enhance economic growth.

Spices have a major stake in the production system and the foreign earnings of the country. It has a great role in transforming farmers into producers for the market instead of producing merely for subsistence [2]. Ethiopia has become one of the largest consumers of spices in Africa. People use spices to flavour bread, butter, meat, soups, and vegetables. They also use spices to make medicines and perfumes [3]. Ethiopia is a homeland for many spices, such as Ethiopian Korarima (Korarima*/Aframomum Corrorima*), long red pepper, black cumin, white cumin/bishops weed, coriander, fenugreek, turmeric, sage, cinnamon, and ginger [3]. Out of the 109 spices listed by International Organization for Standardization (ISO), 50 spices are cultivated or grown in Ethiopia. Apart from this, there are several other spices and herbs available in small quantities [4].

The average land covered by spices is approximately 222,700 ha and the production is 244,000 tons per annum. However, the supply has dwindled considerably in recent years and the Ethiopian Korarima export was less than 100 MT in 2012. The production of Ethiopian Korarima during the 2014/2015 crop season was 9.56 thousand tons with a productivity of 5.1 Q/ha.

In Ethiopia, Southern National and Nationalities Peoples Regional States (SNNP) is one of the regions which produce the maximum quantity of spices in the country. The major Ethiopian Korarima production areas are the forest ecology of South and South West mid-altitude and highland Korarima areas such as the Kaffa zone (center of origin of Korarima), Bench-Maji zone, Sheka zone, Majang zone, Dawuro zone, Wolayita zone, and Gamo Gofa zone, Kembata-Tembaro zone in SNNPR and Jimma zone (Oromiya). The price of a kilo of dry Korarima capsule in the domestic market ranges from 80 Birr to 100 Birr (One US$ = 21 Birr) in the villages. Ethiopia exports about 200 MT of Ethiopian Korarima per year [4].

In South Omo Zone Korarima is also abundantly found and potentially grown/produced by smallholder farmers of South Ari, Semen Ari, and Salamago districts. In the Zone, for the past five consecutive years about 16,843.96 ha, Korarima has grown with a production of around 70,744.63 Quintal with average productivity of 4.2 quintal/ha [5]. Korarima has a contribution to income generation and also has value in reducing/minimizing poverty for smallholder farmers.

Despite, its availability, huge potential, and the role it plays, limited attention has been given to its production, value, value addition activities, and marketing outlets choice. As result, the unregulated price of Korarima (black market), South Omo zone Korarima is transported to Gofa by the black market, and recognition and benefit from it are given to the former Gamo Gofa zone. And also small farm gate prices and less market access are disadvantageous for producers. Therefore, this study focused on identifying major value chain and marketing actors, value additive activities in production, outlet choice in the marketing of Korarima and its products, and identifying the major value chain and marketing opportunities and constraints.

2. Research Methodology

2.1 Type and Sources of Data

Qualitative and quantitative data were collected from primary and secondary data sources. The primary data on the value chain and marketing of Korarima, value chain, and marketing channels, direct and indirect benefits of Korarima, supply and market price of Korarima, transaction cost in marketing Korarima, main actors and their role, margin share and distribution among market actors, marketing infrastructure and information, market participants and concentration at each market chain, opportunities and threats of Korarima production and marketing, farmers perception will be collected from key value chain actors and stakeholders. Value chain actors and marketing stakeholder includes sample producers, collectors, traders, exporters, consumers, enterprise operators engaged in the value chain and marketing of Korarima, end-users of the products, formal and informal institutions involved in Korarima value chain and marketing, supporters of Korarima value chain and marketing, as well as representatives from government organizations and others working in Korarima production. Secondary data were collected from literature, reports, and documents both published and unpublished data sources.

2.2 Methods of Data Collection

To collect the primary data both participatory rural appraisal (PRA) tools of informal methods and formal survey methods of data collection were employed. Informal survey methods such as focus group discussions (FGDs), in-depth interviews with key informants (KII), and direct observation with transacting walk will be employed,

whereas for the formal survey method, structured survey questionnaires were administered to sample respondents. Informal survey such as focus group discussion with known social strata groups (e.g. women, youths, elders, others) was conducted before the formal survey. A questionnaire was pre-tested to indorse new information and to modify the structured questionnaire. Open discussion with producers, traders, consumers, and exporters & were interviewed according to their activities or function (as Value Chain Analysis starts from production up to final consumption).

2.3 Sampling Technique

Two-stage sampling technique was employed to draw the sample from a given population of Korarima producers and traders. In the first stage, potential Korarima producing and marketing Kebeles were identified purposively. In the second stage, sample households were identified by random selection. Yemane [6] sample size determination formula was used to determine the number of respondents.

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

where, n=the sample size, N=total number of Korarima producers, e=acceptable sampling error, and the value of 'e' is 95% confidence level and it's assumed to be e=0.05. After determination of sample size, the sample respondent from smallholder household was selected randomly from sample Kebeles.

2.4 Data Analysis

Both simple statistics and econometric models were chosen for the analysis. The econometric analysis was employed to analyze factors affecting the level of market outlet choice and value addition. Software called Statistical Package for Social Science (SPSS) and STATA were used for the analysis.

2.4.1 Econometric Model Specification

This study used a multivariate probit model as it captures the household variation in the choice of market outlets and estimates several correlated binary outcomes jointly. A multivariate probit model would be appropriate for jointly predicting these three choices (collector, retailer, and wholesaler) on an individual-specific basis. A multivariate probit model simultaneously set out the influence of a set of explanatory variables on the choice of market outlets, while allowing for the potential correlations between unobserved disturbances as well as the relationship between the choices of different market outlets [7]. In this case, three-outlet choices are collector, retailer, and wholesaler and the model enables Korarima producers to choose more than one outlets that are not mutually exclusive to get a better price. The selection of appropriate market outlet i by farmer j is Y_{ij}^{C} defined as the choice of farmer j to transact market channel i (Y_{ij}^{C} =1) or not (Y_{ij}^{C} =0) is expressed as follows;

$$Y_{ij}^{C} = \begin{Bmatrix} 1 \text{ if } Y_{ij}^{C} = X_{ij}^{C}{}_{\alpha ij} + \varepsilon^{c} \geq 0 \Leftrightarrow X_{ij}^{C} \geq -\varepsilon^{c} \\ 0 \text{ if } Y_{ij}^{C} = X_{ij}^{C}{}_{\alpha ij} + \varepsilon^{c} < 0 \Leftrightarrow X_{ij}^{C} < -\varepsilon^{c\prime} \end{Bmatrix} \tag{2}$$

where v α_{ij}^{C} aector of estimators, ε^{c} is a vector of error terms under the assumption of normal distribution, Y_{ij}^{C} dependent variable for market outlet choices simultaneously and X_{ij}^{c} combined effect of the explanatory variables.

The selection of one type of market outlet choice would be dependent on the selection of the other, since smallholder farmers' choice decisions are interdependent, suggesting the need to estimate them simultaneously. To solve this problem many scholars suggested and used a multivariate probit simulation model [8,9]. Since smallholder farmers' market outlet choice decisions were expected to be affected by the same set of explanatory variables.

$$\begin{Bmatrix} \text{Collector}j = x'_{1\beta 1} + \varepsilon^{A} \\ \text{Retailer}j = x'_{2\beta 2} + \varepsilon^{B} \\ \text{Wholesaler}j = x'_{3\beta 3} + \varepsilon^{C} \end{Bmatrix} \tag{3}$$

where collector *j*, wholesaler *j*, and retailer *j* are binary variables taking values 1 when farmer *j* selects collector, wholesaler, and retailer respectively, and 0 otherwise; X1 to X4 is a vector of variables; $\beta 1$ to $\beta 3$ a vector of parameters to be estimated and ε disturbance term.

In a multivariate model, the use of several market outlets simultaneously is possible and the error terms jointly follow a multivariate normal distribution (MVN) with zero conditional mean and variance normalized to unity, and ρij represents the correlation between endogenous variables, given by

$$\begin{pmatrix} \varepsilon^{A} \\ \varepsilon^{B} \\ \varepsilon^{C} \end{pmatrix} \ldots\ldots N\left[\begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix} \begin{pmatrix} 1 & \rho 12 & \rho 13 \\ \rho 21 & 1 & \rho 23 \\ \rho 31 & \rho 32 & 1 \end{pmatrix} \right] \tag{4}$$

$$\begin{aligned} &\text{E}\ (\varepsilon/x) = 0 \\ &\text{Var}\ (\varepsilon/x) = 1 \\ &\text{Cov}\ (\varepsilon/x) = \rho \end{aligned} \tag{5}$$

2.4.2 Description of Variables and Expected Sign

The likely variables, which were supposed to affect producers' market outlet choice decisions, are explained in Table 1.

Table 1. Summary of hypothesized explanatory variable that determines Korarima producers' market outlet choices

Explanatory variables	Measurement	Expected sign
Sex	1 if a male farmer, 0 if a female farmer	-/+
Age	Years	+
Education level(formal)	Years of schooling (grade)	+
Family size	Family members in a household living for more than 6 months (number)	+
Land size	The total area of land managed by a household (hectare)	+
Annual income	An annual income of a household (Ethiopian Birr)	+
Price information	1 if a household has price information of Korarima, 0 otherwise	-/+
Extension contact	Contact with extension agents in a month (Frequency)	+
Access to credit	1 if farmer has access to credit service, 0 otherwise	+
Distance to a market center	Distance to the nearest market center by foot walk (minute)	-
Quantity produced	The quantity of Korarima produced in a year (kilogram)	+
Experience	Experience of farmers producing Korarima (years)	+

3. Results and Discussion

3.1 Socio-Economic and Demographic Characteristics of the Respondents

This sub-section explains the profile of sampled respondents regarding their age, sex, family size, experience, level of education, access to extension services, access to market information, and distance from the nearest market (Table 2). Gender was analyzed by checking the number of male and female-headed households. Out of the total households interviewed 95.8% were male-headed households while 4.2% were female-headed households. In both theoretical and practical situations, education level plays an important role in ensuring household access to basic needs such as food, shelter, and clothing. Skills and education enhance working efficiency resulting in more income and food security. In the study area, the mean grade level achieved by respondents was about grade 6. The minimum grade was 0 for those who were illiterate and the maximum was grade (10+3). The age of sample respondents was measured in years and provided a clue on the working ages of households. The mean age of the sample household was 37 years with the minimum and maximum age of 18 and 65 years, respectively.

The mean family size of the total sample households was nearly 7 persons with a minimum of 2 and a maximum of 12 persons and a standard deviation of 2.67. Therefore, this might help them for a better market outlet choice of households during Korarima marketing because of labor availability. The respondents have an average of 17 years of farming experience in Korarima production and marketing with a standard deviation of 11 years. The total land size of sampled farmers varies from 0.13 to 3 hectares and the average farm size for sampled farmers is found to be 0.78 hectares with a standard deviation of 0.53. From the total land size, the land allotted to Korarima was on average 0.29 ha with a minimum of 0.03 and a maximum of 1.5 ha with a standard deviation of 0.24.

According to the sample respondents, the major sources of income were crop, livestock, and livestock product selling, and also there is some practice of getting off-farm and non-farm sources. The total estimated average annual income that the respondents obtained from those sources was 12,192 Birr. Distance to market is an important variable that affects the marketing of Korarima. The mean distance to the market center for sample households was 18 minutes with a minimum of 10 and a maximum of 50 minutes of walking on their barefoot and a standard deviation of 2.67. Farmers who are located distant from the market center might be weakly accessible to the market outlet and have less transportation cost and time spent.

3.2 Korarima (Aframomum Corrorima) Cultivation Practice in the Study Area

Korarima is a known cash crop in the South Omo zone and cultivation of it is mainly practiced in the agro forestry and river banks of South and Semen Ari areas of the zone. According to Getasetegn and Tefera [10], the cultiva-

Table 2. The socio-economic and demographic characteristics of sample households

	Respondents (120)			
Variables	Minimum	Maximum	Mean	Std. dev
Age of respondent(years)	18	65	37.49	10.97
Family size(number)	2	12	6.63	2.67
Education level(grade)	0	10+3	4.77	3.72
Experience in Korarima marketing(years)	2	50	16.77	11.47
Landholding(ha)	0.13	3	0.78	0.53
Land covered by Korarima(ha)	0.03	1.5	0.29	0.24
Annual income (Birr)	10000	60000	12192	10078
Distance to market (minute)	10	50	18.76	10.74
		Frequency	%	
Sex of respondents	Male	115	95.8	
	Female	5	4.2	

Source: own survey, 2021

tion of the Korarima is mainly practiced in the forests of south and South western parts of Ethiopia such as Gamo Gofa, South Omo, Kaffa, Ilubabor, Sidamo and Wellega. It provides a wide range of benefits for communities such as cultural value, income generation, and soil conservation. In the study area, Korarima is used as traditional medicine and it has also important in supporting local livelihood improvement and environmental conservation. It plays a great role in the household economy and livelihood support by selling. A discussion with key informants (zone, woreda, and kebele experts) the main opportunities in the study area concerning Korarima cultivation was suitable agro-ecology, high demand for the Korarima, and availability of traders from other areas. However, the main constraints for the Korarima production in the study area are no practice of provision of improved seedlings, disease, and poor harvesting practice. As seen in Table 3 the average land size covered by Korarima per household was 0.29 hectares with a maximum of 1.5 hectares.

3.2.1 Land Preparation

As depicted in the Table 3 more than half (59%) of Korarima cultivators practiced land preparation with oxen plow. On the other hand, 31% of cultivators used pit digging without oxen plow and few farmers used both oxen plow and pit digging (10%). As the cultivation of Korarima is intermingled with agro forestry and river banks in the study area and it is difficult for oxen to plow because rhizomes and leaves of it spread over and cover the ground. Due to this condition, farmers cleared land to remove some shrubs and bushes and let Korarima sucker expand around the area freely on the cleaned land without any management practices near shade trees.

3.2.2 Planting Method and Propagation

In the study area, there were no improved varieties of the Korarima sucker and all farmers cultivate the local Korarima sucker. As per focus group discussion with model farmers, elders, and development agents they reported that suckers from nursery fields for plantation give a higher yield than directly suckers propagated in the field. However, most farmers didn't practice as such on nursery plantations. The absence of improved variety coupled with problems of climate change effect and associated diseases decreased the production and productivity of producers. The lack of improved varieties and weak agronomic practices are major production constraints in Ethiopia [11]. In the study area producers simply propagate Korarima from both rhizomes and seeds, and most producers used land clearing by removing some shrubs and bushes and, letting Korarima sucker be propagated around the area freely through its rhizomes. In the study area, once the Korarima sucker is planted, it sets seeds after 3-4 years and it continues to bear seeds many times.

3.2.3 Harvesting and Handling of Korarima in the Study Area

In the study area, the harvesting of Korarima was done based on visual observation of matureness by a color change from green to red and the size of the capsules. In addition, easiness to detach the capsules from the mother stalk plant and complete drying up of the capsule's upper tip (straw) were also taken into account during harvesting. Capsules that were free from insect or physical damage, unbleached, and uniform in color for the particular stage were considered during the harvesting time. More than half (52%) of Korarima producers used sun drying, 20%

used smoke drying 28% used both sun and smoke drying (Table 3). As revealed by the sample respondents sun drying is preferred by traders because it keeps the quality Korarima. Most of the respondents revealed immature capsule harvesting at a green stage in the study area was practiced and it affected the quality of Korarima and the reason for the lack of attractive price.

3.3 Marketing of Korarima in the Study Area

3.3.1 Selling Practice of Producers and Associated Problems

There are different ways of exchange or units of transaction in the study areas (Table 4). These are counting the number of fresh Korarima seeds and weighing scale (price per kilogram) for dried Korarima. According to sample respondents, almost all respondents sold their Korarima directly to the purchaser. However, the problems that have been created by the brokers during the marketing of Korarima were taken to the limited traders (38.3%), charging high brokerage fees (4.2%), cheating on weighing (1.7%), and providing wrong price/market information (55.8%). About 70.8% of sample respondents reported that they face difficulty in finding buyers when they want to sell Korarima whereas only 29.2% said there was no difficulty in finding buyers. As per the sample respondents' report, the reason for facing difficulty in finding the buyers of Korarima in the study area was low price offered (35.3%), lack of good market & information (22.4%), and inaccessibility of the market or long-distance transport (42.3%). However, the sample respondent revealed that they have been sold Korarima at a lower price even though they didn't get the expected price for their Korarima. And some others took back home and wait for another market. The result of the survey indicates that an alternative market and the existence of a limited number of traders that made smallholder Korarima producers sell at low prices in the study area were absent.

3.2.2 Buying and Selling Activities of Traders

As provided in Table 5, as per the trader's interview, the major suppliers of Korarima in the study area were farmers, collectors, and brokers. During Korarima marketing the traders informed that the transaction for the Korarima took place at the market center (66.7%), farmers bring their Korarima up to their business center (25%) while only 8.3% of the transaction takes place at their farm gate. According to traders, 70% of traders cover the cost of transportation service for the farmers when they provide their Korarima to the business center whereas 30% of those didn't cover the transportation costs. In the study area, high demand and supply of Korarima were from September up to December whereas low demand and supply of Korarima were from March up to August. The total quantity of Korarima purchased by the traders amounted to 640 Qt. and each trader has purchased on average 121.8 Qt. with an average buying price of 130 Birr per kg.

Table 3. Land preparation and drying of Korarima

Land preparation	Frequency	%	Drying method	Frequency	%
Oxen plow	71	59	Sun drying	62	52
Pit dig	37	31	Smoke drying	24	20
Both oxen plow & Pit dig	12	10	Both sun and smoke drying	34	28

Source: own survey, 2021

Table 4. Korarima marketing by producers

Problems in Korarima selling	Frequency	%	Problems in finding buyers		Frequency	%
Limited of traders	46	38.3	Face difficulty in finding buyers		85	70.8
Charge high brokerage fee	5	4.2	No difficulty in finding buyers		35	29.2
Cheating weighing scale	2	1.7	Reason for facing difficulty	Low price offered	30	35.3
				Lack of good market	19	22.4
Lack of good price	67	55.8		Inaccessibility to market	36	42.3

Source: own survey, 2021

The total quantity of Korarima sold by the traders amounted to 300 Qt. and each trader has sold on average 112.4 Qt. with an average selling price of 210 Birr per kg last year. The retailers and collectors sold Korarima at the woreda market while the wholesalers have been selling at Addis Ababa with an average selling price of 210 Birr per kg. During a discussion with traders, they reported that they obtain market information from other traders. The majority of traders use their source of capital to run their businesses. However, traders indicated that credit access for their business was poor in the study area. Concerning storage majority of traders have their storage with a maximum capacity of 150 Qt. on average at a time. As reported by traders, the main constraints for them in the study area were very poor infrastructural development, poor quality supply of Korarima, and the presence of illegal traders.

The average age of traders was 36.25 years which ranges between 27 and 52 years. The average family size of the traders was 5 with a minimum of 3 and a maximum of 8. Concerning educational level, the trader's majority lies between grades two and twelve. The average marketing experience of the traders was 8.75 with a minimum of 1 year and a maximum of 15 years of experience.

3.3.3 The Value-adding Activities of Producers or Traders

The main trader's value-adding activities in the study area were cutting, cleaning, drying, grading, transportation and packaging. Figure 1 shows the value-adding functions of the producers or traders. On the other hand, Table 6 shows the value addition practices of Korarima in the study area as about 90.83% indicated that they keep the Korarima quality to provide to the market whereas 9.17% didn't keep the quality. The sample respondents indicated the major value-adding activities conducted by the farmers in the study area were cleaning (43.1%), storage (27.5%), transportation (2.8%), and both cleaning and storage (21.1%) whereas storage and transportation (5.5%). About 87.5% indicated that there was a price difference due to value addition with an average price difference of 20-30 Birr per kg whereas 12.5% didn't know about the price difference.

Table 5. Personal characteristics of traders and buying/selling activities

Variables	Maximum	Minimum	Average	
Age	52	27	36.25	
Family size	8	3	5.2	
Education level	12	2	8.1	
Experience	15	1	8.1	
Total quantity purchased last year(kg)	640	2	121.8	
Buying price/kg	160	110	130	
Total quantity sold last year(kg)	300	2	112.4	
Selling price/kg	270	125	210	
Buying place	Frequency	%	Cover transportation cost	
Market	80	66.7	Yes	No
Business center	30	25	84(70%)	36(30%)
Farm gate	10	8.3		

Source: own survey, 2021

Table 6. Value Addition of Korarima

Value addition of Korarima		Frequency	Percent
Keep the Korarima quality	Yes	109	90.83
	No	11	9.17
Value-adding activities	Cleaning	47	43.1
	Storage	30	27.5
	Transportation	3	2.8
	Cleaning and storage	23	21.1
	Storage and transportation	6	5.5
Price difference due to value addition	Yes	105	87.5
	No	15	12.5

a b c

Figure 1(a-c). Value-adding activities of Korarima in the study area

3.4 Access to Institutional Service of Farm Households

3.4.1 Access to Credit Service

Finance is the crucial element starting from Korarima production up to harvesting and marketing of the product but producers do not take credit specifically for Korarima production. As depicted in Table 7, about 40.8% of sampled producers had access to credit while 59.2% had no access to credit in the study area. However, only 21.7% of those who received credit while 78.4% didn't receive credit last year. The major purpose for those who received credit was input purchase, purchase of livestock for fattening, and land rent purpose. The sample respondents indicated that the credit was provided by Omo Micro-Finance which has a problem with taking credit regarding inadequate supply and high-interest rates. Some respondents have used their friends and relatives as a source of credit in the study area. According to the sample respondents, the reasons for not receiving the credit were high-interest rates, unfavorable repayment time, restrictive procedure, no need, lack of collateral, and fear of inability to repay.

3.4.2 Access to Extension Service

Of the respondents, about 79.2% have access to an extension whereas only 20.8% of the sample respondents didn't have access to an extension. However, concerning extension services to Korarima production last year, only 28.4% of the sample respondents have been got extension services while 71.6% didn't get. The type of extension services that has been provided for the sample respondents in the study area were planting methods, harvesting and post-harvest handling price information, and marketing of Korarima. This indicates that the extension service provided to Korarima production and marketing was very less as compared to other types of extension services provided for crops in the study area. The survey result indicated that the average number of contacts the extension agents made with the sample respondents was 5.5 times per month (Table 7).

3.4.3 Access to Transportation Services

Concerning transportation services (Table 7), the sample respondents indicated that the majority (81.7%) of those who have no means of transportation supply their Korarima to the market while only 18.3% have their transportation. The means of transportation for those who used to take their Korarima to the market were by cart (5%), pack animal (79.2%), and carrying and using a bicycle (15.8%). The average transportation costs per 100 kg to take to the market by motorcycle or cart were 47.26 Birr. The sample respondent also revealed that about 85% of the majority have no long-standing customers with buyers whereas only 15% have a long-standing customer with a buyer.

3.4.4 Market/Price Information

Better information can improve farmers' bargaining power, reduce search costs, and reduces transportation costs. As revealed in Table 7 below about 44.2% of respondents get market information whereas 59.2% of respondents didn't get price information. The main source of price information that producers get for Korarima marketing in the study area in search of last week's market information (37.7%), from traders (28.3%), experts communication (11.3%), and some respondents who sold their products without market information (22.6%).

3.4.5 Bargaining Power of the Sample Respondents

Concerning negotiation on price during Korarima selling (Figure 2), the majority (66.7%) of sample respondents indicated that the price-setting was made by buyers, 26.7% was by brokers and the rest 6.7% was made by the farmers. This result indicates that the Korarima producers have poor bargaining power on the Korarima marketing in

Table 7. Access to services

Variables		Frequency	%		Frequency		%
Access to extension service	Yes	95	79.2	Extension to Korarima	Yes	27	28.4
	No	25	20.8		No	68	71.6
Mean extension contact (month)		5.5 times					
Access to credit service	Yes	49	40.8	Received credit	Yes	26	21.7
	No	71	59.2		No	94	78.3
Access to transportation	Yes	22	18.3	Means of transportation	Cart	6	5
	No	98	81.7		Pack animal	95	79.2
					Carrying & bicycle	19	15.8
				Long stand customer	Yes	18	15
					No	102	85
Get price information	Yes	53	44.2	Source of price information	Traders	15	28.3
	No	67	55.8		Experts	6	11.3
					Last week market	20	37.7
					No information	12	22.6

Source: own survey, 2021

the study area which has made them price takers. Due to low price offer by traders in the study area the Korarima producers have been discouraged in the production of this crop. This might have called the concerned body to intervene in such a poor Korarima marketing system in the study area to benefit smallholder Korarima producers. The result indicates that buyers have a great role in setting the price which discouraged the farmers to participate in this business here is the figure that shows the price setting of Korarima.

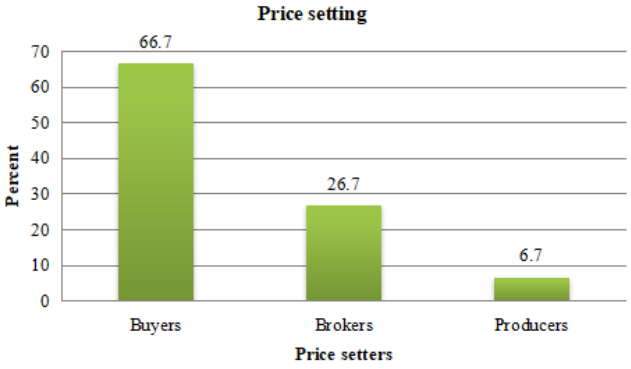

Figure 2. Korarima price setting in the study area

3.4.6 Quantity of Korarima Produced and Marketed

The sample respondents during the survey indicated that almost all respondents have been involved in Korarima production as well as marketing. As presented in Table 8, the average quantity of Korarima produced and marketed per individual sampled household head was about 1.92 quintals and 1.72 quintals respectively. According to sample respondents, the average marketing costs such as packing, loading, and transportation costs incurred during Korarima marketing per sampled household was 126.53 Birr with a minimum of 65 Birr and a maximum of 260 Birr which was based on the quantity of Korarima to be marketed. The unit marketing cost per quintal of Korarima was 73.55 Birr. The average harvesting cost per sampled individual household head was 475.86 Birr.

Table 8. Quantity of Korarima produced and marketed

Quantity of Korarima produced and marketed (n=120)	Minimum	Maximum	Mean
Quantity of Korarima produced per household in Qt.	0.01	8	1.92
Quantity of Korarima marketed per household in Qt.	0.01	10	1.72
Unit price per kg	30	260	114.72
The cost incurred in Korarima marketing per household (Birr)	65	260	126.5
Harvesting cost per household (Birr)	20	3000	475.86

Source: Own Survey, 2020

3.5 Korarima Value Chain and Marketing Actors and Their Function in the Chain

According to survey results, five major Korarima value chain actors were identified in the study area. These are producers, collectors, wholesalers, retailers, consumers, and also other value chain supporters.

Korarima producers: these are the main actors in the value chain who produces Korarima on their farmland. They were the primary link actors who cultivate and supply Korarima to the market. Their main source of seedlings is farmer to farmer and no support has been provided by any extension agent or government. Producers sell their produce at the farm gate or village and district markets.

Collectors: These are actors that collect a large volume of Korarima at the farm gate from the smallholder Korarima producer and provide it to the wholesaler in the study area. The main market outlets for the collectors in the study area were wholesalers.

Wholesaler: Wholesaler is traders that collect a large volume of Korarima from collectors and mainly sell to retailers. They play a significant role in the market chain who mainly known for the purchase of bulky products with better financial and information capacity as well as reside in the town. They are major actors in the channel and they purchase Korarima either directly from the farmer or mainly through collectors.

Retailers: Retailers are known for their limited purchasing with low financial and information capacity. They are the main actors along the channel and deliver Korarima to the consumer in small amounts in the study area.

Consumers: Consumers are the final purchasers of Korarima mostly from retailers for consumption purposes only and it is the last link along the channel.

3.6 Korarima Market Channels

The smallholder Korarima producers have been sold using different Korarima marketing outlets. There are five Korarima marketing channels have been identified in the study area. According to survey results, it was estimated that the total amount of Korarima supplied to the market by the sampled households was 206.4 qt. The highest volume of sales of Korarima was taken in channels four and five which indicates that the flow of Korarima market in the study area is concentrated on these channels. But channels one and five are the most advantageous Korarima market channels for the producers; both channels make producers gain collective bargaining power and also help them get a fair market price. The market channels that have been identified in the study area were:

Channel I: Producer ⟹ Consumers (12.6 qt or 6.1%)
Channel II: Producers ⟹ Collectors ⟹ Retailer Consumer (13.5 qt or 6.5%)
Channel III: Producer ⟹ Retailer ⟹ Consumer (25.4 qt or 12.3%)
Channel IV: Producers ⟹ Collector ⟹ Wholesaler Retailers ⟹ Consumer (81.5 qt or 39.5%)
Channel V: Producers ⟹ Wholesaler ⟹ Retailers ⟹ Consumer (73.4 qt or 35.6%)

3.7 Korarima Market Performance

Marketing margin analysis for each value chain actor was used to determine the market performance of the Korarima. From the result, the Korarima producers' gross profit was highest in channels I, V, and III respectively while they take the lowest gross profit when they sell to collectors in channels II and IV which accounts for 106.5 Birr/kg. This implies producers are more profitable if they sold directly to consumers, wholesalers, and retailers respectively. As indicated in Table 9, the total gross marketing margin (TGMM) is highest in channels IV (61.1%) and V (58.9%), and lowest in channels II (10.8%) and III (6.7%). This difference might support the theory that as the number of marketing agents increases the producer's share decreases. For instance, without considering channel I where the producer directly sold Korarima to consumers, the maximum producer's share (GMMpr) is highest in channel III which was 93.3% of the total consumers' price. The reason is, that the more the number of middlemen in the Korarima market, the more profit they retain for their services whether they add value to the item or not. This is in line with the findings of Kassa et al. [12] who suggested that the share of market intermediaries in the consumer's price was large and there was a need to reduce market intermediaries to minimize the marketing margins.

3.8 Korarima Value Chain Map and Market Route in the South Omo Zone

Value chain mapping is the process of developing a visual depiction of the basic structure of the value chain and illustrates the way the product flows from raw material to end markets and presents how the industry functions. It highlights the point that most goods and services are produced by a complex and sequenced set of activities [13]. As discussed by scholars Springer-Heinze [14]; Lundy et al. [15]; Gebre et al. [16] value chain map is usually an integral part of most value chain analyses that clearly show chain actors, interrelationships, and functional roles, stakeholders involved in the chain, boundaries of the system, a flow of goods, payments, information along the chain, and their businesses interconnection to form one system. Hence, the below Figure 3 discussed Korarima value chain actors (main actors and supporters) are the major components of these Korarima value chain maps. The market route is the pathway to providing the product in front of your customers and identifying the most effective channels for the product that will maximize profit. Deciding how to sell and selecting the right route to market is essential to the success of any product or service (Figure 4).

Table 9. Korarima profit margin of value chain actors along different channels (Birr/kg)

Actors		Korarima marketing channels				
		I	II	III	IV	V
Producers(P)	Marketing cost	2	0.5	1.5	0.5	1.5
	Selling price	115	107	112	107	113
	Gross profit	113	106.5	110.5	106.5	111.5
	GMMP (%)	100	89.2	93.3	38.9	41.1
Local collector(C)	Purchase price		107		107	
	Marketing cost		2		3	
	Selling price		117		120	
	Gross profit		8		10	
	GMMC (%)		8.3		4.7	
Retailer(R)	Purchase price		117	112	250	250
	Marketing cost		0.25	0.25	2	2
	Selling price		120	120	275	275
	Gross profit		2.75	7.75	23	23
	GMMR (%)		2.5	6.7	9.1	9.1
Wholesaler(W)	Purchase price				120	113
	Marketing cost				5	7
	Selling price				250	250
	Gross profit				125	130
	GMMW (%)				47.3	49.8
	TGMM (%)	0	10.8	6.7	61.1	58.9

Source: own survey, 2020

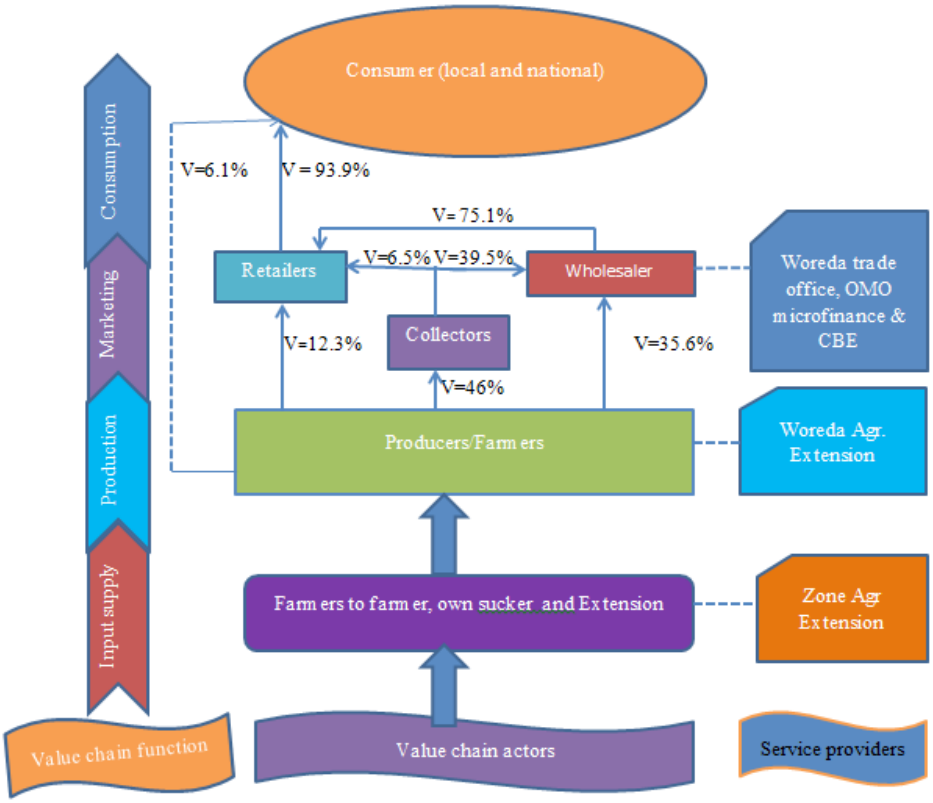

Figure 3. Value chain map of Korarima in South Omo zone

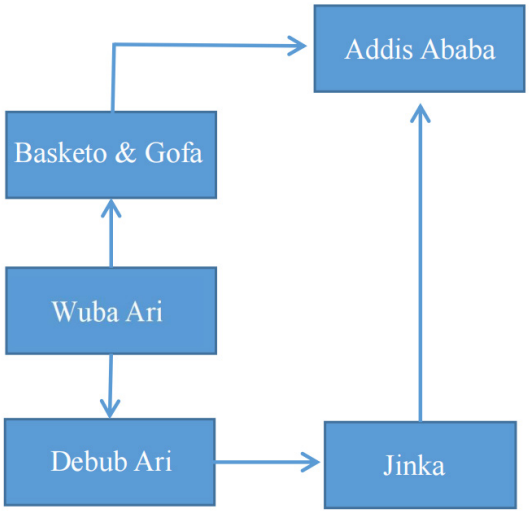

Figure 4. Market routes of Korarima

3.10 Korarima Marketing Outlets

Choice of proper marketing outlets is one of the most important farm household decisions to sell their produce. The sampled respondents were asked if they choose different Korarima market outlets to maximize the profit from their outlet choice decision. Consequently, they reported that different Korarima market outlets were used to sell their produce. These Korarima market outlets include collectors, wholesalers, retailers, and consumers. These outlets are mostly chosen in combination with one another. Table 10 shows the different Korarima market outlets used by the Korarima producers when selling their Korarima. One of the most commonly used market outlets by producers is the collectors' outlet which was chosen by about 83.4% of respondents with a mean supply of 165 kg, while about 75% of respondents sold to wholesalers with a mean supply of 164 kg. As retailers are also common Korarima marketing outlets in the study area, around 35% of sample households sold to the retailers with a mean supply of 134 kg. As revealed by respondents the reason for choosing those marketing outlets was since there is a price difference among buyers (90%), closeness in distance (6.7%), and due to transport availability (3.3%) in the study area.

3.11 Determinants of Market Outlet Choices of Smallholder Korarima Producers

In the study areas, Korarima producers have different market outlet choice options to sell their products. However, various factors affect producers to select the appropriate Korarima channels. The decision of producers to choose such market outlets was determined by various demographic, socioeconomic, and institutional factors. The Wald chi-square statistic was used to test the overall significance of variables.

As presented in Table 11, the Wald test, Wald chi2 (36) = 630.25, p = 0.000 is significant at the 1% level, which shows that the subset of coefficients of the model is jointly significant and that the explanatory power of the factors included in the model is satisfactory; thus, the MVP model fits the data reasonably well. Likewise, the model is significant because the null that the choice decision of the three Korarima market outlets is independent was rejected at a 1% significance level. The results of the likelihood ratio test in the model (LR chi2 (3) = 7.30897, Prob > chi2 = 0.0627) indicate the null that the independence between market outlet choice decision ($\rho_{21} = \rho_{31} = \rho_{32} = 0$) is rejected at 10% significance level and there are

Table 10. Description of Korarima market outlets

Decision	Korarima market outlets					
	Collectors		Wholesalers		Retailers	
	Frequency	%	Frequency	%	Frequency	%
Yes	100	83.4	90	75	42	35
No	20	16.7	30	25	78	65
Supply to each outlet	Mean (kg)	SD	Mean (kg)	SD	Mean (kg)	SD
	165	118.4	164	98.3	134	63.9
Reason for the price difference		Frequency		%		
The price difference between other buyers		108		90		
Closeness in distance		8		6.7		
Transport availability		4		3.3		

significant joint correlations for two estimated coefficients across the equations in the models. This confirms that separate estimation of a choice decision of these outlets is biased, and the decisions to choose the three Korarima marketing outlets are interdependent household decisions. There are differences in market outlet selection behavior among producers, which are reflected in the likelihood ratio statistics of an estimated correlation matrix. Separately considered, the ρ values (ρ_{ij}) indicate the degree of correlation between each pair of dependent variables. The ρ_{21} (correlation between the choice for wholesaler and collector outlet) is negatively interdependent and significant at the 5% probability level whereas ρ_{31} (correlation between the choice for retailer and collector outlet) is positively interdependent and significant at the 10% probability level. This result leads us to the conclusion that Korarima producers delivering to the wholesaler outlet are less likely to deliver to a collector (ρ_{21}). Likewise, Korarima producers delivering to the retailer outlet are more likely to deliver to collector outlets (ρ_{31}). This indicates a competitive relationship between wholesalers with collector outlets and retailers with collector outlets.

The simulated maximum likelihood (SML) estimation result shows that the probability that Korarima producers choose collector, wholesaler, and retailer market outlets was 82.2%, 73.6%, and 35.5%, respectively. This indicates that the likelihood of choosing a collector outlet is relatively high (82.2%) as compared to the probability of choosing a wholesaler (73.6%), and retailer (35.5%). The joint probabilities of success or failure of the three outlet choices also suggest that households are more likely to succeed in jointly choosing the three outlets. The likelihood of households jointly choosing the three outlets simultaneously is 21.8%, while their failure to jointly choose is 2.1%.

The results of the MVP model (Table 12) revealed that some variables were significant at more than one market outlet while some variables were significant in only one market outlet. Among twelve explanatory variables included in the model, two variables (sex & credit access) affected significantly collector market outlets; three variables (price information, distance to market & and family size) significantly affected wholesaler outlets; four variables (extension contact, credit access, family size, and price information) significantly affected retailer market outlet choice at different probability levels.

Distance from the nearest market was found to have a negative and significant relationship with the likelihood of choosing a wholesaler outlet at less than a 1% significant level. This result revealed that for those households whose residence from the nearest market increases by a kilometer, the likelihood of households choosing a wholesaler market outlet decreases by 139.3%, ceteris paribus. This implies that households located far from the nearest market are less likely in delivering Korarima produce to the wholesaler market outlet. The reason for this is that farmers located distant from the market are weakly accessible to the wholesaler market outlet, and the closer to the

Table 11. Overall fitness, probabilities, and correlation matrix of the market outlets from the MVP model output

Attributes	Collector	Wholesaler	Retailer
Predicted probability	0.822	0.736	0.355
The joint probability of success	0.218		
The joint probability of failure	0.021		
Estimated correlation matrix			
	ρ_1	ρ_2	ρ_3
ρ_1	1		
ρ_2	–0.362**(0.161)	1	
ρ_3	0.348*(0.188)	–0.141(0.193)	1
Likelihood ratio test of $\rho_{21} = \rho_{31} = \rho_{32} = 0$:			
chi2(3) = 7.30897			
Prob > chi2 = 0.0627			
Number of draws (#)	5		
Number of observations	120		
Log pseudo-likelihood	–159.51562		
Wald chi2(36)	630.25		
Prob > chi2	0.0000***		

Note: *, ** and *** significant at 5, 10 and 1% respectively.

market the lesser will be the transportation cost and time spent. This result is consistent with Getahun [17] and Alemu et al. [18] who found that distance to the market reduces the likelihood of producers selling to wholesaler market outlets.

The frequency of extension contact has a negative and significant influence on retailer outlet choice decisions at a 1% significance level. Extension services increase the ability of producers to acquire important price information as well as enable the Korarima producers to improve production approaches, hence leading to more output which in turn increases producers' ability to choose the best market outlet for their product. However, no extension services have been provided regarding Korarima production or propagation for producers other than their cultural practices. Thus, households who were not visited by extension agents were less likely to deliver Korarima by retailer outlets. This is because producers who have no price information about Korarima want to sell their produce at their farm gate for collectors or village market.

Access to price information is positively and significantly associated with the likelihood of choosing wholesaler and retailer outlets at 10 and 1% levels of significance, respectively. Access to recent price information improves producers' selling prices because market price information helps producers to analyze the price difference in their locality and the nearby main market which increases the probability of choosing wholesalers and retailers which give a relatively higher price to producers. Market information has a positive and significant effect on retailer channel choice decisions of potato producers [19].

Access to credit services is positively and significantly associated with the likelihood of choosing collector outlets at less than a 10% level of significance. As the farmers have accessed credit service, the probability of participating in a collector market outlet increases by 64.5%, ceteris paribus. The possible explanation is that getting credit services may enhance their production capacity and increase supply. So if they produce more products they simply choose to sell collector market outlet at their farm gate. The likelihood of households to choose a retailer market outlet was negatively influenced by access to credit services at less than 1% levels of significance. The finding revealed that as the farmers have not accessed credit service, the probability of participating in a retailer market outlet decreases by 102.2%, ceteris paribus. The possible explanation is that obtaining an appropriate Korarima market outlet particularly nearby urban retailers is time consumable and needs transportation access.

Family size is negatively associated with the choice of wholesaler outlet at less than a 5% level of significance. This is since households with a larger family size may take the product to market in a different way or sale at the farm gate to a collector or take it to a retailer in a minimum amount, and less likely to deliver to wholesaler market outlet. The result revealed that in households whose family size increase by one more, the probability of participating in a wholesaler market outlet decreases by 14.1%, ceteris paribus. On the other hand, family size is positively associated with the choice of retailer outlet at less than 1% level of significance. This is since households with a larger family size have plenty of labor force to deliver Korarima to retailer market outlets at nearby urban markets. This is in line with the Tewodros [20] who indicated that large family sizes have better labor endowment so that households are in a position to travel to get retailers in the district or nearby town markets.

The sex of the respondents is negatively and significantly associated with the likelihood of choosing collector outlets at less than a 1% level of significance. This result revealed that male-headed households are less likely to choose collector market outlets than their female counterparts. This means that male-headed households prefer to sell to a wholesaler at the nearby market than female and female-headed households prefer to sell the Korarima at their farm gate because females fulfill their daily family demands. As compared to female-headed households, the likelihood of choosing collector market outlets by male-headed households decreases by 426.7%, ceteris paribus.

3.12 Opportunities and Constraints along the Korarima Value Chain in the Study

Major constraints and opportunities along the Korarima value chain in the study were identified in terms of input supply, production, and marketing. As seen in Table 13 below, major constraints in input supply are lack of improved variety or sacker and absence of fertilizer use whereas shortage of land, no or weak extension services, disease, and post-harvesting problems are the production constraints. Moreover, there is a serious marketing problem of Korarima in the study area such as infrastructures like roads, no brand name of the product, and low farm gate price. The major opportunity in input supply is a demand of producers for improved variety or sucker. On the other hand, suitable agro ecology, fertile land, and the high demand of consumers are opportunities for production. Intervention areas identified in input supply are a research effort to release new variety and extension efforts to further enhance the Korarima production in the area. Moreover, there is a serious road problem to transport the product to the market.

Table 12. Multivariate probit estimations for determinants of market outlet choices of Korarima producers

Variable	Market outlet choices		
	Collectors	Wholesalers	Retailer
	Coeff(Std.err)	**Coeff(Std.err)**	**Coeff(Std.err)**
Sex	–4.267*** (0.367)	–0.320(0.554)	–0.129(0.652)
Age	0.017(0.022)	0.030(0.019)	–0.004(0.020)
Education level	0.001(0.042)	0.033(.042)	0.066(0.042)
Experience	0.002(0.015)	–0.005(.017)	–0.004(0.017)
Annual income	–0.00003(0.00002)	0.00001(0.00002)	–4.54e-06(0.00002)
Quantity produced	–0.169(0.103)	0.197(0.188)	0.053(0.104)
Land size	–0.049(0.088)	–0.038(0.086)	–0.125(0.088)
Access to credit	0.645*(0.371)	0.300(0.308)	–1.022***(0.299)
Price information	0.327(0.351)	0.528*(0.319)	1.395***(0.316)
Market distance	–0.044(0.416)	–1.393***(0.397)	–0.209(0.410)
Extension contact	0.029(0.021)	–0.014(0.015)	–0.053***(0.021)
Family size	–0.042(0.069)	–0.141**(0.060)	0.210***(0.074)
Constant	4.476***(0.838)	0.245(0.873)	–1.752*(0.971)

*, **, and *** = significance level at 10%, 5%, and 1%, respectively. Coeff = coefficient, Std.err = standard errors in parentheses

Table 13. Opportunities and constraints along the chain

	Input supply	**Production**	**Marketing**
Constraints	-Lack of improved variety -Absence of fertilizer use practice	-Shortage of land -No provision of extension services -Disease -Post-harvesting problem	- Serious infrastructural problems -Low price at the farm gate -no brand name
Opportunities	- Demand for improved variety	-Suitable agro ecology -Fertile land -High demand	-Highly demanded -High production
Interventions needed	Research	Extension services	Infrastructure development

4. Conclusions

Korarima is the main potential crop and income source for the study area. However, there is no brand indicating this crop, inadequate infrastructural development, and market accessibility, no extension services, and weak provision of adequate, timely, reliable, and formal market information in the study area. And also Korarima in the study area has been marketed to the central market under the name of Basketo Korarima and difficult to trace up to the end market to identify the margin distribution along the chain. Moreover, the results of a multivariate probit model indicated that credit access, family size, and price information to farmers significantly affected the market outlet choice decisions in one or another way. Therefore, it is better to work on the brand name of this particular crop to trace it up to the end market since it is an economically important crop for the study area. Adequate infrastructural development and market accessibility with a good facility are needed to enable the smallholder Korarima producers in choosing better market outlets to increase the benefit. Extension services provision regarding the Korarima production, fertilizer use, and improved Korarima variety supply to the smallholder farmer in the study area. The provision of adequate, timely, reliable, and formal market information from the concerned body is essential to enhance Korarima producers' benefit and bargaining power by avoiding information asymmetry. Provision of credit access to producers is an important factor that enhances

the production capacity of producers and thereby enables them to choose a better outlet.

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Conflict of Interest

The authors disclosed no possible conflicts of interest.

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