Assessment of Banana Production and Marketing in Ethiopia

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Abstract

The study was conducted to assess and identify the factors that influence the production and marketing performance of banana in Ethiopia. Multi-stage purposive and random sampling techniques were alternatively employed at different stages to collect the necessary primary data. Secondary data was also collected from written documents and focus group discussions (stakeholders) across the survey areas. The data for smallholder banana growers were collected from 3 major banana producing zones, 5 districts and 10 farmer villages. The data for large-scale commercial banana producers was collected from a wider part of the country covering 14 farms from 3 regional states. The marketing data encompassed almost all the major market outlets in Ethiopia. As such a total of 150 small-scale and 14 large-scale growers, 59 wholesalers/ripeners, 53 retailers and 53 consumers were interviewed using structured questionnaires. Comparative econometrics and descriptive results as well as multiple linear regression analysis using a Cobb-Douglass production function has been employed to determine and quantify the impact of the explanatory variables or factors affecting the yield performance of banana in the study areas.

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Results indicate that different household and farm characteristics such as age, household size and experience in banana production, area of land allocated and method of banana production (irrigated or rainfed), spacing and type of planting material used, household head (male or female-headed), extension service, membership of farmer cooperatives/unions, etc. affect the yield of banana in the study areas. About 13 marketing channels were identified across the banana supply chain in Ethiopia. Gross Marketing Margins (GMMs) were computed not merely to indicate pure profit margin without considering marketing costs but to point out the possible added transaction values for product ownership and income generation. Results of channels that terminate within domestic markets show GMMs ranging 29.2%-43.8% for small-scale growers, 33.3%-45.8% for large-scale commercial growers, 16.7%-43.8% for cooperatives/unions, 4.8%-12.5% for farm-gate collectors, 25%-37.5% for wholesalers/ripeners, and 29.17%-50% for retailers. Results generally indicate that even though the country has vast potential for banana production, the supply chain is facing several limitations and constraints that include high variability in crop management practices and yield, and highly deregulated marketing practices that result in excessively high price and marketing margin disparities across the numerous channels. These points out the need for increased research and extension services, and improvement in marketing logistics and channel management.

Keywords: Banana; determinants; marketing margin; supply-chain; yield

1. Introduction

Dessert banana and plantain *(Musa sp.)* are the fourth most important staple food crops in the world after rice, wheat and maize [13]. Dessert banana in particular is a commercially important crop in the global trade, both by volume and value, as a leading fruit [13]. In 2010, world commerce in banana was valued at US 8.05 billion and the total world production of banana is about 106,541,709.00 tons [8]. For many African, Asian and Latin American countries, banana is as well one of the most important crops for foreign exchange earnings [8].

Dessert banana is also the major fruit crop that is most widely grown and consumed in Ethiopia. It is cultivated in several parts where the growing conditions are favorable. Especially in the south and southwestern parts of the country, it is of great socioeconomic importance contributing significantly to the overall well being of the rural communities including food security, income generation and job creation. Banana in Ethiopia covers about 59.64% (53,956.16 hectares) of the total fruit area, about 68.00% (478,251.04 tones) of the total fruits produced, and about 38.30%(2,574,035) of the total fruit producing farmers [6]. On the other hand, about 68.72% (37,076.85 hectares) hectares of land covered by banana, about 77.53% (370,784.17 tones) of the banana produced and 22.38% (1,504,207) of the banana producers in Ethiopia are found in the Southern Nations Nationalities and Peoples' National Regional State- SNNPRS [6]. Gamo-Gofa, Bench-Maji and Sheka zones are among the major banana producing zones of the SNNPRS, of which Gamo-Gofa zone alone covers over 70% of the total banana marketed across the major market outlets in Ethiopia [5].

The major commercial cultivars grown by small-scale growers across the survey areas are Dwarf Cavendish, Giant Cavendish, and Poyo, with Williams and Grand Naine recently coming into picture in Gamo-Gofa zone and across the large-scale commercial farms of Ethiopia. Others like Robusta and Butuzua are also among the

recently released Cavendish banana cultivars released through Melkasa Agricultural Research Center. The rest are less popular land races grown to a very limited extent in certain localities across the country (Figure 1).

Figure 1: Local banana cultivars grown in different parts of Ethiopia

Despite the above stated facts and the concerted effort being made by the government of Ethiopia to promote and diversify its agricultural outputs as well as exports at large, the attention given to banana especially in terms of research, extension services, investment endeavors and overall value-chain management has been very limited. In most parts of the country, its production has yet been limited to backyard and small-scale productions with the produce largely supplied to local markets (Figure 2).

Figure 2: Partial view of backyard banana production systems in the survey areas

Large scale banana production in Ethiopia (Figure 3) covers only 0.19 % (1,910.97 hectares) of the total area covered by banana and 0.22% (17, 924.59 tones) of the total banana produced in Ethiopia [6].

Figure 3: Partial view of large-scale commercial banana farms in the survey areas

Except some haphazard applications of farmyard manure and household leftovers when grown at back yard, small-scale growers in Ethiopia generally do not apply fertilizers to bananas. Instead they leave the slashed weeds and chopped banana leaves around the clamps which to some extent help maintain the fertility of the soil. While bananas in Gamo-Gofa zone are grown under irrigated condition (Figure 4 and Table 1), the production in Bench-Maji and Sheka zones is entirely rainfed.

Figure 4: Partial view of rivers and traditional diversion canals used in Gamo-Gofa zone

Table 1: Major sources of irrigation water for banana growers in Gamo-Gofa zone

	Source	Beneficiary Kebeles (villages)	Remark
		A. Arba-Minch Zuriya Woreda	
1	Baso river	Ocholo-Lante (also serves Omo -Lante)	-All use traditional diversion dam
2	Dehe river	Ocholo-Lante (also serves Omo-Lante)	-Use modern diversion dam constructed by Vita (EU financed NGO)
3	Hare river	Kolla-Shara, Chano-Mille, Chano-Dorga, and Chano-Chelba	-All use traditional diversion dam
4	Sile river	Kanchama-mainly, Kolla-Shele, and Shele-Mella	-Lucy private farm also uses Sile river-by pumping. Farmers use traditional diversion
5	Sego river	ZeyiseAelgo, Kolla-Shelle, and Shelle-Mella (also Lucy private farm)	-Lucy private farm also uses Sego river-by pumping. Farmers use traditional diversion
6	Argoba or Wezeka river	Zeyise Wezeka	-All use traditional diversion dam
7	Waso river	Ocholo Lante	-All use traditional diversion dam
8	Kulfo river	Private investors: Omotic farm, Kayiro farm, Amibara farm, Mulat Hailu farm, Mirabu Girma farm, etc.	-All use through the modern diversion dam constructed by Amibara private farm. Farmers also grow some vegetables and other fruits (papaya & mango). Amira farm also grows cotton and maize under irrigation
	B. Mirab Abaya Woreda		
1	Baso river	Omo-Lante (also serves Ocholo-Lante)	-All use traditional diversion dam

2	Raya river	Wanke Wajifo, Kolla-Wolaato	-All use traditional diversion dam
3	Kemie river	Kolla-Barena and Wajifo	-Raya is the major river for Wajifo with Kemie being used to some extent
4	Kolo spring	Doshe	-All use modern diversion dam
5	Ttirattira river -seasonal	Yayika	-All use traditional diversion dam
6	Lake Abaya	Aelge	- Aelge kebele farmers mainly use Shife river; to some extent Lake Abaya
7	Shife or shafe river	Ankober, Molle, Delbo, Aelge, Ugayehu and Faragosa	-All use traditional diversion dam
8	Lake Abaya	Private investors : G/Kirstos, South Industrial PLC, Kedica Enterprise, Shemsu farm, and Minase farm	Investors pump irrigation water from the Lake with an agreed license from the Federal Ministry of Mining and Energy

Source: *Mirab-Abaya and Arba-Minch Zuria wereda (district) agriculture offices, 2014/2015*

Besides, other than those organized into farmer cooperatives/unions, most small-scale growers do not apply the right agronomic practices to banana such as using the right type of sword suckers, maintaining appropriate spacing and sucker management, regular control of weeds, and disease and soil moisture management (Figure 5).

Figure 5: Partial view of symptoms of certain banana diseases observed in Gamo-Gofa zone

As stated by [14], lack of improved varieties is as well one of the critical factors that affect the production and productivity of banana in Ethiopia. As a result, the productivity of banana in most places in Ethiopia is 5-8.95 tons/ha [6], which is far below the world average of 15.8 tons/ha [8]. A summary report by [12] based on a 2012 baseline survey results of the Agricultural Transformation Agency of Ethiopia (ATA) also indicate that the average yield and revenue obtained from banana sales by banana growing households in Ethiopia is only 8,759 kg/ha and 21.3 Birr/year respectively.

Various studies using Cobb-Douglas functional form, have identified that the yield of several crops including banana is influenced by various determinants (factors) such as inputs of production, agronomic and management

practices, and producer and farm characteristics [4, 1, 9, 3]. However, in Ethiopia, no empirical data is so far available in this respect whereby the explanatory variables that influence the yield of banana could be identified and quantified.

Cognizant of this, the present study was similarly undertaken to assess and identify the factors determining the yield and marketing performance of banana in Ethiopia with a subsequent aim to provide relevant information that help reinforce concomitant interventions into the future.

2.   Research Methodology

2.1.   Description of the survey areas

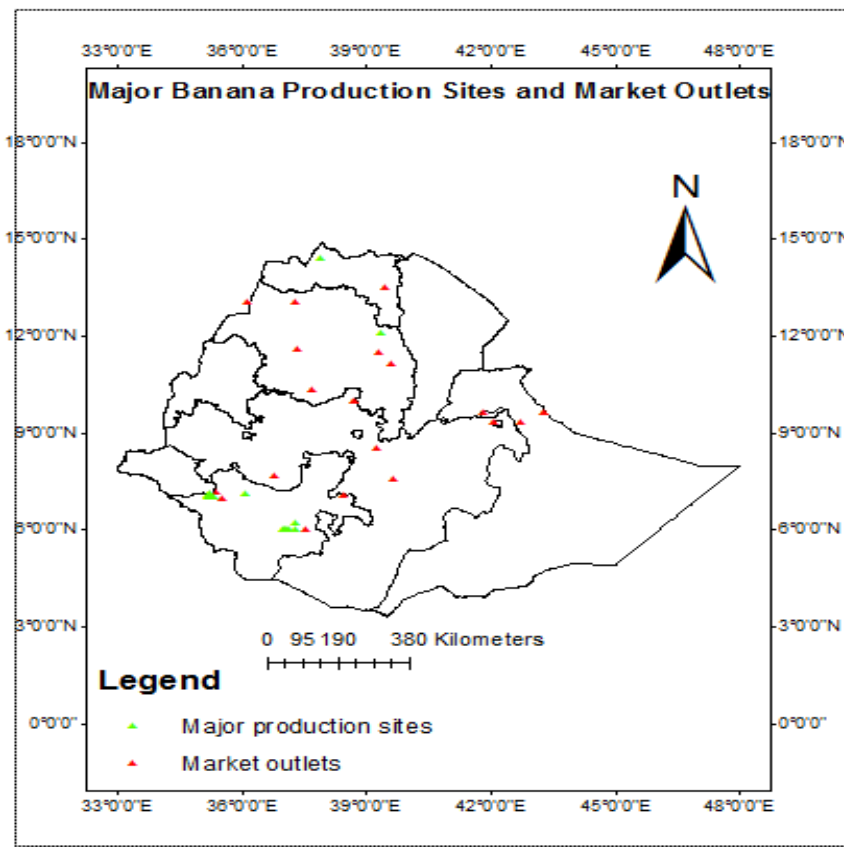The banana production sites and market outlets covered through the survey are shown through Figure 6 below.

Figure 6: Major banana production areas and market outlets covered by the survey, 2014/15

2.2.   Rationale and description of the banana production areas

The survey on smallholder banana producers was solely conducted in the Southern Nations Nationalities and Peoples' Regional State (SNNPR) of Ethiopia covering 3 zones (Gamo-Gofa, Bench-Maji and Sheka), 5 woredas (districts) and 10 kebeles (farmer villages). It is an important regional state where the bulk (77.53%) of

the banana produced in Ethiopia is obtained [6]. Almost all the banana commercially sold in all the major towns of Ethiopia, including Addis Ababa, is produced in this regional state, with Gamo-Gofa comprising over 65% of the market share, Bench-Maji 10% and Sheka 5% [5]. Only the balance comes from other pocket areas of the country that are less known for banana production [5]. Banana in those areas is a major component of livelihood strategies, which constitutes an important food security and household source of income for many farmers [5]. Thus, in those zones, a total of five districts, 10 major banana producer villages, and 150 farm households were considered for the survey work at producers' level. The study on the large-scale commercial production of banana was carried out on a wider part of the country covering 14 farms from 3 national regional states (SNNPR, Tigray and Amhara).

2.3. Description of the banana market outlets covered and supply chain actors consulted across the survey areas

The market level study was carried out across 19 major regional and central towns or market outlets in Ethiopia. They are normally the centers where the traders (wholesalers, retailers and exporters), market regulatory institutions as well as the bulk of the ultimate consumers are found. In this respect, the study was started at farm gate level and continued all the way to the end of the banana supply chain in Ethiopia. The study adopted a number of alternative approaches for generating both quantitative and qualitative data. It included extensive interviews and discussions with the direct market actors as well as private and public enterprises such as research, extension, marketing and regulatory institutions. A systematic random sampling was employed and accordingly a total of 12 licensed farm gate collectors, 6 farmer cooperatives/unions, 59 wholesalers/ripeners, 53 retailers, 53 final consumers and 4 market regulatory institutions (i.e. Customs & Revenue Branch Offices) were considered for the study.

2.4. Method, Source and Type of Data Collected

Both quantitative and qualitative data collection methods were employed using a cross sectional type of research approach in the primary and secondary information collection process. The primary data was collected through interviews by using a semi-structured questionnaire with key informants from the supply chain actors, all the way from the producers' level up until the final consumers. The structure of the questionnaire was designed as both open and close ended questions. The close ended questions were designed as list or select any appropriate/correct answer and they were coded. The open ended questions were designed in such a way to allowing the respondents to freely express their ideas. In addition to the questionnaires, focus group discussions were carried out with all banana supply chain actors (producers, traders, farmer cooperatives/unions, researchers, extension workers and regulatory bodies). The secondary data was acquired from published and unpublished reports of different levels of actors such as line national, zonal, district and village level agricultural extension, research, marketing, cooperative, customs and revenue, statistics, and NGO offices as well as internet (website) search based information.

2.5. Sampling Technique

A multi-stage purposive and random sampling technique was employed to collect all the necessary primary data.

Initially, five major banana producer districts were purposively selected jointly with the respective zonal agricultural offices on the basis of volume of banana production. Then, 10 major banana producer farmer villages (2 villages/district) were similarly selected purposively jointly with the respective district agricultural offices. Finally15 respondent households were randomly selected for the interview from each village from the total list of banana producer households provided by each of the village level agriculture offices.

Developments Agents (DAs) of the respective study villages were largely used as enumerators to work alongside the researcher. They were given about half a day briefing by the researcher on the contents of the structured questionnaire and way of handling of the interview. The market related data were collected randomly from the other banana supply chain actors across the country (farm-gate collectors, wholesalers/ripeners, retailers, consumers and other stakeholders) using other separate structured questionnaires to generate primary data. As such a total of 150 small-scale farmer households, 14 large-scale (commercial) growers, 59 wholesalers/ripeners, 53 retailers and 53 consumers were interviewed in the primary data collection process using the respective structured questionnaires.

2.6. Method of Data Analysis

The SPSS (Statistical Package for Social Science) software was used for data entry and analysis. A descriptive statistics was used that include parameters such as sum, mean, percentage, etc. In addition, mean comparison techniques such as ANNOVA and independent sample–t test were employed to compare the differences in banana production among locations or handling practices.

In order to identify the determinants of the banana productivity, multiple linear regressions using Cobb-Douglass production function was used for identifying the determinants of yield. It is used using the amount of yield through various factors as dependent variables and other explanatory variables such as the type of agronomic practices, and marketing systems as independent variables

3.   Results and Discussion

3.1.   Evaluation of the performance of the banana supply chain actors, marketing channels and margin analysis

Under this section, the banana supply chain actors and their functions, results of gross market margin analysis, and other determinant factors of banana production and marketing in Ethiopia are presented to evaluate the performance of the banana industry in the study areas.

3.1.1. Banana supply chain in Ethiopia

Both small-scale and large-scale banana producers in Ethiopia follow similar marketing channels as shown in the banana supply chain chart below (Figure 7).
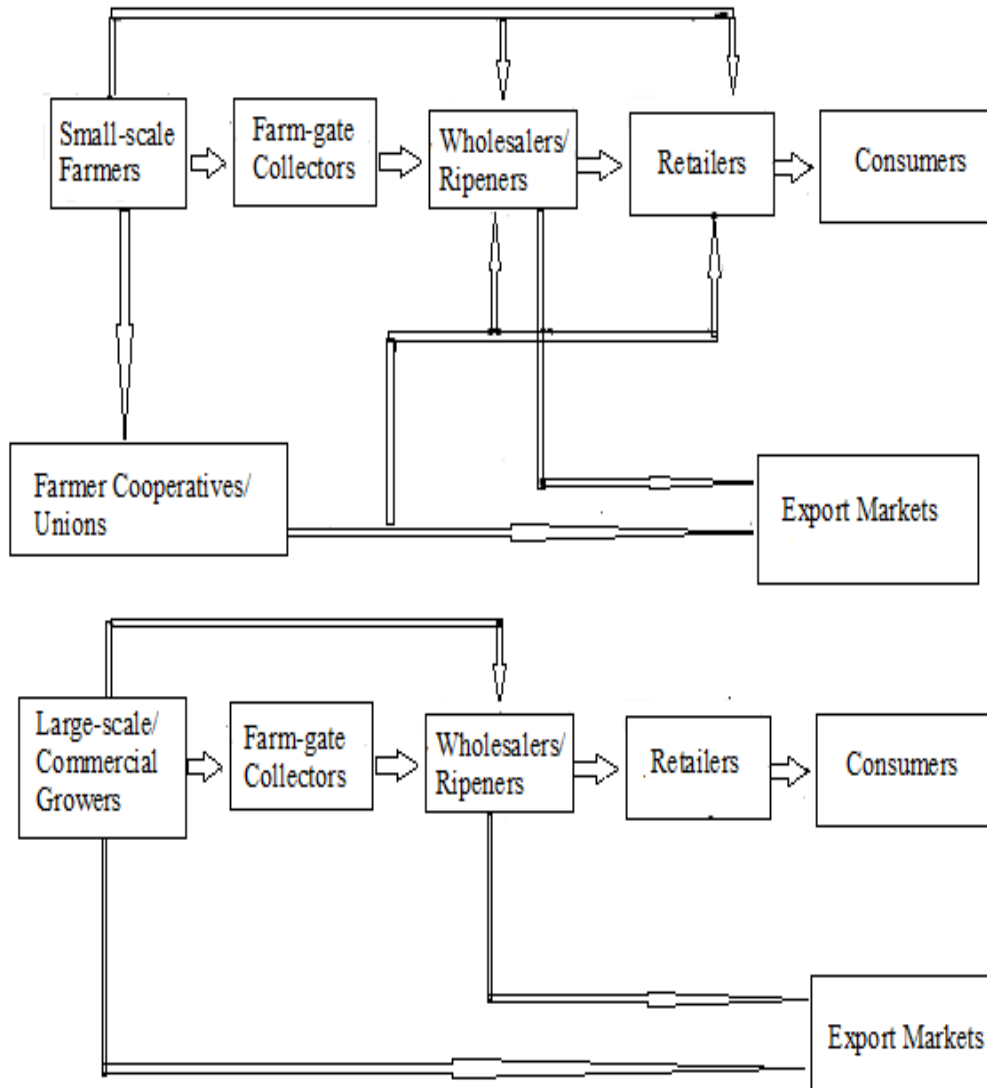
Figure 7: Supply Chain of Banana in Ethiopia (adopted from [4])

3.1.2. Evaluation of the performance of the various segments across the banana supply chain in Ethiopia

As illustrated in Figure 2, the banana supply chain in Ethiopia comprises the following major segments.

Producers

These are both small-scale farmers and large-scale commercial growers involved in banana production (Tables 3 & 4). As stated earlier, both small and large-scale growers in Gamo Gofa zone are the major banana producers in Ethiopia. Depending on the season, 60 to 90 truckloads of banana bunches, each truck carrying 5-9 tons (ISUZU trucks 5-5.5 tons and FSR trucks 8-9 tons), are dispatched every day from this zone to all market outlets in Ethiopia. In 2013 alone, about EBirr 7,120,400.00 of domestic revenue was obtained from about 55946 tons of banana distributed only from the Aba-Mich Zuria and Mirab-Abaya districts of the Gamo-Gofa zone (Table 2).

Table 2: Banana distributed from Arba-Minch Zuria and Mirab-Abaya districts and revenue (Birr) obtained, January 1, 2013-Dec. 30, 2013

No.	Destination	No.of ISUZU truck loads		Revenue obtained (Birr)***	
		Arba-Minch Zuria*	Mirab-Abaya**	Arba-Minch Zuria***	Mirab-Abaya**
1	Addis Ababa	6227	-	4358900	-
2	Mekelle	514	-	359800	-
3	Gondor	291	-	203700	-
4	Tog-Wajaale	143	-	100100	-
5	Harar/D/Dawa	77	-	53900	-
6	Hawassa	85	-	59500	-
7	Woldiya	74	-	51800	-
8	Dessie	72	-	50400	-
9	Adama	43	-	30100	-
10	Jimma	23	-	16100	-
11	Korem	22	-	15400	-
12	B/Dar	17	-	11900	-
13	Moyale	14	-	9800	-
14	Jigjiga	8	-	5600	-
15	Adigrat	6	-	4200	-
16	Maichew	6	-	4200	-
17	Bale-Robe	4	-	2800	-
18	Shashemene	2	-	1400	-
19	Hossana	2	-	1400	-
	Sub-Total	7639	2533	5,347,300.00	1,773,100.00
	Total	10172		7,120,400.00	

Source:

*Arba-Minch Zuria District Agricultural Product Marketing Office, January 2014

**Mirab-Abaya District Customs and Revenue Branch Offices, January 2014

***Arba-Minch Zuria District Customs and Revenue Branch Offices, January 2014

Where:

One ISUZU load= 5 to 5.5 tons (revenue rate=Birr 700.00/ISUZU for traders & 500.00/ISUZU for cooperatives)

One FSR load of banana= 8 to 9 tons (revenue rate=Birr 900.00/FSR for traders & 700.00/ISUZU for cooperatives)

Table 3: Brief profile of small-scale banana production areas covered through the survey

Region	Zone	Wereda (District)	Kebelle (Village)	Area of banana (ha)	Major cultivars grown*	Av. Yield/ha (ton)
SNNPR	Gamo-Gofa	Arba-Minch Zuria	Sele Kanchama	1450	Poyo ("Mekakelegna Ambo), G/C ("Tiliku-Ambo"), D/C ("Dinke"),	30.1**
			Ocholo-Lante	813.1	Poyo, G/C, D/C	26.5**
		Mirab-Abaya	Ankober	257.0	Poyo, G/C, D/C	23.2**
			Omo-Lante	785	Poyo, G/C, D/C	25.8**
	Bench-Maji	North-Bench	Fakatin		D/C, G/C	14.22
			Gorit-ena-Mag		D/C, G/C	15.31
		South-Bench	Kitte		D/C, G/C	15.65
			Fanika		D/C, G/C	14.92
	Sheka	Yeki	Addis Birhan		D/C, G/C	14.71
			Fide		D/C, G/C	16.12
Total	3	5	10		-	-

Source: Own survey result, 2014/2015

Where: HHs= Households; ha= hectare; *G/Naine=Grand Naine; D/C=Dwarf Cavendish; G/C=Giant Cavendish.*

*All farmers use suckers as planting materials; ** Farmers grow banana under irrigated condition

The role of small-scale farmers is by and large limited to production and they have no much control over the price that they receive from their produce. After harvest, they sell their banana to either local licensed farm-gate collectors, farmer cooperatives/unions when any, directly to distant market traders who purchase the banana at farm-gates, or to a limited extent to local market retailers and roadside vendors. Often times when farmers sell their banana directly to distant market traders or farm-gate collectors, they are exposed to varied malpractices such as fraud weighing balances and underestimated guess purchases when the transaction is done on the basis of negotiated quantities in piled bunches. Farmers who are not members of farmer cooperatives/unions are often

victims of such market misconducts.

When bananas are sold to local licensed farm-gate collectors and farmer cooperatives/unions, they are forwarded or transported piled in lose bunches without any package to major urban centers by open or non-refrigerated ISUZU or FSR trucks. They are then sold directly or on contractual agreement basis to wholesalers across the major regional and central towns of the country who at the same time do the ripening operation through the traditional kerosene smoking system. The wholesalers then distribute the ripening treated banana to close or distant retailers (supermarkets, green grocers, street or roadside vendors, traditional open market retailers, etc.) in their respective localities. Retailers often purchase green ripe bananas from wholesalers and keep them till they develop the ultimate yellow color before they sell them to the final consumers.

Farmer cooperatives/unions

These are a group of village level farmers formally organized into farmer cooperatives or unions in order to market their banana and access or purchase inputs. The majority of farmers in the banana growing villages in Gamo-Gofa zone are organized into village level farmer cooperatives, with the cooperatives further organized as members of the Gamo-Gofa Farmers Vegetable and Fruit Marketing Cooperative Union PLC. This union is the only cooperatives' union so far engaged in banana business in Ethiopia. It is a strong union that, on behalf of its member cooperatives, at times enters directly into agreement with input suppliers, service providers, donors and export outlets such as Saudi Arabia. It has so far 26 member farmer cooperatives that are engaged in the production of different vegetable and fruit crops in addition to banana. Such collective action of farmers in the Gamo-Gofa zone has empowered and enabled them overcome various barriers, own their own storage and transportation facilities, build up their production skills, get access to extension and information services, and at large become part of the market economy compared to those in Bench-Maji and Sheka zones.

Farm-gate collectors

These are sometimes referred to as farm gate level "assemblers" or "forwarders". They are often village based licensed middlemen or intermediaries who purchase the newly harvested banana at farm gate from the direct producers and forward it to wholesalers that are found in the major regional and central markets. Farmers get the harvested banana bunches to nearby farm gate collection centers where they often pile them under natural tree shades or in the open covered with banana leaves. The farm gate collectors then hire trucks and purchase and forward the bananas to the regional or central market wholesalers often on contractual agreement basis. In this case, the wholesalers send them the money through their bank accounts. At times, the wholesalers send their own hired trucks to the farm gate and purchase the bananas either directly from the producers or through the farm gate collectors. In both cases, the farm gate collectors operate as brokers in between the producers and wholesalers and gain their profit margins for their facilitation services from the wholesalers.

Table 4: Brief profile of large-scale commercial banana farms covered through the survey

	Region	Zone	Wereda (District)	Name of Farm	Area of banana (ha)	Cultivars grown	Panting. Material	Av. Yield/ha (ton)
	SNNPR	Gamo-Gofa	Mirab-Abaya	South Industrial PLC	15	Poyo, D/C, William I, G/Naine	Suckers & plantlets	30.21
	"	"	"	Gedika banana farm PLC	40	"	"	18.15
	"	"	A/M/Zuria	Omotic General Trading PLC	38	Poyo, G/C, D/C, William I, G/N, Vallery	"	31.72
	"	"	"	Kayiro Zamba Banana Farm	12	Poyo, G/C, D/C, William I, G/Naine	Suckers	27.71
	"	"	"	Mirabu-Girma Banana Farm	15	"	Suckers	26.63
	"	"	"	Amibara Agric.Dev't PLC	100	Poyo, G & D Cavendish	Suckers	18.05
	"	"	"	A/Minch Sericulture/Banana Farm	8	Poyo, G/C,D/C, William I, Grand Naine	Suckers	25.85
	"	"	"	Mulat Hailu Banana Farm PLC	7	"	Suckers	27.50
		"	"	Lucy Agri. Dev't PLC	120	Poyo, G/C, William I, G/Naine	Suckers	24.50
*	"	Bench-Maji	S/Bench	Bebeka Coffee Estate Share Co.	45	D/C	Suckers	12.85*
*	"	Sheka	Yeki	Tepi Green Coffee Estate Sh.C.	30	D/C	Suckers	13.50*
*	"	Keffa	Gimbo	Gojeb Agri. Dev't Ent.	150	Poyo, G/C, D/C, William I, G/Naine, Robusta, Butuzua	Suckers	16.50*
	Tigray	N.W Tigray	T/Adiabo	Tekeze Fruit Growers Ass.	80	Poyo, G/C, D/C, William I, G/Naine	Suckers & plantlets	26.50
	Amhara	N/Wollo	Raya-Kobo	Kobo-Girana Banana Farm PLC	50	G/Naine	Plantlets	29.60
Total	**3**	**6**	**7**	**14**	**672**	**-**	**-**	**-**

Source:*Own survey result, 2014/2015; *Grow banana under rain- fed condition.* **Where:** *ha= hectare; G/Naine (G/N)=Grand Naine; D/C=Dwarf Cavendish; G/C=Giant Cavendish; S/Bench=South-Bench; A/M/Zuraia=Araba-Minch Zuria;*

Bananas are transported on piled lose bunches either by open ISUZU (5 to 5.5 tons load capacity) or FSR (8 to 9 tons load capacity) trucks. Such officially licensed middlemen are found only in the banana producing villages of the Gamo-Gofa zone and there were 104 of them at the time of the survey work; of which 76 were in Arba-Mich Zuria districtand 28in Mirab-Abaya district [2, 11].

Wholesalers

These are banana traders that operate mostly at major regional and central market outlets. They buy the bananas in bulk either directly from producers or through the licensed farm gate collectors and ripen and sell them to individual and institutional retailing business operators (green grocers, supermarkets, street and open market vendor, etc.). After the bananas are unloaded upon arrival, they are sorted, weighed and treated for ripening initiation for 2 to 4 days, depending on the locality or prevailing temperature. The ripening process is done through the traditional kerosene smoking system inside airtight and non-ventilated chambers commonly called "chela" or "muket" houses. Ripening is most commonly done on piled bunches of 5 to 10 layers (only ETFRUIT and a few whole sellers perform the ripening process in hands). After ripening, bunches are dehanded and sold to various retailers in their respective localities either in green-ripen or yellow-ripen forms. Some wholesalers located close to the export outlets (Dire-Dawa, Harar and Jigjiga; sometimes ETFRUIT as well) are engaged in green banana exports to neighboring Djibouti and Somaliland (Figure 8).

Figure 8: Partial view of banana farm-gate selling (upper left), farm-gate loading (upper middle), transport to regional & central wholesale markets (upper left), unloading at regional & central wholesale markets (bottom left), ripening at regional & central wholesale markets (bottom middle) and green-grocer & street retailing (bottom left) in Ethiopia

Retailers

These are traders that purchase either green-ripe or yellow-ripe bananas after dehanding from wholesalers/ripeners and sell them to consumers. When they buy the green-ripe bananas, they often cover them with newspapers for another 2-4 days (depending on the prevailing temperature) and keep them until they develop the ultimate yellow color before they sell them to the ultimate consumers.

Table 5: Overview of major banana market outlets and marketing information in Ethiopia

Outlet	Distance from A/Minch (km)	Cost of transport (Birr)		No. of ripeners	No. of "chella houses"	No. of wholesalers	Av. No. hours for ripening in "chella houses"	Av. No. hours for yellowing wooden boxes	Av. price/kg of green-unripe banana	Av. wholesaler selling price of Green-ripe banana to retailers/kg (Birr)	Av. wholesaler selling price of yellow-ripe banana to retailers/kg (Birr)	Av. retailer selling price of yellow-ripe banana to consumers/kg (Birr)	Av. Street vendors selling price of yellow-ripe banana to consumers/kg (Birr)
		ISUZU	FSR										
Arba-Minch	-	-	-	0	0	1	-	-	4	-	6	7	8
Hawassa	280	3000	5000	6	9	6	16-20	24-36	5.5	6.5	7.5	8.5	10
Adama	455	5000	9000	9	16	9	18-24	24-36	4.75	6.75	7.75	9.5	11
Addis Ababa	505	6000	10000	38	92	92***	36-48	30-36	5.50	8.5	9.00	12	12
Assela	555	6500	9500	1	1	1	36-48	30-36	5.0	7.0	9.0	12	12
Harar	955	12000	21000	4	7	6	24-36	24-36	5.25	7.5	8.75	12	12
D/Dawa	955	12000	21000	0	0	6***	-	24-36	-	10.0	11	15	15
Jigjiga	1055	13000	23000	5	9	7	24-36	24-36	5.5	9.0	11	12	12
Tog-Wajaale	1145	13500	-	1	1	1	-	-	5.5	9.0	11	13	13
Dessie	905	11500	18500	6	11	12	36-48	30-36	5.5	8.5	11	12	12
Woldiya	1025	12300	18000	6	8	6	24-36	24-36	5.5	8.5	11	12	12

Mekelle	1288	13500	22000	22	33	22	36-48	30-36	5.5	8.5	11	12	12
D/Markos	835	8000	12000	2	2	2	24-36	24-36	5.25	8.5	11	12	12
B/Dar	1055	10000	14000	1	1	6	18-24	24-36	5.25	9.0	11	13	13
Gondar	1215	12000	21000	4	7	4	36-48	30-36	5.5	9.5	11	13.5	13
Metema	1395	14000	-	0	0	3	-	18-24	-	9.5	11	20	20
Jimma	860	11000	-	3	5	7	18-30	24-36	5	8.5	11	12	12
Mizan	-	-	-	-	-	-	-	-	5	-	-	8	10
Tepi	-	-	-	-	-	-	-	-	5	-	-	9	10
Gelabat	1397	-	-	-	-	-	-	-	-	-	-	22	-
Hargeisa	1092	-	-	-	-	-	-	-	-	-	-	1.75 (USD)*	-
Djibouti	1064	-	-	-	-	-	-	-	-	-	-	1.55 (USD)**	-

Source: Own survey result, 2014/15

*, **=information collected from Jigjiga and Dire-Dawa Customs and Revenue Offices respectively; ***Includes ETFRUIT

"Chella" or "Muket" houses= banana ripening houses using kerosene smoking; Birr= Ethiopian currency (equivalent to 0.05 USD at the time of the survey)

Table 6: Distribution of Gross Market Margins of actors across the major market channels, *2014/15*

Market channel	Domestic Markets**													Importers in Export Markets**		
	Small-scale Growers*		Large-scale Growers*		Farm-gate collector		Farmer Cooperatives /Union		Wholesalers		Retailers		Consumers	Djibouti	Hargeisa	Jeddah
	Birr/kg	%	Birr/kg	%	Birr/kg	%	Birr/kg	%	Birr/kg	%	Birr/kg	%	Birr/kg	Birr/kg	Birr/kg	Birr/kg
Channel 1	4.0	33.3	-	-	1.5	12.5	-	-	3.00	25	3.50	29.17	12.0	-	-	-
Channel 2	4.0	33.3	-	-	-	-	-	-	4.50	37.5	3.50	29.17	12.0	-	-	-
Channel 3	3.5	29.2	-	-	-	-	2.00	16.7	3.00	25	3.50	29.17	12.0	-	-	-
Channel 4	-	-	4.0	33.3	1.5	12.5	-	-	3.00	25	3.50	29.17	12.0	-	-	-
Channel 5	-	-	4.0	45.8	-	-	-	-	3.00	25	3.50	29.17	12.0	-	-	-
Channel 6	4.0	50.0	-	-		-	-	-			4.0	50	8.0	-	-	-
Channel 7	4.0 (11.4)	12.9	-	-	1.5 (1.5)	4.8 (4.3)	-	-	25.5 (29.5)	82.3 (84.3)	-	-	-	31.0	(35.0)	-
Channel 8	4.0 (11.4)	12.9	-	-	-	-	-	-	27.0 (31.0)	87.1 (88.6)	-	-	-	31.0	(35.0)	-
Channel 9	3.5	43.8	-	-	-	-	3.5	43.8	-	-	1.0	12.5	8.0	-	-	-
Channel 10	3.5 (10.0)	11.2	-	-	-	-	2.0 (2.0)	6.5 (5.7)	25.5 (29.5)	82.3 (84.3)	-	-	-	31.0	(35.0)	-
Channel 11	3.5	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	NA
Channel 12	-	-	4.0 (15.7)	17.7	-	-	-	-	25.5 (29.5)	82.3 (84.3)	-	-	-	31.0	(35.0)	-
Channel 13	-	-	4.0 (100.0)	100.0	-	-	-	-	-	-	-	-	-	31.0	(35.0)	-

Source: Calculated from own survey result, 2014/15

Where:

*Small-scale and large-scale growers, and licensed farm-gate collectors in Gamo-Gofa zone

**Channel actors in Addis Ababa and current export markets; ( )= Gross market margins in brackets are calculated based on import prices in Hargeisa

NA= data not available; *Birr= Ethiopian currency (equivalent to 0.05 USD at the time of the survey)*

- *Av. Large-scale growers' selling price to wholesalers in Addis (Birr/kg) =5.50;*
- *Av. Farm-gate collectors selling price to wholesalers in Addis (transports costs borne by farm-gate collectors),Birr/kg=5.50*
- *Farmer cooperatives/unions selling price to wholesalers in Addis Ababa (transports costs borne by cooperatives/unions, (Birr/kg) =5.50*
- *Av. wholesalers selling price of green-ripe banana to retailers in Addis Birr/kg = (8.50).;*
- *Av. farmer cooperatives/union selling price to retailers in A/Minch town (Birr/kg)=7.00*
- *Av. farmer selling price to local retailers at farm gate in A/Minch Zuria & Mirab-Abaya Districts (Birr/kg)=4.00*
- *Av. Selling price of retailers to consumers in A/Minch Zuria and Mirab-Abaya Districts (Birr/kg)=8.00*
- *Av. Farm gate selling price of farmer coops/union in A/Minch Zuria District to direct exporters to Jeddah Birr/kg)=4.50*
- *Average purchase price of importers in Hargeisa (USD=1.75USD/kg, i.e.=35 Birr/kg)*
- *Average purchase price of importers in Djibouti (USD=1.55USD/kg, i.e.=31 Birr/kg)*
- *Average purchase price of importers in Jeddah=NA*

Consumers

Consumers are categorized into individuals, households, and public and private institutional types. Households form the bulk of the consumers in the market. Institutional consumers include, juice houses, cafeterias, hotels, restaurants, hospitals, universities, etc. (Figure 8 above).

Export buyers

These are foreign traders often in the neighboring countries of Djibouti and Somaliland, and at times Saudi Arabia, which purchase fresh bananas from Ethiopia and do the subsequent business within the market channels in their respective countries (Table 5).

3.1.3. Banana marketing channels

Banana is an important fruit crop in Ethiopia and goes through the hands of several supply chain actors. Based on the direction of flow, 13 different banana market channels were identified in this study (Table 6). The channels start either from small-scale or large-scale producers and end up either domestically with the final consumers or the export terminal markets of Djibouti, Hargessa and rarely Jeddah. The volume of banana transacted in the channels is quite different with the first five being currently the most dominant (Table 6). For example, Table 2 above shows the amount of banana distributed from January 1, 2013 to Dec. 30, 2013, to the

major regional and central markets in Ethiopia through the five major market channels, just from the two major banana growing districts of the Gamo-Gofa Zone (Arba-Minch Zuria and Mirab-Abaya Districts). The country was also able to export about 80 tons of bananas to more distant export markets such as Suadi Arabia using refer containers [7]. The trend was planned to continue with an export of 1000 tons per month [7] but that could not be materialized due to problems like high level of inland transport costs through the standard temperature controlled refer containers. The actors involved in the supply chain invariably face some kind of marketing charges and post-harvest loss challenges as the produce moves from one chain to the other. The marketing charges being related to transportation, loading, unloading, handling, and ripening, the post-harvest challenges are related to the inherent bulkiness and perishability of the produce, and rudimentary transportation (vehicles and roads), handling (loading and unloading), packaging, storage, and ripening facilities and systems.

3.1.4. Marketing margin analysis

The term marketing margin commonly refers to the difference between producer and consumer prices of an equivalent quantity and quality of a commodity [15]. As such, marketing margins for the major domestic marketing channels, where most the banana transactions are taken place, are calculated by means of the following formula (Table 6).

$$GMM = \frac{\text{Selling price} - \text{purchase price}}{\text{Consumer Price}} \quad x \quad 100$$

Of the total 10 villages included in the study, only four of those in Gamo-Gofa zone (Sele-Kanchama, Ocholo-Lante, Omo-Lante and Ankober) have farmer cooperatives through which the majority of farmers sell their banana. Selling of newly harvested bananas at farm gate through farm gate collectors is the most common marketing practice in most of the study areas.

Descriptive and econometric results of factors of banana yield performances and its determinants

Different literatures, including [10, 4], have documented various household, farm and other socioeconomic characteristics as important factors to influence the yield of banana. Similarly different household and farm characteristics were observed to affect the yield of banana in the study areas. Table 7 presents comparative descriptive results of yield and its determinants across the different study sites.

The result on Table 7 indicates that the yield of banana by producers in Gamo-Gofa area is substantially higher than those of Bench Maji and Sheka zone. Area allocated for banana production is significantly higher in Gamo-Gofa zone than in Bench-Magi and Sheka zones. As far as the method of production is concerned, all producers in Gamo-Gofa zone use irrigated production system while all farmers in Bench-Maji and Sheka zones follow the rain fed system. There is also a significant difference on the number of suckers allowed per hill (clump) by producers across the three zones.

Table 7: Comparative descriptive results of yield and selected growers-and farm specific characteristics of banana producers

Variables	Whole sample	Gamo-Gofa	Bench-Maji	Sheka	F-values
	Mean (St.dev)	Mean (St.dev)	Mean (St.Dev)	Mean (St.dev)	(P-values)
Average Yield (ton/ha/year)	19.5	26.25	15	15	1190.70***
	(5.69)	(2.18)	(0.000)	(0.000)	(0.000)
Age	48.15	48.35	48.6	46.87	0.392
	(8.99)	(9.27)	(8.74)	(9.12)	(0.676)
HH size within the productive age group (15<age<65)	4.77	4.77	4.8	4.73	0.008
	(2.33)	(2.38)	(2.33)	(2.30)	(0.992)
HH experience in banana prodn. (Years)	15	15.58	14.33	15.17	0.951
	(5.02)	(5.97)	(4.36)	(4.04)	(0.389)
Average no. of suckers allowed per hill	8.49	6.15	10.05	10.03	1016.84***
	(1.98)	(0.63)	(0.43)	(0.41)	(0.000)
Area allocated for banana (ha)	0.52	0.90	0.28	0.25	38.38***
	(0.53)	(0.67)	(0.08)	(0.000)	(0.000)
		%	%	&	Chi-square (P-value)
Gender of HHH					
-male	66.7	61.7	70	70	1.125
-female	33.3	38.3	30	30	(0.570)
Type of planting sucker					150***
-Mixed (sword, water and maiden)	60	-	100	100	(0.000)
-Sword only	40	100	-	-	
Method of banana production					150***
- rain fed	60	-	100	100	(0.000)
-irrigated	40	100	-	-	
Use of spacing technology					18.79***
-yes	84.7	100	76.7	70	(0.000)
-No	15.3	-	23.3	30	
Cooperative membership					150***
-yes	40	100	-	-	(0.000)
-No	60	-	100	100	
Extension service on banana					

-yes	53.3	100	25	16.7	95.87***
-Not much	33.3	-	60	46.7	(0.000)
-No	13.3	-	15	36.7	

Source: Own survey result, 2014/15   *** denotes significance at 0.01 level

Producers in Gamo-Gofa zone maintain lower and more appropriate number of suckers than those in Bench Magi and Sheka zones. In addition, banana producers in Gamo-Gofa zone use only sword suckers as planting materials while those in Bench-Magi and Sheka zones use mixed suckers (sword, water and maiden suckers). While almost 100% of farmers in Gamo-Gofa zone also use regular spacing technologies of 3m to 4m, only 76.7% of the farmers in Bench-Magi and 70% in Sheka zone reported to considering spacing as an important production factor for banana. This can be related to differences in extension services as only producers in Gamo-Gofa zone reported to get some level of extension services on banana. Besides, the majority of banana growers in Gamo-Gofa zone are members of their respective village level farmer cooperatives through which knowledge and experience can be shared among members. Therefore, the substantial yield difference between producers in Gamo-Gofa zone and those in Bench and Sheka zones can be attributed to the aforementioned differences in production techniques as well as access to extension, experience-sharing and information services.

However, in order to determine and quantify the impact of the explanatory variables or factors affecting the yield performance of banana (production inputs, household and farm characteristics, etc.) in the study areas, multiple linear regression analysis using a Cobb-Douglass production function, which measures output elasticity, have been employed on the pooled data from the above table. Table 8 presents the multiple regression analysis results of the effects of these explanatory variables on yield of banana.

Based on various literatures and the available data, topography, soil type, age, household size within the productive age, number of suckers allowed per hill, type of sucker used as planting material, use of spacing technology, area of banana land holding and method of production (rain fed or irrigated) were identified or selected to be used in the regression model as determinants of banana yield performance. Out of the selected variables, soil type and method of production were excluded from the analysis due to collinearity problem.

According to the above results, the two variables of type of banana planting materials (suckers) used as planting materials and area of banana land holding for production, were found to have a significant effect on yield. As the probability of using sword suckers for planting material increases by 1%, yield of banana will also increase by 0.512 percent. In addition, as the area of land allocated for banana increases by 1%, yield can increase by 0.048 percent. Since the summation of the significant coefficients (0.512 + 0.048= 0.560) is less than 1, it can be said that banana production in the surveyed areas is characterized by decreasing returns to scale (output is proportionately less as related to the proportion of input used).

4.   Conclusions

Banana production is a major component of the farming systems in the lowland localities of the three survey areas of Gamo-Gofa, Bench-Maji and Sheka zones. It plays a considerable role in the household nutrition and

income generation.

Table 8: Multiple regression analysis results of the effects of selected explanatory or banana yield influencing variables using Cobb-Douglass functional form

Variables	Regression Coefficients (standard errors)	T-value (P-value)
Topography 1 (1.Sloppy)	-0.00004	-0.004
	(0.012)	(0.997)
Topography 2 (1. Flat land)	0.002	0.125
	(0.012)	(0.900)
Age of HHH	-0.065	-1.607
	(0.04)	(0.110)
HH size within the productive age group (15<age<65)	0.002	0.122
	(0.014)	(0.903)
Experience in banana production	0.006	0.463
	(0.013)	(0.644)
No.of suckers allowed per hill	0.000	0.004
	(0.054)	(0.996)
Type of sucker planting material (1. Sword suckers)	0.512	17.15***
	(0.030)	(0.000)
Use of spacing (1.yes)	0.001	0.050
	(0.011)	(0.960)
Area of land for banana	0.048	6.32***
	(0.008)	(0.000)
Constant	3.002	16.61
	(0.181)	(0.000)
No. of observation	150	
Adjusted R^2	0.974	
F-value	628.71***	

Source: Calculated from own survey result, 2014/15.

*** denotes significance at 0.01 level.

***,**, and *significant at 1, 5 and 10 percent probability level.

Household and farm characteristics such as age, household size and experience in banana production, area of land allocated and method of banana production (irrigated or rainfed), spacing and type of planting material used, household head (male or female-headed), extension service, membership of farmer, cooperatives/unions, etc. affect the yield of banana in the study areas.

The study identified 13 banana marketing channels and eight major actors in the supply chain of banana in Ethiopia. All actors sustain varied costs for production, transportation, handling, ripening, marketing and government taxes alongside their respective net marketing margins (profit). On the other hand, the involvement of some of intermediaries such as farm-gate collectors and transporters in some of the marketing channels seems to be superfluous whose presence only adds the cost to the final consumers and reduces the marketing margins to the smallholder farmers by reducing their purchase and selling price share respectively. Moreover, while membership in farmer cooperatives/unions benefitted farmers significantly in terms of income, and more organized market participation and negotiation, it had consequently negatively influenced the marketing margins of the intermediaries along all the identified banana marketing channels

Unlike those in Gamo-Gofa zone, both small-scale and large-scale growers in Bench-Maji and Sheka zones grow their banana solely under rainfed conditions. They also pay less attention to their banana plantations in terms of all aspects of agronomic and crop management practices such as regular weeding, manuring (farmyard and green manure), sucker and plant density management, and harvest maturity determination and harvesting techniques. To this effect they have not yet managed to secure good enough yields and benefits from their banana like their counter parts in Gamo-Gofa zone.

Another worry stated by farmers was poor prices and failure by the government to intervene and ensure that farmers benefit from their produce. Especially banana farmers in Bench-Maji and Sheka zones generally have no clear market information about where and how to sell their bananas. There is no deliberate extension service on banana to help them improve their banana productivity and market their produce at fair prices. The other problems associated with marketing as identified during the survey were high government taxes and transportation costs for traders who supply bananas from the production areas to the market outlets, and rough produce handling all the way through the supply chain.

Despite the availability of favorable policy and production conditions, the current situation of banana marketing in Ethiopia is generally inefficient and so disorganized. It is affected by several factors including unregulated marketing practices and inappropriate marketing facilities (transportation, packaging, storage, and ripening) largely on account of the absence of strong marketing institutions such as the Ethiopian Commodity Exchange Authority. This coupled with the bulky and highly perishable nature of the produce has rendered more particularly small-scale growers to fraud marketing practices by various intermediaries and oblige them sell their produce at throwaway prices. This in turn is pressurizing them switch to other less perishable crops such as cereals and coffee as observed during the survey in Bench-Maji and Sheka zones.

5. Recommendations

Gamo-Gofa farmers have better transformed their experience in banana production and marketing systems from traditional to commercial applications. These have been demonstrated in terms of their abilities to produce higher yields and higher quality fruits for both domestic and export markets. This in turn has tremendously increased their profitability and develop strong market linkages the country over. On the other hand, banana growers located in Bench-Maji and Sheka zones are not yet organized into farmer cooperatives/unions. As a

result, their access to training, improved production and marketing technologies, market information and bargaining power in the marketing of their banana is very limited. This needs due attention as a matter of urgency.

The Tekeze Banana Growers Association members use water pumps to use the water from the Tekeze River and the Kobo-Jirana Banana Farm PLC uses largely borehole water for irrigating its banana plantation through drip system. Similarly, both small-scale and large-scale growers in Gamo-Gofa zone produce their banana under flood irrigation systems. They mostly use natural river flows through either traditional or modern diversion dams. The modern diversion dams were constructed by NGOs such as Vita (European Union funded NGO) and SNV (The Netherlands funded NGO). Only a few farmers use water pumps to get the river water to their plots. Large-scale commercial growers in Arba-Minch Zuria district use either direct pumping from rivers or modern diversion dams constructed by them. Those in Mirab Abaya district mostly use Lake Abaya as source of irrigation water. However, especially small-scale farmers across all the survey areas expressed shortage of irrigation water and extended rotation periods among irrigation users as the main bottlenecks for banana production. This problem was attributed to several factors including increased seasonal run-off and soil erosion, gully formation and deepening of river banks for construction of traditional diversion canals, and absence of boreholes and micro-dams. To mitigate such problems and enable farmers to better utilize their banana production potential, integrated irrigation water development and utilization technologies as well as soil conservation and gully rehabilitation programs across the catchment areas need to be given due attention.

Supply of improved and disease free tissue culture plantlets or suckers from regulated central nurseries, and control of farmer-to-farmer exchange of suckers in order to minimize the possible risk of pest and disease transmissions, provision of extension services to producers on improved agronomic practices including sucker management and post-harvest handling systems, and regular training of all banana supply chain actors should be planned and implemented in good time to optimize the functioning of the banana industry in Ethiopia.

6.   Acknowledgements

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