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Assessment of the Constraints, Opportunities the Mango (*Mangifera indica* L.) Production in at Wolaita Zone, Southern Ethiopia

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Abstract

Ethiopia has highly –diversified agro ecological conditions which are suitable for the production of various types of fruit and vegetables. The southern region has 110,931 square km accounting about 10% of the country. With regard to the land use, out of the total area about 25% is cultivated, 22 % potentially cultivable, 12% is grazing and 19% is covered with forests and bushes. The objectives of this survey are to analyze existing potential of mango production and the livelihoods of the mango producers. The national average production is 10 tones. However; it is well known that yields of 25 tones. ha and more for Kent, Tommy Atkins and Keitt are common with regard to maturity, depending on cultivars and environmental conditions it takes 90 to 160 day after flowering. Not all fruits on one tree will ripen at the same time. A opportunities have high demand, favorable agro climate for mango production and great problem is to determine precisely the stage at which the fruits picking, and disease

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Constraints, Opportunities, Potentiality, Mango, Zones

Introduction

Although the mango tree is bot indigenous to Ethiopia, it has been cultivated for many years in some parts of the country (like Wolaita zone, Arba-minch and Harare areas).Mango tree were reported in Somalia as early as 1331.The mango is one of the most important fruit crops in the tropical and subtropical lowlands. It is native to India, Bangladesh, Myanmar and Malaysia, but can be found growing in more than 60 other countries through the world (Salim *et al*., 2002 cited in Griesbach, 2003).
The mango –because of its attractive appearance and the very pleasant test of selected cultivars is clained to be the most important fruit has been touted as 'king of all fruits'. Although it has undesirable features including coarse fibrous stands through the flesh and the pungent and turpentine flavors of some cultivars, it is one of the most delicious fruits.

In addition to income opportunities, the mango is noted for combating nutritional disorders. The mango compares favorably in food value with both temperate and tropical fruits. Indeed the fruit contains almost all the known vitamins and many essential minerals. Studies have shown that one mango fruit can provide a large proportion of the daily human requirements of essential minerals, and vitamins (see Table 1 and 2).

The calorific value of mango is mostly derived from the sugars. It is as high as that of grapes and even higher than that of apple, pears or peaches. The protein content is generally a little higher than that of other fruits except the avocado. Mangos are also a fairly good source of thiamine and niacin and contain some calcium and iron (Grisbach, 2003).

The world production of mangoes amounted to 25.7 million metric tons on average for the 2000-2004 periods and to over 26 million metric tons in 2004.

The world production of mangoes is increased by 6% or 1.5 million tons (2004 vis-à-vis 2000). India is by far the largest world producer, with 10.8 percent of the world production even if a large part of their crops is not destined for exports (UNCTAD/WTO, 2005).

When we consider Ethiopia and neighboring countries Kenya and Sudan, the country production in 2004 is relatively good. However, most of Kenya; s mango produce is exported while Ethiopian is very small in export volumes. In Ethiopia, production of fruits has been increased since 1991. Upper awash agro –industry enterprise, horticultural development enterprise, cooperatives and some private investors and individual small scale farmers are the major producers of fruits (mainly mango) in the country (CBI, 2005).

Major constraints contributing to low production is food security concerns, rural farmers prefer to produce cereals and pulses. Other constraining factors include low production and production and productivity, lack of adequate pest control, poor soil fertility management practices, lack of attention to product quality and prevention of physical damage, as well as the lack of storage and packaging facilities.

Objectives of the study

The purpose of this survey is to analyze existing potential of mango production and the livelihoods of the mango producers. In Boloso Bombe woreda, wolaita zone and arbaminch zuriagamo-gofa administrative zones in the selected major mango producing woredas in the respective zones. Specifically, the following are the major objectives of the study;

1. Identify potential mango producing areas (specific woredas and kebeles in the woredas)
2. Identify those agricultural crops that contribute to the livelihood strategies of smallholders Analyze the contribution of mango production to the income of the households in those identified woredas,
3. Identify constrains in the production, harvesting and post-harvest of mangoes in those in those identified woredas of Wolaita and arba minch zuria woreda administrative zones
4. Suggest some intervention points to overcome identified constraints in the production, harvesting and post-harvest handling, of mango in the identified woredas of Wolaita and arba Minch zuria woreda

Materials and Methods

In order to identify the constraints and opportunities of growing of mangoes in boloso bombe and sore woreda Wolaita zone and arba Minch zuria woreda areas by small holders, and to address study objectives indicated above, primary and secondary data and information were collected, analyzed and synthesized. Two consultants from our organization are directly involved in coordination of the primary data collection by using three data collectors for each woreda of the study (totally six data collectors with diploma, fist degree and post graduates level are used). Accordingly the following methodology was employed;

Data collection $ approaches

In the process of primary data collection, detailed structured and semi-structured questionnaires are used to interview producers in zones respectively. Checklists are used to gather overall regional, zonal and woreda level information on mango production, harvesting and post-harvest handling and also marketing.

During discussion with regional and zonal agriculture and rural development offices, potential mango producing woreda are identified. As a result, Boloso Bombe Boloso soreworedas and arbaminch zuria woreda market are identified as top producers of mango in Wolaita administrative zone respectively. Then at woreda level discussion, the potential kebeles involved in high volume production of mangoes with number of households in each kebeles are identified. Asa result, Boloso Bombe, Boloso Bombeworedas and Sodo town market are identified as top producers of mango in Bombe, B/sore and Wolaita administrative zones respectively. Then at woreda level discussion, the potential kebeles involved in high volume production of

mangoes with number of household in each kebeles are identified.

And finally, the three kebeles are randomly selected and gain within each kebeles three sub-kebeles are chosen randomly for household interviews. Total of 60 households are interviewed from the three kebeles in each woreda. Names of kebeles selected in Boloso Bombe woreda are Gido-Amnbe, Kutu Ambe and Ajora and in Boloso sore woreda metal-Hembecho, Gido-Homba and arbaminch zuria market. It is from these 6kebeles that a total 18sub kebeles (gote, 3gates for each kebeles) are selected for selected for interview of households.

In addition to primary data, various documents and literatures relevant to mango production, harvesting and post harvesting technologies, and marketing are assessed. Some of the secondary sources used include strategic plans of the regional, zonal and woreda agriculture and rural development offices, national reports on fruits and vegetables production and marketing, and various other documents from internets are used for global contextual analysis of mango production and marketing.

Data analysis and synthetization

For the analysis purpose a combination of different methods are employed to get a comprehensive picture of the areas and issues under study objectives. Qualitative comparisons and appropriate quantitative statics with the help of statistical package for social studies (SPSS software) are used for the analysis of the data.

Limitation of the study

The zonal and woreda agriculture and rural development offices in the wolaita area very cooperative and provided us all the necessary information.

However, we didn't find the same response and ease of communication with the same organization in Arbaminch zuria area due to the restriction they are given from somewhere not to release any kind of information without the pre-approval of the relevant higher government bodies. In order to overcome the potential suspicions by respondents, we were obliged to take kebeles security personnel with our data collectors. We believe this may result in lack of free and un-respondents in the process of answering questionnaires, hence problem of reliability and consistency. In order to minimize the effect, we used triangulation of questions.

In addition to this, producers are currently engaged all mornings in banana harvesting in arba Minch zuria woreda. Hence we were only able to contact potential respondents in the afternoon (has implications on our time effectiveness and efficiency).

Mango production

The mango is a member of the family anacardiaceous. This family comprises many other valuable trees such as the cashew and the pistachio nether genus *mangifera* includes 25 species (Moberly, 1997) with edible fruits such as *Mangifera caesia. M. foetida. Mordorata and M. pajang,* although *M. indica* is the only species that is grown commercially on a large scale. Workdwide mango cultivation now covers approximately 2.9 million hectares (FAO.2001) and earns nearly US$500 million in export revenues. There are two races of mango –one from India and the other from Southeast Asia. The Indian race is intolerant of humidity, has flushes of bright red new growth that is subject to powdery mildew and anthracnose and bears mono –embryonic fruit of high colour and regular shape. The Southeast Asian race is tolerant of excess moisture, has place green and of an elongated kidney shape. The mango is a deep rooted, evergreen plant which can develop in to huge trees, especially o deep soils. The height and shape varies considerably among seedlings and cultivars. Seedling tree can reach more than 20m in height while grafted ones are usually half that size. The tree is long –lived with some specimens known to be over 150 years old and skill producing fruit.

General practice in mango production

Production

Mangos are propagated either vegetative of by seed... Seedlings are grown sometimes to produce new cultivars but mainly for use as rootstocks or to reproduce known poly-embryonic cultivars. Mono –embryonic types, however, require vegetative propagation to retain all of the desired characteristics. It is also known that trees grafted on selected rootstocks remain smaller that the rootstock, and bear better and earlier.

The selected of suitable rootstock is as important as the selected of the scion cultivar. It has a strong influence of the growth, yield fruit maturity and soil adaptability, among other things. Seeds must be taken from ripe fruits and should be removed to examine the seed for disease or any damage caused by the mango weevil

(*Sternochetus*). Freshly sown seeds should be protected from high temperatures and desiccation by providing shade and once seedling. Emerge the shade is removed to harden the plants and produce a sturdy stem for grafting. Once the seeds have germinated, the seedlings are carefully lifted and cullued. This may be about one month after planting when they have reached the 3-5 red-leaf stage.

After transplanting the seedlings in to containers not smaller than 18X35 cm they remain there until they are of pencil thickness at about 20 cm above soil level. There are many techniques used to graft mango seedlings, but the most common methods are side –graft, side veneer and wedge-graft. Mongo tree must never be transplanted while it is flushing or when the leaves are still tender; the best time to transplant is after the second flush has hardened. Such as Asosa there is only one time harvest in a year. As a result, although amount in the market differs, there is year round supply of mango fruit in Ethiopia. Productivity depends on a number of factors, including quantity of previous crop, weather and soil conditions, altitude, control of pests and diseases, fertilization and cultivar. Even in the case of the same cultivar, yields vary greatly because mango is grown under widely varying agro climatic conditions and cultural practices in the country. The national average production is 10 tones. However; it is well known that yields of 25 tones. ha and more for Kent, Tommy Atkins and Keitt are common.

Harvesting and post-harvest handling

With regard to maturity, depending on cultivars and environmental conditions it takes 90 to 160 day after flowering. Not all fruits on one tree will ripen at the same time. A great problem is to determine precisely the stage at which the fruits picking. Fruits harvested too early will be of inferior quality after stratagem; however, fruits picked when too ripe cannot be stored for any length of time and may give rise to problems such as jelly seed.

In Ethiopia, harvesting generally begins in April in Ethiopia. Peak harvesting is in may, June and July. Some areas like Arba-Minch and Wolaita have two harvest seasons from April to July being major and from November to February is minor harvest.

The fruit will have its best flavor if allowed to ripen on the tree. The fruits are generally picked when they begin to change colour. This may occur first in a small area or the change will cover most of fruit's surface. However, one destructive maturity test that can be applied even before the external colour break starts is to examine the couloirs of the flesh around the second the seed. When this begins to change from green-white to yellow or orange, it indicates that the fruit is beginning to ripen and may therefore be picked. Also the greater the swelling of the shoulders above the stalk attachment, the riper the fruit is likely to be (see diagram of a mature mango fruit).

During and after harvesting the highly perishable mango fruit must be handled with the greatest care. The fruit is removed from the tree by cutting the fruit stalk or peduncle about 2 cm from the fruit. This will prevent the latex (exuded from the cut stalk) adhering to the skin of the fruit, staining it and rendering it unattractive.

Ladders or long picking poles with acuter blade and an attached canvas bag, held open by a ring can be used to avoid fruit damages during harvesting. In addition, the picked mangos should be carefully placed in to clean wooden or plastic containers (crates) and never in to gunny bags (sacks). If this is a delay in the transfer of the fruits to a store or packing shed they should be kept in a sheltered place to minimize sunburn, loss of moisture and accumulation of dust.

After any sorting, grading, washing, fungicidal treatment and perhaps waxing, the fruits are ready for packing, preferably in to shallow single-layered trays of 4-5 kg each. Because mangos are harvested during the summer months, the fruit temperature may be as high as 35^0C and more. This has a detrimental effect on the shelf life of the fruit. It is therefore the top- working of fruit trees is a normal orchard practice and is necessary to replace old cultivars or seedlings with improved selections which are developed from time to time. Top-worked trees will start bearing with thin 2-3 years, that is much earlier than a newly planted tree. Further-more, the survival of newly planted trees is not always guaranteed (drought, fire, animals etc.) This technique is not well publicized in the extension programme of Ethiopia. Recently, however, JICA, MASHAVA (in Boloso sore) and SNV-Ethiopia supported the transfer of this technology to Boloso bombe and Arbaminch zuria woreda farmers tested the advantage of using it over standard practice they have been growing mangoes (through seed).

Mango is successfully grown on a wide range of soils. The essential prerequisites for good development of the trees are deep soils (at least 3m), appropriate rainfall

(500-1000mm), good drainage, suitable altitude (0-1200m) and preferably apH value of between 5.5 and 7.5 The tree itself is not difficult to grow and, once well established, is relatively tolerant of drought, occasional flooding and poor soil condition. Irrigation in the first years after planting promotes flushing (and suppresses flowering), so that tree size increase quickly. Irrigation also widens the scope for intercropping, for example, with papaya, banana, pineapple or vegetables, during the establishment phase. When the trees are big enough to enough to produce a substantial crop, Irrigation is stopped,or at least interrupted long enough to impose quiescence leading to flower initiation.

Among the various climatic factor's temperature, rainfall and humidity have a greater effect on mango production than irrigation and soils. Furthermore, the production of high quality mango fruit depends much on the range of temperatures available. The two important considerations for mango cultivation are a dry period at the time of flowering and sufficient heat during the time of fruit ripening. For optimum growth and productivity, 20-26^{0}c is believed to be ideal. Temperatures exceeding 40 ^{0}c may, especially in hot/dry areas, lead to sunburn of fruits and stunting of tree growth.

Rainfall of 500-1000mm at the right time of the year is sufficient for successful cultivation. However; the mango cannot do well in areas which experience frequent rains or very high humidity during the flowering period. Such conditions are not conducive to good fruit set and they increase the incidence of serious diseases like powdery mildew and anthracnose.

Since the mango is along lived perennial, the planting distance usually dependents to a large extent on the vigorsity of the cultivar or rootstock and on the environment. When mango trees are planted too densely, the trees are forced to grow upright and very tall which makes harvesting very difficult. In addition, overcrowding results in the production of fewer fruits which are mainly poorly colored and infected with diseases. Normally, grafted trees are spaced at 8X8, or 8X10X12 meters. Intercropping of short-lived fruit trees such as papaya or annual crops could be used for better utilization of land in widely spaced young plantations.

Mango seedlings normally start to bear fruit within 4 years, while grafted trees (if allowed) may bear a few fruits in their second year in the field. In Ethiopia, two supply seasons can be differentiated in some areas such as Arbaminch and Wolaita. The first and main season runs from November to February and the second from June to August. In other areas advisable to move the packed fruits in to cold storage as quickly as possible to help them lose this inherent heat. The recommended storage temperature must, however, not drop below 7"c(range :7-10^{0}c) as otherwise cold injury may occur.

Existing conditions of mango production, harvesting and storage, in Wolaita and arbaminch areas

Wolaita Area (major finding)

Wolaita administrative zone is one of the 13 zones and 8 special woreda in SNNPR state. The Wolaita area with a total area of 438,370 hectares and estimated population of 1,559,836 is the major producer of different crops. Out of the total land area, 235,823 hectares are covered with crops where as 91,427 are forest and 48,082 hectares are grazing land.

Production

Major fruits produced in the Wolaita area include mangoes, avocado and banana among other crops such major cash crop Ginger, coffee and chat. For food purpose, the area produces among others teff,wheat and maize.

Boloso Bombe woreda is one of the largest mango producing woreda in wolaita administrative zone (35 percent of the households involved in mango production in the wolaita area is from this woreda). It is about 54 km from the zonal town (wolaita sodo) with a total population of 17,895, out of which 3,637 are female. Boloso Bombe woreda has a total land area of 17,625 hectares from which only 8,652 hectares are used for crop production, 288 hectares are forest and 1745 hectares are grazing land.

There are two major mango harvesting seasons in the woreda: from November –March and from June to September. Average productivity of a mango tree in the woreda is 0.161 tones (ranging from a minimum of 15kg/tree to a maximum of 400 kg/tree). Hence total production of mango fruit per household in the woreda is 5.152 tones per years (32x0.161 tones). By considering the 7,096 mango producing households, it can be generalized that the annual production of mango in Boloso Bombe woreda is about 36,558.6 metric tons.

Mango varieties produced by farmers in the woreda: local (differentiated as male and female). These local

varieties are reported to be very productive and are very big in terms of height and canopy. However, there are few farmers (through the woreda could not came up with specific number of seeding distributed and number of households planted them) growing improved types of mangoes. During the field work, we came across some apple mangoes already baring quite high yields per tree.

Mango in the woreda is grown in intercropping with important cash crop, Ginger. All the production seasons are dependent on rain (no irrigation or any other form of water supply is used). The interviewed households (78 percent) in Boloso Bombe and sores area explained that their mango production trend during the past three years was increasing. During the survey of the households 'fields, the consultant group also observed that even old mango trees in the woreda are giving good produces (Table 1–12 and Fig. 1).

Table.1 Calories and nutrient per 100g edible portion of fruits (Griesbach, 2003)

Fruits	Calories	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A(IU)	Thiamine (mg)	Vitamin C(mg)
Orange	53	0.8	22	0.5	-	0.05	40
Banana	116	1.0	7	0.5	100	0.05	10
Mango	63	0.5	10	0.5	600	0.03	30

Table.2 Minimum daily vitamin and minerals requirement for normal bodily functions

Vitamin A	IU	2.500
Vitamin C	Mg	60
Thiamin	Mg	1.5
Niacin	Mg	19
Iron	Mg	18
Calcium	Mg	1000

Table.3 World production of mangoes for the period 2000-2004 (Breakdown per country)

Mangoes production (MT)	Year				
	2000	2001	2002	2003	2004
World estimates	23,909,199	24,123,908	25,649,286	25,100,489	25,381,475
India	10,500,000	10,060,000	10,640,000	10,780,000	10,800,000
China	3,210,692	3,27272,875	3,513,366	3,420,513	3,622,000
Thailand	1,633,479	1,700,000	1,750,000	1,750,000	1,750,000
Mexico	1,559,351	1,577,450	1,523,160	1,503,010	1,503,010
Pakistan	989,790	1,037,145	1,035,000	1,072,000	1,072,000
Sudan	192,000	193,000	194,000	195,000	195,000
Ethiopia	153,000	156,750	159,600	163,305	135,000
Kenya	112,608	179,638	118,240	118,000	118,000

Source: - International trade Centre (UNCTAD/WTO, 2005)

Table.4 Production and productivity of fruits in Ethiopia (in 2005 data)

No	Fruits	Producer HH(number)	Land covered (ha)	Volume produced (tones)	Productivity tone/ha)	Potential (tone/ha)
1	*Avocado*	530415	3596.2	228347.68	7.898	20
2	*Mango*	1425197	28102.49	2211449.87	7.574	25
3	*Banana*	188935	802.44	1429.391	1.781	6.5
4	*Lemon*	152363	569.44	4195.029	7.419	20
5	*Orange*	463868	54000.31	54729.24	10.406	25
6	*Papaya*	350200	2760.72	50657.348	18.433	25
7	*Guava*	488261	2894.51	71092.544	24993	15
8	*Pineapple*	21777	NA	NA	11.215	30
	Total	3621016	44126.11	621900.99		

Source: MoARD: Fruits and vegetables production study (February, 2010)

Table.5 Major mango producing woredas in Wolaita administrative zone

No	**Name of woreda**	**Number of mango producing households**	**Percent of woreda from total mango producer**
1	Boloso Bombe	13,125	35.0
2	Boloso Sore	11,772	31.4
3	Demote Woyide	8,000	21.3
4	Kindo Koyisha	1,760	4.7
5	DugunaPango	1,600	4.3
6	Humbo	800	2.1
7	Ofa	300	0.8
8	Sodo zuria	186	0.5
	Total	37,543	100

Table.6 land ownership status of the respondents in Boloso Bombe woreda (Source: Interview results, 2009)

Land size (in ha)	Frequency	Percent	Valid percent	Cumulative percent
Less than 0.5 ha	10	16,7	16,7	16,7
0.5ha	6	10,0	10,0	26,7
0.5-1 hectare	10	16,7	16,7	43,3
More than 1 ha	34	56,7	56,7	100,0
Total	60	100,0	100,0	

Major crops grown in woreda according to their importance in land allocated are teff, maize, cash crops (Ginger and coffee), wheat, banana, vegetables, mango and avocadoes.

Table.7 Major mango producing kebeles in Boloso Bombe and Boloso Sore woreda

No	Name of kebele	Total household	Mango producer households	% mango producer households
1	B/sore: Metalhembecho, GidoHoma	2989	2768	92.6
2	Ajora	1498	1,440	96.1
3	Adila	1000	986	98.6
4	Badaye	969	969	100.0
5	Bombe 01 &02	983	929	94.5
6	Bombe gebremahiber	790	746	94.4
7	Gido-ambe	750	715	95.3
8	Udulametela	715	663	92.7
9	Kutoambe	700	648	92.6
	Total	**10,394**	**9,864**	**94.9**

Average number of trees per household in the woreda is 32 ranging from minimum of 5 trees to maximum of 300 trees per household.

Table.8 Number of mango trees peer household in Boloso Bombe woreda (source: interview results)

Mango trees/HH	Frequency	Percent	Valid percent	Cumulative percent
5,00	2	3,3	3,3	3,3
6,00	2	3,3	3,3	6,7
9,00	2	3,3	3,3	10,0
10,00	8	13,3	13,3	23,3
12,00	4	6,7	6,7	30,0
13,00	2	3,3	3,3	33,3

Table.9 Types of mango varieties grown by the respondents

Type of mango varieties	Frequency	Percent	Valid
Only local and varieties	42	70,0	70,0
Both local and improved varieties	18	30,0	30,0
Total	60	100,0	100,0

Table.10 Pests & disease reported by respondents

Types of pests and disease	Frequency	Percent	Valid Percent
Fruit fly	6	10.0	11.5
Anthrancnose and fruit fly	44	73.3	84.6
Anthrancnose, fruit fly	2	3.3	3.8
Total	52	86.7	100.0

Table.11 Methods of harvesting mango fruits in Boloso Bombe and Boloso Sore area

Method of harvesting	Frequency	Percent	Valid Percent
By climbing and picking	20	33,3	33,3
By hitting the fruits with sticks	16	26,7	26,7
By using special harvesters	2	3,3	3,3
By combination of methods except special harvester	20	33,3	33,3
Using locally made harvester (Hingeta)	2	3,3	3,3
Total	60	100,0	100,0

Table.12 Summary of constraints and opportunities

	Constraints	Opportunities	Suggestions for intervention (action)
Production	Lack of wide range improved varieties	Favorable agro climate for mango production	Support to improved varieties introduction
	Prevalence of pests and diseases	Possibility for integration of supporting originations	Use of top-working techniques to change old mango trees
	Overdependence on rain-fed production, which is inadequate and not reliable (lack of irrigation system)	Long time mango production tradition of smallholders in the wolaita (Boloso Bombe and sore) area	Support protection of major mango pests and diseases
	Lack of reliable and capable supporting organization for mango production	Drought tolerance nature of mango plants (trees)	Training of smallholders producers & woreda ARD offices in mango production
	Poor agronomic practices	Low production cost requirement	
Harvesting & post-harvest handling	Lack of harvesting technology (tools)	• Possibility of value addition • Few practices of using locally made harvester	Introduction of improved harvesting techniques
	High post-harvest loses		Training of farmers
	Less careful harvesting practices		Support processing activities
	Poor post-harvest handling techniques (lack of appropriate storage facilities)		Introduction & support appropriate storage facilities
	(lack of value addition(processing)		Reduce informal and small traders role (legalize them)
Marketing	Limited information access to smallholders producers	Expanding local markets	Establish market information sharing centers
	One way price making practices and smallholder just receive that price) and unfair trade practices	Encouraging government policies	
	Low farm gate prices for mango fruits per kg	Changes in fruits consumption habits of the people	
	Lack of proximity (access) to market areas	Existence of farmer cooperatives	
	Seasonality of mango production	Existence of good infrastructure	

A.Tommy B. Atkins C.**Haden** **D. Kent**

Fig.1 Is undoubtedly the most common and Anthracnose (caused by the fungus)

In the production of mango in the woreda, kalehiwot church plays a significant role (14 percent of households interviewed have received the churches services) in addition to the modest extension services provided by the woreda agriculture and rural development office (6 percent). It should be noted, however, that the majority of the interview households(80 percent) don't have access to any kind of technical or input supply services from any organization (even including lack of access to government public services).With regard to agricultural credits, it was found that about half of the interviewed households have used loans from Omo microfinance Share Company.

Prevalence of diseases and pests

In BolosoBombe, producers frequently reported the prevalence of anthracnose and its damage to their mango fruit production.

Widespread fungal disease of mango and is a major factor limiting production in areas where conditions of high humidity prevail. The fungus invades inflorescences, fruits, leaves and branches.

Young fruits are readily infected. Sports may remain as pinpoint latent infections or they may enlarge in wet weather. Wet weather also causes characteristic tear-stain symptoms due to the spread of fungal spores by raindrops. The latent infections on young fruits cause much of the decay which occurs in mature fruits. Nearly mature to ripe fruits will have black spots of varied form which may be slightly sunken and show surface cracks penetrating deeply in to the fruit causing extensive rotting or complete blackening of the fruit surface.

Mango fruit fly white fly called by producers in Boloso Bombe) is the major pest affecting the production of mangoes in the woreda. Mango fruit flies are known to attack ripening mangoes in almost all mangos producing area of Ethiopia. The females lay their eggs under the surface of the already useless fruit. Fruits of some cultivars are more susceptible to attack than those of others.

Harvesting and storage

Methods of mango harvesting require special care if one needs to have quality mango fruits for fresh or product consumption. As discussed earlier, it is preferable if mango fruits are allowed to ripen on the tree and proper way picking selectively the ripen fruit by using different harvesting mechanism. Harvesting will be more difficult when trees get taller by making human height smaller to pick the fruits.

In Boloso Bombe woreda of the wolaita administrative zone, locally grown types mango trees are very tale. As

result, the interviewed households use different methods to harvest fruits which are actually found to be harmful to fruits quality. Some of the techniques used for harvesting in the area include climbing the tree when possible, hitting the fruits with sticks and shaking tree branches to let fruits fall on the ground or using combination of these methods are common.

Surprisingly, two respondents out of the 60 interviewed households were explained that they use locally made harvester called "Hingeta"to pick ripen fruits from their local and the mango trees.

Equivalent to the need for using careful harvesting techniques, mango fruits handling after picking from the tree without causing any wounds (wounded fruits are susceptible to spoilage and causes damage to good fruits as well). Then fruits need to be transported with smooth boxes which will not create any more damages to the fruits during transporting to storage places.

Sorting of the fruits (in terms of quality, damaged and clean, size and etc) and cooling by using any locally available techniques (like washing will to reduce risks of after harvest loses.

In Boloso bombe woreda, smallholders use locally made baskets which are rough surfaced and are not good for handling fruits. Producers store fruits using a combination of systems such as wooden boxes, jars or by covering fruits with straws.

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