LWATI: A Journal of Contemporary Research, 16(1), 196-216, 2019
ISSN: 1813-222

Mango Value Chain Analysis in South West Ethiopia: the Case of Gomma District Jimma Zone, Oromia National Regional State, Ethiopia

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Abstract

This study is designed to investigate mango value chain in Gomma district, Southwest Ethiopia. The specific objectives of the study are to: identify mango marketing channels, estimate marketing margins and identify factors affecting mango market supply. Descriptive statistics such as mean, standard deviation & frequencies and multiple linear regressions have been used. The study identified seven potential mango market channels in the study area. The computed marketing margin among different actors and channels indicated the total gross marketing margin of mango is highest in Channel II, III, VII, IV and followed by Channel V Traders and processors get the highest TGMM which accounted for79.8, 62.6 and 58.6% of consumers' price. Producers share in consumer price is less than 25% in all channels except in channel I, V and VI. The result from multiple linear regressions model indicates that seven variables from the total of 12 independent variables are significantly affected quantity of mango market supply. Their magnitudes, relationship with quantity of mango market supply and interpretations are given in results and discussion part of the document. Finally, policy recommendation is suggested based on the significant variables.

Key words: marketing margin, multiple linear regressions, Mango value chain

Introduction: Background of the Study

Fresh tropical fruits are on winning ground in world markets as to recent statistical figures (Anonymous, 2001). Its production has risen by 7% annually since 1997; and the bulk of these fruits (98%) are grown in developing countries. As Yeshitla (2004) indicated the latest figure shows that pineapple accounts for 44% of the total traded volume, followed by mangoes (27%), avocados (12%) and papayas (7%). The main reason for increase in demand of tropical fruits is the growing familiarity of consumers with tropical fruits; their taste, nutritional value and cooking qualities

Promotion of the production and trade in fruit and vegetables has recently become one of the key objectives of developing countries (Lumpkin *et al*., 2005). IFAD's regional strategy for sub-Saharan Africa focuses on enhancing the income of small holders within the context of trade liberalization. Smallholder production and the marketing of fruits and vegetables is a key focus. Most fruits such as mango are perennial trees and can live more than fifty years (IFAD, 2003).

Ethiopia is still predominantly agricultural economy where 40 percent national GDP, 90 percent of export earnings and 85 percent employment opportunity are dominated by agriculture (World Bank, 2004). Gomma Woreda is endowed with diverse natural resource and has the capacity to grow different annual and perennial crops. Avocado, mango, orange, banana and papaya are the major types of fruits which are grown in the area. Fruit production in the Woreda is mainly for market. The production is very fragmented and uncoordinated where all growers produce similar type of crop resulting in glut typically in harvest seasons.

In Ethiopia, the existing income generating capacity of fruits is compared to its immense potentials at the macro and micro level is not encouraging. Thus, from a total 3.5 million quintals of fruits produced in Ethiopia, only less than 2% is exported (Joosten, 2007; MoARD, 2005). The nature of the product on one hand and lack of organized marketing system on the other often resulted in low producers' price. Fruit marketing channel and their characteristics have not yet been studied and analyzed for the target study area where great potential of fruit production exists.

According to Yilma (2009), the production potential of fruits is not widely and evenly distributed across the various regions of the country. The cultivation is also seasonal and the supply is scanty and volatile even in areas where irrigation is possible. The knowledge gap on fruit production techniques and processing technologies is wide. Also, knowledge of domestic consumers of the benefits of fruits is confined to very few varieties of fruits. Hence, domestic demand, with the exception of few widely known tropical fruits, is generally small and, various studies show that people generally consume fruits and vegetables on a daily basis, without considering them as basic. These factors have adversely affected the growth and expansion of the fruit sub-sector in Ethiopia. Lack of concerted public support, scanty information, poor understanding of how the market chain works; and lack of systematic documented knowledge are main threats that hampered the benefit of the sector. Thus comprehensive data collection along the chain is a must envisage the direction of input-output flows (Tsegaye *et al*., 2009)

Development needs of fruit in general and that of mango in particular is poorly addressed in Ethiopia. But these days efforts have been stepped up to improve and support the sector. With this line, the current Growth and Transformation Plan of Ethiopia (GTP) prioritizes intensive production and commercialization of horticulture as a sector for attention. Thus, the development policy initiates the need to accelerate and lucid the transformation of the sub-sector from the subsistence to business and market-oriented

agriculture. But, the existing restraints of post-harvest and marketing infrastructures such as: packaging, pre cooling, warehousing, cold storage, pre-package and distribution have played their deterring role on trade and consumption of fruits in Ethiopia (Seifu, 2003).

Therefore, this study is designed to analyze mango value chain by estimating marketing margins for mango market actors, identifying mango market channels and factors affecting market supply which will narrow the information gap on the subject and will contribute to better understanding of strategies for reorienting marketing system for the benefit of small farmers and traders.

Research Questions

1. What are the major mango marketing channels in the study area?
2. How is the marketing margin distributed among market actors?
3. What are the factors that affect the quantity of mango supplied to market?

Objectives of the Study

The general objective of this study is to analyze mango value chain in Gomma District Jimma Zone Oromia Regional State, Ethiopia with the specific objectives of: (1) to identify mango marketing channels (2) to estimate mango marketing margin for each market actors (3) to identify factors affecting mango market supply.

Significance of the Study

This study will generate useful information to fruit marketing project designers and guidelines for interventions that will improve the efficiency of fruit marketing system. The findings of the paper also help as a source of input for producers, traders, government and development practitioner in the area of fruit marketing in general and mango marketing in particular.

Methodology

Description of the Study Area

Gomma district is one of the 17 districts in Jimma Zone of Oromia Regional State of Ethiopia known for predominantly growing coffee. The district takes its administrative duties and responsibility in 36 kebeles and 3 urban centers (Gembe, Limmu-Shaye and Choche towns). It is located 390 km south west of Addis Ababa and about 50 km west of the Jimma town. It is one of the foundations and Origin of coffee Arabica. The ecology of Gomma is favorable for coffee production. The life of the people in this district is directly or indirectly connected with coffee production & fruit (Profile of Gomma district /Wikipedia) (IPMS, 2007).

Gomma district extends between 7^0 40'- 8^0 04' north latitudes and 36^0 17'- 36^0 46' east longitudes. It is bordered with Gumaye district north, Limmu kossa district in east, Manna district in southeast, with Seka chokersa in south and Gera district in west. It has a total surface area of 936.58 Km^2 (993657.72 hectare) that accounted 4.8 % of the total area of Jimma Zone. Agaro town is the capital of the district. Geological surveys indicated that the district is fallen under the tertiary volcanic of maqdala and trap series that make its conductive for farming activities. It consists of alkali olivine basalt and tuffs (CSA, 2001 E.C).

Relief, Drainage and Climate of Gomma District

The present land configuration of the district is the result of tertiary volcanic (Acidic volcanic and Basaltic flow). The largest part of the district areas belongs to part of western Oromia lowland. The district has two different altitudes: the vast northern, central and the eastern part that lies with elevation between 1500 and 2000 m.a.s.1 (88%) are characterized by undulating land . The western part of the district lies with altitude 2000 m.a.s.1 (12%) act as a watershed for Dedesa Rivers (WFED, 2009). Almost the total of Gomma district is fallen in the Dedesa river basin. Awetu, Naso, Tamsa, Malka-hinda, Dogaja, Loga and Colombo are the major perennial rivers that drain to Dedesa River. The district does not have lakes. The district is characterized by three agro-climates such

as low land (4%), sub- tropical (88%) and cool (8%). The vast area of the district annual rain fall varies between 1700mm-2100mm and the mean annual temperature ranges between 15c^{o} to 22c^{o}.

The major soil categories of Gomma district are Orthic Acrisols (10%), Dystric Nitsols and Chromic & pellic vertcols (80%) soils. Dystric Nitosols do confine the central, southern and eastern portion of the district. All the soil types have good agricultural potentialities.

Vegetation and wild life

Vegetation covers major types of natural vegetation such as forest, wood land and shrub covers 8.88 % of the total area of the district which accounts 8316.81 hectares. There is community protected man-made forest located in *Mennagesha* which approximately covers 60 hectares. Major wild life species observed in the area include Baboons, Monkey, Antelopes, Lions, Tiger, Civet, Cat, spotted Hyena and Cheno are abundantly available. There is no reserved area for wildlife conservation (WFED, 2009).

Demographic Structure

There are 36 rural kebeles and 3 urban kebeles in Gomma district. The number of agricultural households in the district is 45,567 from which 35,533 are male headed and 10,034, female headed (IPMS, 2007). The total population of the district was 216,662 from which 110,448 are males and 106,174 females (CSA, 2008). Gomma is the second most densely populated district in the zone with two coffee state farms which cover an area of 2704 ha (IPMS, 2007).

Sources and Types of Data

We have used both primary and secondary data for the study. Primary data was collected using structured questionnaire through face to face or direct interview with respondents. While secondary data was gathered through reviewing and examination of documents, annual reports and records of published and unpublished documents. Both qualitative and quantitative data

were used.

Sample size determination

Two stage sampling procedure was used to select the sample respondents. In the first stage two *kebeles* namely Bulbul and Homo Bako were randomly selected out of the total 36 mango producer rural *kebeles.* The total numbers of mango producer households in Bulbul and Bako *kebels* were 158 and 110 respectively. Using Yamane (1957) sample proportion formula 43 and 30 sample households have been selected from the two *kebeles* respectively. Therefore 73 sample households have been interviewed.

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

Where: n = sample size

N = total number of households

e = margin of error (10%)

The sites for the trader surveys were market town where large number of mango traders available. On the basis of flow of mango, three markets namely *Jimma, Agaro and Lemi, Choche* were selected purposely because they are the main mango marketing sites in the study area. As a result 15 mango traders were selected by systematic random sampling technique.

Data Analysis

Data was analyzed using both descriptive statics and econometric model. Descriptive statistics such as mean, standard deviation and frequency were used to describe socioeconomic characteristics of households and marketing margin was used to estimate margins for mango marketing actors.

Marketing Margin

Cost and price information is used to construct marketing cost and margin. Computing the total gross marketing margin (TGMM) is always related to the final price paid by the end buyer and is expressed as percentage (Mendoza, 1995).

$$TMM = \frac{Endbuyerprice - Firstsellerprice}{Endbuyerprice} * 100$$

Where, *TGMM* is total gross marketing margin. It is useful to introduce the idea of producers' gross margin *GMMp* which is the portion of the price paid by the consumer that goes to the producer. It is calculated as:

$$GMMp = \frac{Endbuyerprice - MarketinggrossM\arg in}{Endbuyerprice} * 100$$

Where, *GMMp* = the producer's share in consumer price.

Econometric Analysis

Multiple linear regression models are preferred to dichotomous dependent variable model when the dependent variable is continuous. At the time of household survey it was confirmed that about 95% of producers in the study area are market suppliers. Therefore it is recommendable to use multiple linear regression models to analyze factors affecting mango market supply. Following Green (2003), the multiple linear regression models are specified in a matrix notation as:

$Y_i = \beta X + U_i$…….. *(1)*

Where: Y_i = mango supplied to the market

β = a vector of estimated coefficient of the explanatory variables

X = a vector of explanatory variables

Ui = disturbance term

Results and Discussion

Descriptive statistics

Table 1: Mango producers' characteristics for dummy and categorical variables

Variable	Category	Frequency	Percentage
Sex	Male	42	57.5
	Female	31	42.4
Literacy status	literate	20	27.39
	Illiterate	53	72.6

Marital status	Single	9	12.3
	Married	40	54.79
	Widowed	13	17.8
	Divorced	11	15
Religion	Muslims	33	45.2
	Orthodox	25	34.24
	Protestant	15	20.54
Mango producers access to services			
	Yes	40	55
Credit service	No	33	45
	Yes	34	47
Extension service	No	39	53
	Yes	32	44
Market Information	No	41	56

As indicated in the above table, out of the total interviewed mango producers 57.5% of them are male and the rest 42.4 % were female respondents. This indicates that majority of mango producers in the study area are male headed households. From the total respondents 72.6% were illiterate and the remaining 27.39% were literate. The result indicates that mango producers in the study area are mainly illiterate suggesting that extension and training services needed to capacitate their skill gap. The marital statuses of the respondents in the study area are single (12.3%), married (54.79%), windowed (17.8 %) and the remaining 15% are divorced. As far as the religion of the respondents is concerned Muslims accounted for 45.2% and the remaining orthodox and Protestants accounts for 34.24% and 20.54% respectively.

Credit is an important service to access innovative technologies and output marketing. Even if one micro-finance and four commercial banks are available in the study area, only 55 % of the total respondents received credit and the remaining 45% were not accessed credit services. From all respondents only about 47 % of them have extension while the remaining 53% of the respondents reported that they had no extension visit. The study result indicates that extension service is largely in favor of other food

crop production and is delivered unintentionally to fruits in the study area. This is in line with Carlson *et al*., (2005) and Sonko *et al.,* (2005) who explained the current extension approach is in favor of cereals but not fruits. Thus, it has negatively affected the fruit production and marketing. Belay (2003) also indicated agricultural extension service has failed to bring major impact on productivity of fruits due to weak link between stakes and associate workloads of extension agents. Davis (2007) has also stated that dearth of extension service has led to poor linkage to support avocado industry.

From the total respondents only 44% of mango producers have access to market information and majority of producers (56%) have no access to market information. The study indicates that colleague farmers are the first source of information followed by producers while traders, government extension workers and NGOs are second, third and fourth information sources respectively in the study area. The study shows that farmers get limited market information than traders with their own efforts. Owing to inequitable access to market information, large proportion of market power is captured by traders who have diversified information sources including: neighbors, fruit traders, personal observation and better access to mobile technology which favored traders to adverse risks of loss to this product.

Table 2: Mango producers' characteristics for continuous variables

Variable	Mean	SD
Age	45.55	13.24
Family size	5.77	2.84
Land size	3.84	2.41
Number of mango trees	4.95	2.91
Quantity produced in quintal	8.26	2.03

The average age of the sample households was 44.53 years. This indicates that mango producers in the study area are within the

productive age. The data result also indicates that average family size of mango producer household is 5.77. Large family size is a source of labor for agricultural production and increases volume of market supply. Average land holding of mango producers in the study area is 3.84 hectares and the average number of mango tree is 4.95. On average mango producers have harvested 8.26 quintals in 2016/2017 production year. This insignificant volume of production is attributed to a number of factors like lack of access to irrigation, poor extension services and market information.

Mango market channel

Mango market channels we.re constructed based on the data collected from the three mango markets. The study result revealed that there are 8 major mango marketing channels in the study area.

I. Producer → Retailer → Consumer channel: It represented 26% of the total mango marketed during the survey period. The channel was identified to be the first and most important mango marketing channel in the study area.

II. Producer → Processor → Consumer channel: It accounted for 13% of total mango marketed in the study area during the survey period. The channel was found to be the third important channel in the study area.

III. Producer → Rural assemblers → Processor → Consumer channel: It accounted for 7% of total mango marketed during the survey period. The channel was found to be the fourth and least important in study.

IV. Producer → Wholesaler → Processor → Consumer channel: It accounted for 7% of total mango marketed during the survey period. The channel was found to be the fourth and least important in study area.

V. Producer → Rural assemblers → Wholesaler → Retailer → Consumer channel: It represented 13 % of total mango marketed during the survey period. The channel was found to be the third important marketing channel in study area.

VI. Producer → Wholesaler → Retailer → Consumer channel: It accounted for 20% of total mango marketed during the survey

period. The channel was found to be the second important in study area.

VII. Producer → Rural assemblers → Wholesaler → Processor → Consumer channel: It represented 7% of total mango marketed during the survey period. The channel was found to be the fourth least important marketing channel in terms of volume and accompanied by large number of intermediaries in the market.

VIII. Producer → Consumer Channel: It accounted for 7% of the total mango marketed. The channel is the fourth and least important mango marketing channel in the study area.

Table5: Purchasing and selling price of mango market actors in different market channels (Birr/Quintal)

Agents' purchasing and selling price		**Mango marketing Channels**						
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**
Retailers'	Purchasing price	400	-	-	-	820	740	-
	Selling price	810	-	-	-	967	895	-
Processors'	purchasing price	-	400	740	740	-	-	820
	Selling price	-	1978	1978	1978	-	-	1978
Whole Sellers'	purchasing price	-	-	-	400	684	400	684
	Selling price	-	-	-	740	820	740	740
Rural Assemblers	purchasing price	-	-	400	-	400	-	400
	Selling price	-	-	684	-	740	-	684

Source: Survey result, 2017

Marketing margin

Table 4: Mango marketing margins for market actors along different marketing channels

	I	**II**	**III**	**IV**	**V**	**VI**	**VII**
TGMM	50.6	79.8	79.8	78.9	58.6	55.3	79.8
$TGMM_R$	50.6				15.2	17.3	
$TGMM_P$		79.8	62.6	62.6			58.6
$TGMM_W$			45.9	45.9	16.6	45.9	16.6
$TGMM_{LC}$					41.5		41.5
$TGMM_F$	49.4	20.2	20.2	20.2	41.4	44.7	20.2

Source: Survey result, 2017

The computed marketing margin among different actors and channels indicated that total gross marketing margin of mango is highest in Channel II, III, VII and IV which accounted for 79.8 and 78.9 % respectively and followed by Channel V which accounted for 58.6% of the consumers' price. Similarly of all mango traders, processors, get the highest TGMM which accounted for79.8, 62.6 and 58.6% of consumers' price. In general producers share in consumer price is less than 25% percent in all channels except in channel I, V and channel VI.

Table 6: Factors affecting quantity of mango market supply

Variables	Un standardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. error	*Beta*		
(Constant)	-10.296	3.256		-3.162	.003
Sex	1.346**	.525	.232	2.566	.014
Marital Status	-.044	.516	-.011	-.086	.932
Education	3.358***	.752	.573	4.467	.000
Age	.057***	.021	-.273	-2.747	.009
Family	-.116	.109	-.112	-1.065	.292
Land size	.045	.123	-.036	-.364	.717
Extension Service	.687	.604	.119	1.138	.261
Access to credit	.510	.596	.088	.856	.397
Market Information	.967*	.528	.168	1.831	.073
Market access	-1.304**	.576	.221	2.263	.028
Quantity of mango tree	.416***	.101	.388	4.114	.000
Quantity produced	.476***	.144	.358	3.300	.002

*Dependent variable: mango supplied to market in quintals in 2016/2017. * Significant at 10 percent, ** Significant at 5 percent, and *** Significant at 1%, n = 60, R^2 = 0.659 Adjusted R^2 = 0.572.*

Quantity produced: The multiple regression result shows that the quantity of mango produced in 2016/17 production year measured in quintal is significantly and positively related to mango marketed supply at 1% significance level. It implies that a unit increase in production of mango increases its market supply by 0.476 quintals. This could be because as the production of mango increases, its marketable surplus also increases.

Distance from market: Distance to market was expected to adversely affect the volume of total sales. Accordingly, the result shows that distance to the market is negatively related with mango market supply at 5% significance level. This implies that, a unit increase in walking hours from market center results in a decrease of mango market supply by 1.304 quintals. As the distance from the production area to market place become further and further, farmers supply the lesser quantity of mango to the market because of high transportation cost.

Age of the household head: The age of household head positively affects mango market supply at 1% significance level. An increase in age by one-year results in increasing mango market supply by 0.057quintals. This implies that aged farmers would have a better experience and knowledge than younger farmers in agricultural activity. The reason is that, through time producers acquire experience about production and marketing and supply better than those who are less experienced.

Number of mango tree per household: Number of mango tree per household is positively related to mango marketed supply at 1% significance level. If the number of mango trees per household increases by one unit, producers' mango marketed supply increases by 0.416 quintals other things remaining constant. This could be because of the number of mango tree per household directly related with volume of harvest and marketed supply.

Educational level of HH: Educational level of household head significantly and positively affects mango marketed supply. An increase in educational level by one-year results in an increase of mango marketed supply by 3.358 quintals at 1% significance level, other things remaining constant.

Access to market information: Access to market information is positively related to mango market supply at 10% significance level. If a given producer has access to market information, mango marketed supply increases by 0.967 quintals.

Conclusions and Recommendations

Conclusion

Producer to consumers channel was the most important and dominant mango market outlet through which producers and consumers get acceptable prices. Lack of organized institutional support made mango traders in a better position relative to producers. Quoting of lower prices and lack of market information are also common market malpractices in the study area. In addition deficiency in capital and credit availability is reported as another problem that badly compelled farmers to sell their produce at whatever price given by traders who have borrowed them earlier. Although comparative rewards such as suitable agro-ecology, proximity to zonal market and cheap provision of labor are opportunities, declining prices, occurrence of deadly fungal disease, poor market integration, and lack of improved technologies and provision of extension packages are major factors that hindered mango production and marketing in the study area. Eleven independent variables have been regressed on the dependent variable. Accordingly six independent variables namely educational level, age of the household head, access to market information and number of mango trees per household and quantity of mango produced measured in quintal are positively related with mango market supply however, distance of producers' home from market center is negatively related with mango market supply.

Recommendations

There are a number of actions need to be undertaken in order to promote the development of mango market performance. This particularly includes, capacity building, technological applications, improved extension and plant breeding activities, infrastructural development, and increasing ownership of mango tree per individual farmer. Further more emphasis should be given to improve storage and transportation system and offering credit and other services to improve mango production and marketing activities. Mango traders are capable of accessing price

information from different sources whereas poor farmers rely on other farmers and government extension staff to obtain market information. Therefore, there is a great need to make market information available to farmers at the right time and place. It is also recommendable to develop an integrated agricultural marketing information system that will link woreda information center to other government's program.

The study result indicates that educational level of household heads positively affected mango market supply. Households with formal education are in a better position in mango production and market supply. Therefore provision of extension advice and adult education is highly recommended. Continuous education and training on production and marketing will have a positive impact on producers' attitudes. Distance of households' residential home from market center is another important variable that hinders mango market supply as directly related with market transaction cost. Establishment of accessible market center is recommendable to increase market participation level of producers.

Acknowledgments

The authors are grateful to acknowledge Jimma University for the support and funding of the research work. The authors also thank all the respondents and data collectors.

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