Amhara National Regional State Bureau of Agriculture

Training Needs Assessment and Feasibility Study for Upgrading Bikolo Abay Horticultural Multiplication Site

Final Report

Volume I: Training Needs Assessment

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We would like to thank BoA and its line Offices found in the surveyed Weredas who helped us by organizing the farmers for interview and provision of valuable information on existing horticultural production. It was not possible to accomplish the field work without the cooperation of these offices.

We would also like to extend our thanks to AgroBIG for its financial support. Great thank also go to the Hotel owners, traders and other experts who participated in sharing their valuable knowledge and experience.

Special thanks also go to staff members of BoA and AgroBIG for their valuable comments on the whole process of the work from beginning to end. Last but not least, we would like to extend our gratitude to the Bikolo Abay nursery site employees for their important information.
EXECUTIVE SUMMARY

Amhara National Regional State Bureau of Agriculture in collaboration with Agro-BIG has initiated to improve skill and knowledge stallholders in horticultural production and marketing through training. The general objective of the study is Upgrading Bikolo Abay Horticultural Multiplication Site to provide practical horticulture production and marketing training for small holder farmers, DAs, farm organizations, private sectors, Universities and NGOs thereby promote value chain in the horticulture sector in Amhara region.

Specifically the study was carried out to conduct training need assessment and come up with recommendation for type and number of courses to be given, to estimate human resource needs and annual budget for the project and to prepare training action plan and make cost estimation.

The study has used field observation, interview of DAs, farmers, horticultural nursery site managers and literature for data collection.

The study has revealed that due to many reasons none of FTCs are delivering complete trainings in the study area. Based on data analysis 80% of DAs possess bachelor of degree science in agriculture and 60% of DAs have participated in but they are not satisfied.

Mango, onion and coffee are leading horticultural crops in which large numbers of farmers are growing. By using appropriate agronomic practices it was possible to extend shelf life of perishable horticultural crops but farmers lack basic cropping skills from seedling raising to storage and marketing. Besides identification and control of crop pest and storage are problems identified.

Farmers demand for improved horticultural seeds and seedlings is increasing but they don't have access to prepare their own or to buy at nearby. In addition existing governmental and nongovernmental nurseries are not satisfying and they will not satisfy ever increasing demand.

For sustainable development of horticultural production there should be sustainable skill and knowledge improvement in stallholders of the sector.
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# ABBREVIATION

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACZ</td>
<td>Agro Climatic Zone</td>
</tr>
<tr>
<td>ADSWE</td>
<td>Amhara Design Supervision Works Enterprise</td>
</tr>
<tr>
<td>AgroBIG</td>
<td>Agro - business induced Growth</td>
</tr>
<tr>
<td>ANRS</td>
<td>Amhara National regional state</td>
</tr>
<tr>
<td>BoA</td>
<td>Bureau of agriculture</td>
</tr>
<tr>
<td>CSA</td>
<td>Central Statics authority</td>
</tr>
<tr>
<td>DA</td>
<td>Development agents</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and agricultural organization</td>
</tr>
<tr>
<td>FTC</td>
<td>Farmers training center</td>
</tr>
<tr>
<td>GTP</td>
<td>Growth and Transformation plan</td>
</tr>
<tr>
<td>HIWU</td>
<td>Horticulture and irrigation water use</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Governmental organizations</td>
</tr>
<tr>
<td>ORDA</td>
<td>Organization for rehabilitation and development in Amhara</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

Amhara National Regional State with its wide range ecological, water and edaphic resources can grow different horticultural crops throughout the year. CSA, 2006 Meher season annual report has indicated that only 94728 hectare of land was under horticultural crops: Vegetables, fruits, root crops and coffee. This indicated that horticultural sub sector is emerging economy in the region. But it is challenged by lack of technical knowhow in production, handling, transportation and marketing. These coupled with traditional cropping practices result in poor return.

Agro-Business Induced Growth (AgroBIG) in Amhara region is a bilateral programme financed by the government of Finland and Ethiopia. The goal of the programme is "to contribute poverty reduction through agriculture based economic growth in the Tana Beles growth corridor." The programme follows a value chain development approach and it is all about input supply, production, marketing, value addition, quality and standards etc. It supports to a large extent building the capacity of value chain actors, supporters, and enablers for agri-business development. The primary target beneficiaries of the programme are small holder farmers, entrepreneurs, traders, processors, consumers and their respective organizations.

Lack of good practical knowledge and skill in production, handling and marketing of horticultural crops are critical problems that have been identified in Tana sub basin. As a result market demand can't meet, smallholders’ farmers are disadvantaged; the existing potential of the area cannot be exploited. Moreover, access to improved seeds/seedlings is major bottleneck to smallholder farmers. This resulted in; despite its horticultural potential of the area, people in the basin are under chronic food insured

Improving practical skill and knowledge of farmers, development agents in horticultural production, handling, transportation and marketing systems are urgently needed. AGROBIG has planned to upgrade Bikolo Abay Horticulture Multiplication Site, so as to serve as a practical training, multiplication and demonstration centre to mainly development agents and farmers to promote value chain in horticulture sector. Hence this report is prepared to show the training needs assessment, training topics to be given, feasibility of upgrading Bikolo Abay nursery site financial requirements and action plan of the training.
1.1 Objectives of the Study

The general objective of the study is Upgrading Bikolo Abay Horticultural Multiplication Site to provide practical horticulture production and marketing training for small holder farmers, DAs, farm organizations, private sectors, Universities and NGOs thereby promote value chain in the horticulture sector in Amhara region.

Specifically the study has the following objectives:

- To conduct training need assessment and come up with recommendation for type and number of courses to be given
- To estimate human resource needs and annual budget for the project
- To prepare training action plan and make cost estimation for the project

1.2 The Scope of the Study

Horticulture is generally defined to include fruits, vegetables, flowers, ornamental, spice and medicinal plants. In this study only fruit and vegetable are given more emphasis. In addition, training needs assessment is mainly focused for Tana sub-basin which includes AgroBIG intervention Weredas.

1.3 Organization of the report

The report is organized into five chapters. The first chapter consists of back ground which is already described, second literature review, third methodology used, fourth training needs assessment, the fifth conclusion and recommendation and sixth is feasibility study of upgrading the nursery site.
2 LITERATURE REVIEW

2.1 Role and nature of horticultural crops
Horticultural crops are complex including a wide variety of different crops which have different growth requirements, handling and transportation. Horticultural crops are sources of numerous essential nutrients in the diet and they also play a major role in improving the income of smallholder farmers in particular. Its production also creates a number of job opportunities in complementary businesses that arises such as marketing, processing and transportation. It is one of means to cope climate change (Bok, et al, 2006). Different literatures has indicated that vegetables production is labour intensive and can generate 3-10 times the employment and income per hectare of land compared to that of cereals.

Existing food production and environment conservation programs in Amhara region tend to integrate fruit trees into the existing cropping system. The rapid population growth coupled with raged topography makes fruit production the best advice to feed the population and conserve the nature. Horticultural production is a profitable enterprise and promising way of raising the incomes of household with sustainable way. In raged and mountainous areas it has a great role in natural conservation and climatic maintenance

Horticultural products are perishable and they do have short shelf life. In most cases one of the biggest frustration smallholder growers’ encounters is raising a beautiful crop only to see it rot in the field because there is no market or storage to store it. These problems can be solved by planning production in accordance with the market needs, implementing good agronomic practices and using improved storage technologies. Beyond production, agricultural business information and building value added agriculture is the key issue today to alleviate the problem (Kitinoja and Kader, 2003).

Value-added agriculture builds on the primary product or service of an agricultural business by adding a new component that has economic value and consumer appeal. For example, tomatoes farm that normally sells its product to a retailer may add value by expanding into pick-their-own, direct sales to consumers at their farm or local market (FAO, 2003).
2.2 Status of horticulture in Amhara

Despite all efforts made and its large suitable area since today most of regional fruits and vegetable demand is satisfied by other region's produce. Many of demand and supply variations are associated with poor performance of sector. Coupled with other challenges lack of sufficient planting material of improved fruit varieties/ cultivars and accompanying knowledge and skill gaps are bottle neck problems identified (BoA, 2008).

2.2.1 Vegetables production

Vegetables production is an important economic activity which is commonly grown on smallholder farm; commercial farming is insignificant and almost none. All vegetable types; fruit vegetables, Cole vegetables, root and tubers, bulb and leaf vegetables are grown in the region under rain fed and irrigation and the major producers are small scale farmers (Table 1). It is grown largely as source of income and food. This indicates that it can be a means to access food security through market integration and value chain participation and to get health community. In terms of area coverage and total output potatoes are prominent among the vegetables produced (Table 1).

Table 1 Common vegetable production in ANRS (2006 irrigation)

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Under irrigation (2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (ha)</td>
</tr>
<tr>
<td>tomato</td>
<td>28201</td>
</tr>
<tr>
<td>Onion</td>
<td>93306</td>
</tr>
<tr>
<td>Shallot</td>
<td>25752</td>
</tr>
<tr>
<td>Garlic</td>
<td>38621</td>
</tr>
<tr>
<td>Head cabbage</td>
<td>21017</td>
</tr>
<tr>
<td>Ethiopian cabbage</td>
<td>1385</td>
</tr>
<tr>
<td>Carrot</td>
<td>7888</td>
</tr>
<tr>
<td>Beet root</td>
<td>3960</td>
</tr>
<tr>
<td>Lettuce</td>
<td>3403</td>
</tr>
<tr>
<td>Swiss chard</td>
<td>2726</td>
</tr>
<tr>
<td>Potatoes</td>
<td>175924</td>
</tr>
<tr>
<td>S/potato</td>
<td>2304</td>
</tr>
<tr>
<td>Onion seed multiplication</td>
<td>56</td>
</tr>
</tbody>
</table>

Source: Annual report of 2006E.C, BoA, ANRS
2.2.2 Tropical and sub-tropical fruits production practices

Even though there is no written document when tropical and sub-tropical fruits have been introduced to the region, information collected from local people indicated that Citrus, Mango and Banana were started in Werebabo, Wuchalie, Bati and ShewaRobit Weredas in 1950s. But due to poor extension service and less attention provided to the sector, its production and extent was limited to these pocket areas only (BoA, 2008, unpublished).

Since 1990 attention was given to this sub sector by the government and nursery sites establishment, training and experience sharing were initiated. Different mother trees of citrus, Mango, Avocado, Guava, Banana, Papaya and other tropical and sub-tropical fruits were bought from Upper Awash horticultural farm and Melkasa research centers. Cognizant the importance of the sector the regional government has established more than 173 nursery sites (BoA, 2014).

Table 2 Production of fruits in ANRS (2006 E.C)

<table>
<thead>
<tr>
<th>Fruit</th>
<th>Production 1</th>
<th>Production 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coffee</td>
<td>15578</td>
<td>101615</td>
</tr>
<tr>
<td>Banana</td>
<td>8876</td>
<td>1343823</td>
</tr>
<tr>
<td>Mango</td>
<td>5282</td>
<td>646453</td>
</tr>
<tr>
<td>Avocado</td>
<td>2021</td>
<td>271798</td>
</tr>
<tr>
<td>Sugar cane</td>
<td>12198</td>
<td>6648625</td>
</tr>
<tr>
<td>Orange</td>
<td>3794</td>
<td>631800</td>
</tr>
<tr>
<td>Guava</td>
<td>1841</td>
<td>225179</td>
</tr>
<tr>
<td>Papaya</td>
<td>3835</td>
<td>611425</td>
</tr>
<tr>
<td>Apple</td>
<td>7118</td>
<td>71979</td>
</tr>
<tr>
<td>Mandarin</td>
<td>173</td>
<td>23437</td>
</tr>
<tr>
<td>cherimoya</td>
<td>12</td>
<td>777</td>
</tr>
<tr>
<td>plum</td>
<td>82</td>
<td>4776</td>
</tr>
</tbody>
</table>

Source: Annual report of 2006 E.C, BoA, ANRS

2.2.3 Highland fruits production practices

Highland fruits are temperate fruits which were introduced to Amhara region by different religious institutions which were working at Boru hospital (South Wollo) and missions at Gondar during reign of emperor Haile Silesia. Despite its age the distribution and expansion of these fruits were restricted and finally stopped due to lack of skill on how to grow and less attention provided to sub sector (BoA, 2008).
In 1986 adaptation trail was established in Kutaber Wereda by SIDA in Apple, Plum, peer and peach seedling which were introduced from Italy and Japan. In this nursery site awareness creation for farmers and training of professionals how to prepare the seedling was started. Again this nursery site was interrupted in 1989 because of financial support problem and military camping in the nursery site (BoA, 2008).

According BoA, in 1991 the regional government considered this site as source of seedling and financially as well as technically support has been provided to it. In addition to this different governmental and nongovernmental organization: SIM, ORDA, Save the Children UK, Semen Mountain development, Plan Ethiopia and others has contributed in distributing of different highland fruits in the region from other parts country and abroad Ethiopia. As result the region has today the region has 7118 ha of Apple and 82ha of plum with their yield of 71979qt and 4776qt respectively. In addition, based on 2014 quarter report of BoA, at present there are 68 highland nursery sites in the region.

2.2.4 Spices production

Evidently, Amhara National Regional State with its diverse agro ecology is conducive to grow a wide variety of indigenous and exotic spices. Based on CSA, 2013/14 annual survey report high area was covered by other crops than spices. Despite its wide area allocation for cereals, root crops, vegetables and other crops which are consumed in the house or supplied to local market the foreign exchange is mainly focused on some specific crops, like coffee, sesame and pulses.

On the other hand, spices with its limited area coverage have earned high amount foreign exchange per unit of area. The sector has also immense potential for economic development and poverty reduction through creation and expansion of employment opportunities and distribution of income and foreign exchange earnings.

Based on BoA, 2006 irrigation annual report the major spices grown in the region include: Pepper, black and white cumin, fenugreek, Coriander, Turmeric, Korerima and others (Table 3). The sector is unexploited resource for export diversification. The production of all the different types of spices, especially the techniques employed by stallholders is mainly based on traditional
ancient knowledge that has been inherited and transferred from generations. In most cases cropping of spices is unplanned and do not allocate enough land.

Table 3. Spice types and area coverage in 2006 E.C under irrigation

<table>
<thead>
<tr>
<th>Crop types</th>
<th>Area</th>
<th>Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black cumin</td>
<td>291</td>
<td>3808</td>
</tr>
<tr>
<td>White cumin</td>
<td>432</td>
<td>6642</td>
</tr>
<tr>
<td>Fenugreek</td>
<td>9629</td>
<td>119822</td>
</tr>
<tr>
<td>Ginger</td>
<td>181</td>
<td>24224</td>
</tr>
<tr>
<td>Turmeric</td>
<td>56</td>
<td>3761</td>
</tr>
<tr>
<td>Pepper</td>
<td>26320</td>
<td>593177</td>
</tr>
<tr>
<td>Basil</td>
<td>1076</td>
<td>18235</td>
</tr>
<tr>
<td>Coriander</td>
<td>81</td>
<td>583</td>
</tr>
<tr>
<td>Korerima</td>
<td>55</td>
<td>1185</td>
</tr>
<tr>
<td>cress seed</td>
<td>6</td>
<td>31</td>
</tr>
<tr>
<td>Tenadem</td>
<td>137</td>
<td>2508</td>
</tr>
</tbody>
</table>

Source: Annual report of 2006E.C, BoA, ANRS

Due attention is given in the first GTP plan and national spice sub sector development package, which will give strategic guidance is initiated.

Spices provide economic, employment and associated benefits. Spice production and demands is increase in Amhara because of increase in export.

2.3 Prospects for Horticulture Development in the Region

Based on DSA and SCI, 2006 potentials assessment survey report ANRS has areas which receive rainfall of less than 500mm to 2000mm and mean monthly temperature of 7.5° -27.5°. The report has also show that the region has many perennial and seasonal streams and rivers different soil types with their different physico-chemical characteristics. All these make the region highly potential to grow different horticultural crops with their different requirements.

The rain fall is different from place to place and it has two types of pattern; Meher and Belg. This type rainfall pattern coupled with high amount of surface and underground water help the region to get fresh produce throughout the year.
Figure 1 Major soil units of Amhara, Source: BoIUD
Figure 2. Rainfall map of Amhara region Source: BoIUD
Figure 3 Temperature map of Amhara region. Source: BoIUD
Besides its agro ecological potential the region has also skilled and unskilled unemployed labour. The demand of horticultural products is expected to grow significantly in coming decades, due to an increase in awareness of their nutritional importance and the resultant increase in their consumption. This offers an opportunity to absorb an ever-increasing unemployed labour force in Ethiopia (Bezabih, et al 2014)

It is fact because of its perishable nature, most cultivation of horticultural crops require has high labour. But these may require supplementary mechanical operations at certain stages of production. This is doesn't mean that here is horticultural crop cultivation that can be completely mechanically harvested and transported, as grain and cotton operations.

Using Sat satellite imagery (2010) analysis, ADSWE in its existing and potential crops assessment report has indicated that out of cultivated land in 2010 cropping season 225625 ha of land was above slope gradient of 45% and other 108960ha was even above 60%. Production of fruits in such slopes can alleviate erosion problem that can be caused during soil disturbance.

All these indicate that to use existing potential and to alleviate problems promoting horticulture production is solution and urgently needed sector.

2.4 Advantages of training needs assessment

The capacity of an organization has been defined as its ability to successfully apply its skills and resources to accomplish its goals and satisfy its stakeholder’s expectations. Achieving development in organizations crucially requires analysis of training needs and the design of training activities at the workplace. Thorough training needs analysis yields information on employee training objectives and suggests the most appropriate training strategy and methodology to be used in a particular work context (Ker, 2003).

The training needs assessment is a critical activity for the training and development function. The purpose of a training needs assessment is to identify performance requirements or needs within an organization in order to help direct resources to the areas of greatest need, those that closely relate to fulfilling the organizational goals and objectives, improving productivity and providing quality products and services. (Sajeev et al 2012)
In theory, training needs are analyzed following certain steps. Needs at organizational level should first be analyzed, followed by operational (job) and individual analysis. Needs at each level can be identified by carrying out certain techniques such as the Balanced Scorecard (organizational level), task analysis (operational level) and performance review (individual level) (Miller and Osinski, 2002).

Organizational analysis looks at the effectiveness of the organization and determines where training is needed and under what conditions it will be conducted. Task is any group of activities performed at about the same time or in close sequence and sharing a common work objective. Task analysis provides data about a job or a group of jobs and the knowledge, skills, attitudes and abilities needed to achieve optimum performance. Individual analysis analyzes how well the individual employee is doing the job and determines which employees need training and what kind. It targets individual employees and how they perform in their jobs.

Miller and his colleague also indicated common method of determining training needs of individual is analysing information or data from an employee's performance review. If an employee's review reveals deficiencies, training can be designed to help the employee meet the performance standards.

Employees can also be surveyed, interviewed, or tested to determine their training needs. They can indicate problems they have or provide recommendations to solve problems. These interviews can be conducted on an individual basis or in a group setting.
3 MATERIALS AND METHODOLOGY

3.1 Study area
The study covers five Wereda which are found within Tana sub basin (Fogera, Mecha, Dera, Bahir Dar Zuria and Fagita Lekoma). The study Wereda have 3 major climatic zones of which includes moist tepid, sub humid tepid and sub humid cool as indicated in Fig 1 below

Figure 4. Location map of assessment Weredas
3.2 Data collection methodology

3.2.1 Sampling

Different existing factors determine the type of data to be collected and nature of data collection methods employed. All farmers are not participating in horticultural production. As result to address farmers who are participating in horticultural production purposive sampling was implemented. For this survey data were collected from different sources- primary and secondary sources.

Field observation and measurement, Interview of development agents, Households’ Interview, Key Informant Interviews and Review Literature and Document are the major data sources.

3.2.2 Field observation and measurement

To understand actual agronomic practice of farmers in horticultural production at field and nursery level, field observation was undertaken. The training given by DAs was also observed on the field.

During field observation site selection and seedling raising and transplanting practices, fruit orchards management and layout of orchards and other agronomic practices are observed and spacing are measured. In general, during field observation the following important issues are emphasized in data collection works.

- Major horticultural crops grown in the area.
- Farmers agronomic practices in horticulture production
- Field management
- Post-harvest technologies used
- Main factors affecting horticultural production
- Best management practice to reduce erosion

In nursery observation major horticultural crop types and their varieties, crop management and access to infrastructure (road, power, and telephone), ongoing experiments and demonstrations were observed.
3.2.3 Interview of development agents

The objective of DAs interview was to assess the current status of development agents’ skill, knowhow and abilities in horticultural production and their short comings in the level of service to farmers in horticultural production.

Based on existing extension system (participatory agricultural extension system) DAs are responsible for developing the skill and knowhow of farmers using the FTCs and farmers field. To assess the skill and Knowhow of farmers the DAs were interviewed about availability of training center, modules, manuals, text and crop types on which training was conducted in FTCs (Annex_1).

In addition development agents were interviewed about the training in which DAs are participated. Even though it was difficult to get consistent information DAs were requested to mention the name of institution, type of training and their satisfaction about training.

Five DAs from five Kebeles in Wereda, two from Agro Big intervention Weredas (Mecha and Fogera) and three others (Dera, Bahir Dar Zuria and Fagita Lekoma) within Tana sub basin were interviewed.

3.2.4 Households’ Interview

The household interview was conducted on the basis of sampling frame designed. A multistage stratified cluster sampling of households using implicit stratifying method was applied to prepare the sample frame. The sequence of stratification is arranged, first the study area is stratified by Agro climatic zones, and then each Agro climatic zone is further stratified by Kebele administration boundary. Then in each agro climatic zones to get household heads that are participated in horticulture Kebeles and household heads were selected purposively. In each Kebeles 10 farmers who are participated in horticultural production are interviewed with prepared checklist (Annex--1).

3.2.5 Key Informant Interviews

Information was collected from Key informants that consisting of nursery managers, innovative farmers, Wereda horticultural expert, and investor in Mecha are also incorporated.
3.2.6 Review Literature and Document:

The survey also reviewed different horticulture training manual and guidelines, previous studies and documents which include: potential survey identification of opportunities, and preparation of projects profiles and feasibility studies by ANRS investment office and existing and potential crops assessment by ADSWE. The study also reviewed HIWU two years annual report.

3.2.7 Secondary Data Collection

Secondary data were collected and reviewed from offices of agricultural, trade and transport, cooperatives and women, youth and children's affairs.

3.3 Data Analysis and Interpretations

After collecting the data, data analysis activities were carried out by using descriptive statistics. Accordingly, knowledge and skill gap of farmers and development agents were identified.

3.4 Materials and Equipment

In addition field observation was done using the following equipment:

- Digital Camera for taking sample photos
- Lap Top computers
- Vehicles and others
4 TRAINING NEEDS IN HORTICULTURAL DEVELOPMENT

The gap in knowledge, skills and abilities of farmers is different from that of development agents so their training needs are also different. Therefore training needs assessment has to be different to farmers and development agents.

4.1 Assessment of Skill and knowledge gaps of development agents

Based on existing structure of BoA, 2011, agricultural trainings are expected to pass through TOT principles from regional horticultural experts to zonal experts, zonal experts to Wereda experts and Wereda experts to DAs and at last DAs are expected to transfer to farmers. But this may not functional and in some cases regional expert may handle training for Wereda experts and development agents.

To capacitate farmers DAS are expected to:

- Providing modular and short term trainings
- Assist farmers in their farms in different agricultural practices

With these assignments the existing performances of DAs are described as follows:

4.1.1 Educational level

Education back ground is key point to perform a given task. As result to know educational back ground each DAs were interviewed. Based on data analysis 80% of DAs possess bachelor of degree science in agriculture. With regard to trainings all DAs have participated in 60% of development agents have participated in horticultural and irrigation training which was given by office agriculture to all type of professions at once in the same class. As result DAs are not satisfied with the training.

4.1.2 Practical trainings delivered in FTCS

To know practical trainings delivered in the FTCs assessment was made. Based on the assessment at present none of developments agents (DAs) are delivering practical trainings at their FTCs as required. Reasons include lack of land for FTCs, training materials, irrigation water and knowledge of DAs.
According to analysis in sampled Kebeles even though there is initiation in 40% of Kebeles, None of FTCs are equipped with full training manuals, text, guides, modules and equipment and tools. 20% of Kebeles has mentioned that totally it lack land for FTCs; all (100%) mentioned lack of training materials and irrigation water. Being new for the assignment, 60% of development agents mentioned lack practical knowledge in agricultural practice of each vegetable crop. As result none Kebeles has practiced complete training in their FTCs. It was also informed that they cannot identify different horticultural seeds. In respect to fruits production none of development agents can practice grafting.

Based on the assessment it is possible to say, even though most of horticultural production is under irrigation there is no irrigation water at FTCs which indicates the need for practical trainings at farmers' field. It is also possible to get development agent who do not know the crop types or varieties growing in their Kebeles.

In addition to these DAs were also intervened their assistance in crop protection and postharvest technologies use. Based on data analysis all (100%) of them mentioned lack practical skill in identification of disease, insect pests and weeds, and postharvest technologies.

As mentioned by development agents there is also lack of farmers interest to train in FTCs. In first place it is far for some villages and in second farmers do not have confidence in skill and knowledge of DAs.

4.1.3 **Assessment of development agents assistance**

Theoretical trainings supported by practical are more easily applicable by farmers. But the development agents are providing trainings at Kebele meetings, churches and other meetings. As result farmers are not be able to transfer in to practical.

To assess quality of assistance farmers were interviewed about where they are getting assistance from DAs. Information obtained from 50 farmers revealed that 84% of farmers are obtaining their assistance at church and conferences while the other 16% are receiving assistance in their farms as well as churches and conferences. The result implies that there is quality problem and these types of trainings may not address those peoples who are out of such please. For example it
may not address youth at rural areas who do not participate at church ceremony at end of preying.

4.2 Assessment of farmers' skill and Knowledge gaps in horticulture

4.2.1 Assessment of major crops produced

Due to its high potential of irrigation water and rain fall vegetable production in Tana sub basin it is possible to get vegetables throughout the year. But the actual situation is reverse and in most cases there is excess production at one season and shortage at other season

Horticultural crops production in Tana sub basin is at its enfant stage and most crops types produced are different from one Wereda to other Wereda and the participation of farmers in growing each crop is different. An interview was made to know horticultural crop type grown by most of farmers'. Based on this major vegetables and fruits types growing and amount of HHs who are producing each crop is indicated in the table 3 below.

All producers are small scale farmers and commercial farming is none in Tana sub basin. Horticultural crops are grown largely as source of income and eating habit of vegetables and vegetables is not common. This indicates that horticulture is a means to access food security through market integration and value chain participation but it also indicate the need in extension service to aware importance of vegetables and fruits to change food habit of community.

Table 4 Amount of HHs participated in horticultural crops production

<table>
<thead>
<tr>
<th>No</th>
<th>Vegetables</th>
<th>HHs (%)</th>
<th>No</th>
<th>Fruits &amp;coffee</th>
<th>HHs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cabbage</td>
<td>18</td>
<td>1</td>
<td>Apple</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>carrot</td>
<td>16</td>
<td>2</td>
<td>Mango</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>Swiss chard</td>
<td>18</td>
<td>3</td>
<td>Coffee</td>
<td>48</td>
</tr>
<tr>
<td>4</td>
<td>Potatoes</td>
<td>36</td>
<td>4</td>
<td>Chat</td>
<td>30</td>
</tr>
<tr>
<td>5</td>
<td>Beet root</td>
<td>18</td>
<td>5</td>
<td>Orange</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Pepper</td>
<td>34</td>
<td>6</td>
<td>Papaya</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Onion</td>
<td>50</td>
<td>7</td>
<td>Lemmon</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Tomatoes</td>
<td>34</td>
<td>8</td>
<td>Guava</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>Avocado</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>Cherimoya</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td>Banana</td>
<td>14</td>
</tr>
</tbody>
</table>
4.2.2 Assessment of farmers cropping practices

Horticultural crops include a vast array of products and farmers who are growing horticultural crops are not growing all types of crops that are growing in the sub basin. This makes difficult to get equal information about each horticultural crop from all horticultural crop producers. As result analysis about each crops cropping practice is made based on information obtained from farmers (HHs) who are growing that crop type. In addition analysis about each of vegetables and fruits is unmanageable and it may cause redundancy. To avoid this farmer were grouped based on kings of major crops they produce. These gave three cases of vegetables (Onion, Tomato and potato) and two cases of fruits (Tropical and sub-tropical) producer farmers group.

Even though there is difference in their requirements and managements; other vegetables practices are assumed to be considered with the mentioned vegetables practices.

4.2.2.1 Assessment of cropping practice of Onion

Onion (Allium cepa L.) and shallot (Allium ascalonicum) are grown as source income and for flavoring and seasoning of a variety of dishes. To the cropping practice of Onion 25 farmers were interviewed about their agronomic practices, main factors affecting horticultural
production, soil fertility management, irrigation and post-harvest practices. These were triangulated with field observation. Based on these the following results are summarized.

1. Seedling raising and transplant

**Site selection and sowing:** based on information obtained in the study area raising seedlings and then transplanting is commonly used method for establishment of Onion at farm. The ideal spacing and plant population are those that maximize yield and quality without increasing in costs. In addition principle of using mulch is 1) to control soil temperature, either by keeping cool or keeping warm; 2) to prevent soil moisture 3) to control weeds and disease. This affects germination rate and numbers of seedlings (AVRDC, 1999).

The survey revealed that to prepare their seedling all (100%) farmers prepare flat seed bed near to their planting field and saw in broadcasting on the bed. It has also indicated that all farmers use leaves of any nearby plant as a mulch than grass. This has increased amount of seed to be used and incidence of weed. After germination they practice crop protection and other managements which include use of irrigation with of interval every 1-3 days.

![Figure 6. Local mulching practice](image-url)
Figure 7 Broadcasted seedlings of Onion in Fogera Wereda

**Land Preparation:** Farmers informed that both dry and paddy lands are used for onion production. Most of onion growing areas in Fogera and Dera are paddy or poorly drained at rainy season as result beginning of tillage depends on water draining time from the farm. They use animal drawn and local farm tools for land preparation. The number of tillage is variable depending on soil texture and land cover and in most cases it is 6 to 8 times. The number of tillage for seed bed preparation is more than tillage for transplanting field.

After plowing, the soil clods are broken in to smaller particles, again with the use of the fork, trowel and axes; leveling is also achieved in the process. Ridging is not common in the sub basin and farmers plant on unleveled beds and use flood irrigation.

After the field is prepared for transplanting farmers plant their seedlings using dibbler and their hands. Similar to nursery bed the spacing between plants in the field is not uniform and most of farmers do not use ridge and only 24% of farmers use
In their onion seed production manual Olani and Fikre, 2010 have indicated that Onion can be grown on nearly all types of soils, ranging from sandy loam to clay but loam and clay loam soils with pH of 6-8 and day temperature of 18°-24° and 10-12 night are appropriate for mother bulb production.

When Onions are grown under irrigation in Tana sub basin, based on awareness of the farmers and drainage condition of soil farmers saw their seeds at end of September and start of October and transplant at end of at end of November. This benefits farmers to use cool time of December and January for early stage of growth and warm temperature of February for bulb setting

The major criterion for selection of production sites in the study area is availability of water but it was necessary to consider soil pH. Based on Koga irrigation project feasibility most of command area of Koga irrigation site in Mecha is with pH of less than five and farmers are not happy on their onion yield.
Varieties used: Farmers have experiences in using different varieties: Bombay Red, Adama red, Sudan red, Mermiru white and other unknown varieties. The preference is based on availability and disease resistance. Bombay red is preferred by farmers in its disease resistance. Still these varieties are old and they need to be replaced.

During field survey farmers mentioned that the area coverage and trend of onion production is increasing but productivity is lower than the potential due to different factors. One of the major problems is shortage of quality seeds/planting materials and it is common to see in the market onion seed mixed black cumin seeds and weed seed called "ast nagir" in Amharic. In addition expired seeds are sold in the market and still there is no clear and systematic quality seed chain in the region. Farmers are also suffering from high price of seed and illegal brokers. During field observation it was observed farmers buying 800Birr per Kg onion seed.

To avoid the seed problems farmers in Fogera and Dera Wereda are trying to produce their own onion seeds. But the storage is major problem till they plant their mother bulb and they bring their mother bulbs from other areas like Shewa Robit and East Shewa. If they can control disease and insect pest which favored at offset of rain season, they will be profitable if they plant mother bulbs in September because cool temperature of December which favors flowering.

But they do not select good quality mother bulbs and farmers plant all bulbs what they got. This has resulted in thin stem and small ball.
2. Field management

Common field management practices at field are hoeing application fertilizers, irrigation and crop protection. Bulbs are made of thickened leaf bases, root system of onion crops is shallow and there should be care during hoeing. Framers use curved and pointed iron for hoeing and they hoe as required and as availability of labour.

Onion requires good fertilizer application. Even though the amount of fertilizer applied vary from farm to farm generally 200kg/ha DAP and 100Kg/ha of Urea is recommended (ERA, 2007). But none of farmers are using fertilizer at field and they use only at nursery beds. But their interest is initiated based on observation on other farms.
Even though it varies from place to place conflicts between upper users and lower users is common phenomenon observed in study area. The source of irrigation water is commonly from rivers, streams and dam which are managed under community leaders and Kebele administrative to avoid conflicts between upper users and lower users. Flood irrigation is commonly used practice.

Onions are a shallow rooted crop and frequent light irrigation is required. A root zone of onion can be assumed 30cm and soil in this zone must be kept moist. It is recommended to irrigate onion at time of planting, 1-2 days interval for first six weeks and later at weekly interval ((Sani and Jaliya, 2011). But based on information obtained from farmers interview irrigation frequency in the study area varies from one day to 7 days. In area where there is a sandy soil farmers irrigate their farm daily.

Figure 10. Flood irrigation practice

One of major problems is prevalence of disease and insect pest. Besides lack of knowhow and practical knowledge in development agents and farmers to identify these pests in the field, lack of identification guide and lack of knowhow how to protect and prevent these pests make the problem more serious. Assessment was made to know the skill and knowhow of farmers in identification of crop pest. All of them respond farmers not have practical skill in identification of pests. As result the farmers spray two or more chemicals at the same time at the same field to
increase the chance of control. When farmers use the recommended amount two or more chemicals, this in turn damages the crop itself. But to avoid the damage farmers use below the recommendation of each chemical which make chemical non effective to control pests.

Different chemicals are used to control disease, insect pest and weeds. Except 2 4 D herbicide they use chemicals for different insect pests and disease inter changeable. Commonly used chemical include: Gain 20 SL, Endosulfan 35% EC, Profite 72 EC, AGro_laxyl Mz 63.5WP, Dimethoate 40% EC, Agro_ethoate 40%, Mankozeb, Redimole and selecron 72% EC, Trust sate S.

During field survey key informants mentioned that due to mishandling of agrochemicals there is death of farmers every time. Knowingly or/ and unknowingly the people have died due to chemicals. For example in KuharMichael Kebele of Fogera Wereda in 2006 about 10 people were died knowingly by taking the chemicals. Children are one of community groups who have are exposed to the problems.

Farmers do not use any kinds of safety equipments and visible and invisible damages are observed in farmers during spray. Most vegetable seed traders are generalist and they trade all types of vegetables and agrochemical in single shop.

3. Post-harvest technologies use

Post-harvest technologies are traditionally defined as all processes, procedures and operations that take place between harvest and consumption of commodity. It includes harvesting and handling techniques, maturity and quality standards, cleaning, sorting, grading, packing and packaging, storage and transportation and others. In recent years, this definition has been expanded to incorporate value-added processing as well (AVRDC, 2005).

From field-to-fork, a large proportion of horticultural produce is lost. In developing countries, estimates are that 50 percent or more of fruits and vegetables are lost during postharvest (FAO 1981). In addition to discarded product, deterioration of quality (appearance, texture, flavor and nutritive value) and subsequent decreases in market value are significant factors. Quantitative and qualitative postharvest losses can be reduced through the adoption of appropriate management practices, both before and after harvest. Any reduction in postharvest losses serves
to increase food availability to burgeoning human populations while decreasing the total land area needed for production.

**Harvesting:** According Sani and Jaliya 2011, When onions are mature, they cease to produce new leaves and roots, the food still present in the leaves move in to the bulbs under normal condition; it becomes soft at neck and top fallen over. During this stage and immediately after food materials are being transferred to the bulbs, as result bulb increase rapidly in size. Therefore this stage should be allowed to be over before harvest begins. However, the tops should not be allowed to dry completely because onions pulled green keep better in the store than those allowed to ripen off completely in the ground. As result bulbs become ready for harvest when tops of most plants have fallen over and necks of bulbs are dry.

Sani and Jaliya also indicated, bulbs that are harvested when they are too much immature may take longer than others to dry properly for storage, and if the necks are not yet soft, the inner leaves may still be growing and will continue to elongate from topped bulbs, yielding unsightly product. If the crop is grown under irrigation it should be withhold 10 days before harvest.

Onions are generally harvested by hand pulling. They are then laid on their sides for a number of days for further ripening in the open. If they do not lie on their sides or heaped, they tend to take root in wet weather and start growing again. Harvest must be done in dry weather. Care should be taken not to bruise the bulbs so as to prevent rotting during storage.

In the study farmers mentioned that Onions are considered matured when the whole leaves of a plant are dried and fallen over. At this time they withhold irrigation for 10 to 15 days. But after four or five days of last irrigation they tramp over the plant to interrupt growth of remaining live leaves by walking over it. After 10 day of over walking or before a day or two days to harvest they irrigate field again assuming to make harvest easy and increase the weight of bulb.

After two days they harvest their crops and immediately after harvest farmers cut the leaves and root and prepare for selling; there are no curing, sorting, grading etc. practices. Besides the farmers use fork, Sickle and point iron tools to harvest their yield. All these make to bruise the bulb and then rotting. In some case when there is shortage of labor they stake for short days at field.
Storage: It was observed that there is no transporting to store or somewhere else. The farmers sell their yield at field. Because they have already irrigated before a day or two days before harvest and it will rot if they try to store even for a week. Because of illegal activity of middle men the farmers cannot sell their yield to whole sellers or transport to market. The buyers use tracks and plastic sacks for transporting produce to market.

4.2.2.2 Assessment of cropping practice of Tomato

Tomato (*Lycopersicon esculentum* Mill.) is grown as source income and for consuming with and flavoring of a variety of dishes. It is grown in four Weredas in the study area: Fogera, Dera, Mecha and Bahir Dar Zuria. Even though there is in few farmers plots tomato is commonly grown under irrigation. Onion is widely grown in Fogera, Dera, and Bahir Dar Zuria Weredas. 19 tomato producers are interviewed about their agronomic practices, main factors affecting horticultural production, soil fertility management practices, irrigation and post-harvest practices. These are triangulated with field observation.

1. Seedling raising and transplant

Tomato (*Lycopersicon esculentum* Mill.) is a warm-season crop that is sensitive to frost and killed by freezing temperature. An average daily mean of 20 ° to 24 °C is optimum for growth, yield and fruit quality. Fruit set and quality are poor at temperatures below 12 °C and above 35 °C. Hot, dry winds cause excessive flower drop while continuous moist, rainy weather conditions result in occurrence and spread of foliar diseases. Tomato gives good yield on soils of sandy loam and heavy clay loam which are well drained and pH of 5.5 to 7 (Bok, et al 2006). In the study area Fogera, Dera and Bahir Dar Zuria are major production areas. Framers producing onion are also producing tomatoes.

1. Seedling raising and transplant

**Site selection and sowing:** Seedling raising and transplanting is the same as that of onions but tomato is transplanted in short time than onion and it is commonly transplanted at end of September and harvested at mid of December. Similarly sowing and use of mulch are the same onions. All respondents agree that the major criterion for selection of production sites in the study area is availability of water. But it was necessary to consider soil pH and drainage.
Farmers mentioned that Different from onion they are using row planting on ridges and furrow irrigation at field in tomatoes.

**Varieties used**: commonly used varieties include Roma VF (farmers say *Kocharo* because of its better shelf life), Marglobe, Money maker and other Israeli varieties. The preference based on shelf life as result farmers prefer to grow Roma VF while consumers prefer Marglobe.

Access to improved tomato seeds is one of major problem in tomato production in the area. The problems are expressed in labeling of unwanted varieties with wanted name, segregation of different variety seeds, changing expired seeds label. Farmers are also suffering from high price of seed and illegal brokers. During field observation it was observed farmers buying 50 grams of tomato seeds by 60 Birr. To avoid the seed problems farmers are trying to prepare seeds from selected fruits in their farm.

2. **Field management**

Common field management practices at field are hoeing application fertilizers, irrigation and crop protection.

Field management practices hoeing, application fertilizers and crop protection are the same to onion but Frequency of irrigation is different and it varies 5 to 15 days. 57.9% of household's use 7 to 10 days irrigation interval while 31.6% use in less than 7 days interval the other 10.5% use more than 10 days interval. Unlike onion farmers use furrow irrigation and sometime mixed with flood in tomatoes. Similar to onion problems related to crop pests is identification and control.

3. **Post-harvest technologies use**

**Harvesting**: Farmers informed that harvest of tomatoes is based on areas where they found the market for their produce. When they get market demand at far area like Metema and Shire they harvest at pale green stage and while they expect market demand in their surrounding they harvest at light red stage. But if they assumed their market somehow moderate they harvest at early stage of light green. They harvest their produce with hand and transport with basket and wooden box. Once tomatoes are matured tomatoes are harvested at ever few days interval 4 and
5 times. When there is market problem they harvest every day and take to nearby road for sell to passengers and consumers

**Storage:** Farmers informed that there is no is practice of storage. The middlemen delivered at field or at road side and transport to market with wooden box.

### 4.2.2.3 Assessment of cropping practice of Potatoes

Mulugeta and Yigzaw in 2011 mentioned that potato (*Solanum tuberosum*) was introduced to Ethiopia in 1858 by the German botanist Shimper. Since then, it serves as food and cash crop for small scale farmers. Among vegetables grown in ANRS, in rain fed agriculture, potatoes rank first in volume of produce and area coverage (CSA, 2013/14).

#### 1. Site selection and planting

Potato is growing under irrigation and rain fed. The other method to grow potato using rain water is planting on recession lands at lack shore, wetland boundaries and riversides. When potato is grown under irrigation, planting time is not fixed. In addition it is common to grow potatoes under supplementary irrigation. As result potato is produced throughout the year in the study area.

To prepare the land farmers start their tillage at end of rain season for the next rain season planting and it passes through more than 8 tillage to get deep and fine field. Land with better organic matter and free from water lodging is selected.

At field farmers plant their potato seeds in raw using oxen draw equipment by put potato tubers at every next furrow. When potato is grown under irrigation the field is irrigated one day before planting. If the field is very saturated and became wet planting may be extended until it became moist. Farmers prefer pre sprouted medium size tuber with appropriate numbers of buds "eyes" at time of planting. This helps them to ensure quick, uniform and full germination, and consequently increase crop yield.

Bok, 2006 indicated that potato prefers a cool temperate climate but it can also thrive under warm day temperatures provided night temperatures are cool, otherwise tuber formation will be
poor. However, potatoes are susceptible to frost, though young plants which have not started to form tubers can recover from frost damage. The mean optimum temperature for tuber formation lies between 15°C to 20°C. Above 32°C tuber formation and development is very poor. High soil temperatures at planting time can cause the seed to rot in the soil and lead to poor emergence. Potatoes need a well-drained soil. Bok, 2006 also indicated that sandy or sandy loam soils with neutral to slightly acidic soils which range pH value of 6 to 7 are better than heavy clay soils for quality potato production.

In Ethiopia it has indicated that all soil types are suitable for the crop, provided that they are not waterlogged and preferably have pH values between 5.5 and 6.7 (FAO, 1984). Since Tana sub basin has areas suitable for potatoes farmers are growing in all parts of the basin.

**Varieties used:** ERA has released different Potato varieties that can grow in different agro ecological zone but the major potato varieties used in the study area include: Gera (kp-380479.6), Guasa (384321.9), Zengena (CIP-380479.6) and Gorebela (CIP-382173.12), Tolcha, Wochacha Jalenie and local varieties. Even though many efforts are done in potatoes improvement, farmers are suffering from lack of varieties that can resist disease and insect pest. To avoid the problem farmers are using revolving seed production and each year some farmers are participating in the program receiving their own and transferring to others.

2. **Field management**

At field, after 3 or 4 weeks the buds become above soil farmers practice earthling up using oxen and hand tools and repeat as required. Earthling up prevents new tubers from turning into green and poisonous. The use of fertilizer is variable from farmer to farmer and the survey result revealed that 27.8% of farmers have experience of using fertilizer. Framers mentioned that it is common to use fertilizer under rain fed than irrigation. Even though Adet agricultural research center has recommended that 108kg/ha of N and 69kg/ha of P₂O₅, for Tana sub basin, the rate fertilizer use in the study area is dependent on farmers ability to buy the input and it vary from 1qt/ha to 0.51qt/ha DAP and urea respectively. South African department agriculture indicated in potatoes production guideline that potato plants have a poorly developed root system as result fertilizer is mainly applied in the planting furrow at the same time of planting. It should be preferably be placed at the same level as or under seed tubers.
When potato is grown under irrigation farmers use furrow irrigation and based of soil type fields are irrigated in intervals of 7-15 day. Based on survey 11.1% of farmers irrigate at interval of less than 7 days, 69.5% of farmers irrigate at interval of 7-10 days while other 19.4% irrigate at 10-15 days interval. An experiment was conducted at Adet and Merawi to study the effect of irrigation frequency and nitrogen fertilization on tuber yield of potato in two successive years in the off season (from January to end of April) in 2006&2007 under furrow irrigation. The research result revealed that 7 days interval is economical irrigation frequency for potato

Farmers mentioned that the other challenge facing is disease and insect pest. Even though farmers are able to control weed problems ever increasing disease and insect pest are becoming unmanageable. Common known late blight and powdery mildew, coupled with tuber rotting disease has forced farmers to become out of production. Farmers are not well aware of chemical using or other means of control.

3. Post-harvest technologies

**Harvesting:** Farmers mentioned that potato is harvested when the leaves and stems of most plants became yellow. When farmers grow under rain water, on dry lands depending on onset of the rain, seed tuber planted at end of February and beginning of March and harvest at end June and beginning of July. But if they want to conserve for next season planting, farmers leave it in the ground. Farmers don't practice curing, sorting, grading activities.

After potatoes are ready to harvest it is advisable to remove/cut the leaves and stem about 2 weeks before harvest to help toughen skin of tuber and prevent leaf diseases from entering tuber. But farmers don't practice it.

**Storage:** The two critical environmental factors involved in properly storing potatoes are temperature and humidity. Adequate and unrestricted air movement is also necessary to maintain constant temperature and humidity throughout the storage pile, and to prevent excessive shrinkage from moisture loss and decay. Farmers use bed to store the seeds and for short days storage and use of diffused light storage and others are not commonly used.
4.2.2.4 Tropical and sub-tropical fruits production practices

In the study area fruits are grown for generation of food and income; fruit processing firm are not initiated. Major tropical and sub-tropical fruits grown in the study area include Mango, Guava, Avocado, Orange, Banana, Papaya and Cherimoya (Table 1)

1. Seedlings raising

The success or failure of horticultural crops production depends on the quality of planting materials and field management after planting. Planting materials can be seed or seedlings. By their nature of large space requirement at field fruit seedlings growing by direct sowing at field is unmanageable. As result growing seedlings in the nursery site is prerequisite. In addition growing seedlings in nursery is more advantageous to produce more genetically uniform stock and it is easy to manage the seedlings.

In study area there are private and community owned nursery sites which are producing fruit seedlings. But none of them produce improved seedling. Most improved planting materials are limited to a few governmental and nongovernmental nursery sites. As result DAs mentioned that in every planting season answering improved fruit seedlings demand of the farmers is challenging and farmers are forced to plant poor quality local varieties. This is mainly due to lack of skill and knowhow in farmers as well as DAs. Based on survey all (100%) DAs can't practice grafting and other vegetative propagation methods. In addition lack of mother trees and nursery equipments are another problem.

High seedlings demand of the farmers is still unsolved problem. All (100%) household heads who are participated in the interview indicated they are not getting the required improved planting materials. Farmers cannot prepare their planting materials or buy it. Farmers as well as development agent do not have knowhow how to graft fruit trees. All these made all 100% of farmers who are interviewed are not satisfied in improved seedlings supply.

2. Planting of fruit trees

One of the operations that are under taken in orchard establishment is planting seedlings in the field. In appropriate planting operation there are three successive phases which make successful.
The first one is digging of holes based on root system of crop and water source. The second is improving the structure of the soil which is taken from the hole by mixing it with plant or animal manure before planting and the third is filling of the hole with enriched, well-structured soil at time of planting. Farmers mentioned that they do prepare holes before receiving their seedlings. The reasons included on one hand lack awareness about importance of pre digging and the other is farmers are not sure of getting seedling.

It observed that at field gardens are not well designed and arranged with proper spacing requirement of the species. There are no practices like seedling training, pinching of top buds which make fruit trees manageable, balances shoot/root ratio, promote growth of the required part. In some area some fruit trees are planted out of their ecological and edaphic requirement ranges.

It is also observed that except few farmers who planted their fruits in mix at their irrigation farm; most of the fruit farming systems are home garden and all types of fruits are grown around their compound on the same plot in mix. There are no pure plantation orchards.

3. Garden management

To be productive and fruitful there should be proper management of gardens. Major management practices undertaken in garden include managing soil fertility, canopy management, application irrigation water and protection of crop protection from different pests. In these regard farmers respond differently for each of practices. Even though amount and rate is different from farer to farmers, application of animal manure and ashes, irrigating fruit seedlings at early stage and inspection of their garden is practiced. But canopy management is not practiced. Hence poor canopy management coupled with poor arrangement of plants in the garden affect productivity of fruit trees.

Singh, 2010 in their practical manual on canopy management in fruit crops indicated that canopy management is the most important one that affect productivity of fruit yield. They have mentioned that canopy management affects sunlight interception, flowers fertilization rate, and increase incidence of pest, trees became unmanageable etc.
During survey during field observation it was observed that even though the fruit types are the same, management problems are quite different and many from farm to farm. Farmers are not aware of importance of canopy management as result they consider canopy management as damaging of the tree.

4. Post-harvest technologies use

**Harvesting:** Farmers mentioned fruits are picked manually when matured. Fruit that can be touched from surface are picked by hands while the others are harvested by kicked with long stalk and drop it on the ground. The other farmers mentioned, harvesting is practiced using tripod or by climbing on fruit trees. Common harvesting containers are plastic bags and baskets. Fruits are harvested for home use of for sale at nearby roadside or market.

After harvest due to many interacting steps involved from farm to market there is loses and famers are not benefited. The practices like washing, sorting, grading, waxing and other practices.

**Storage:** If produce is to be stored, it is important to begin with a high quality product. The lot of produce must not contain damage. But in study area fruits production are not large enough and in addition it is damaged during harvest.

4.2.2.5 Highland fruits production practices

Apple, pear, plum and peach and common highland fruits grown in Tana sub basin. The major problem here is also lack of skill and knowledge of development agents in seedling preparation, garden management.

During this survey 8 farmers in Fagita Lekoma and Mecha Wereda who are participated in highland fruit production are interviewed. It was observed that today there are lots of experiences and many highland mother trees which are developed in farmers' nursery sites. Many of farmers are engaged in this sector as their mainstay and to get more than 30 and 40 thousand Birr in a year.
Planning to grow temperate fruits require more careful attention, since most area in Tana sub basin lack sufficient chill period. As result highland fruits grown in Tana sub should be carefully selected and they should be low chill requiring varieties.

**4.3 Assesment of produce and seed traders**

Besides producers horticulture is an important economic activity and source of livelihood for many peoples, especially for those who are poor and their livelihood is based on fresh horticultural produce and spice marketing. It is source of income for wholesalers of produce and seeds.

Based on data collected from Wereda offices of trade and transport business types in which wholesalers and retailers are engaged include: Onion, Potato, Tomato, Fruit and fruit seedlings (Table 4). If Bahir Dar, Wereta and Merawi towns administrative are consider the number of engaged population may be large. It was informed that there are also individual who are not registered but their livelihood is based on horticultural trade.

<table>
<thead>
<tr>
<th>Wereda</th>
<th>Business type</th>
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<tbody>
<tr>
<td></td>
<td>Onion</td>
<td>Potato</td>
</tr>
<tr>
<td>Fogera</td>
<td>21</td>
<td>15</td>
</tr>
<tr>
<td>Dera</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Bahir Dar Zuria</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Mecha</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Fagita Lekoma</td>
<td></td>
<td>36</td>
</tr>
</tbody>
</table>

*Source: Wereda office of trade and transport*

The major problems mentioned by traders are seasonality of produce, lack proper storage, poor shelf life because of damage on produce during harvest. As result it is difficult to engage in fresh produce as full time enterprise.

Besides the produce there are traders who are engaged in seed and pesticides trade. Seeds are living things that need care and proper handling. All traders who are engaged in seed trading are also traders of agro chemicals and they have stored at the same store.

Based on information collected from produce traders, farmers in Tana sub basin are not benefited from their produce mainly due to poor production system, illegal traders and length and unfair market chain. Traders mentioned that when there are five legal traders at each Wereda there may be fivfold illegal trader at their chain.
Immediate following farmers there are illegal brokers followed by legal brokers and then local collectors of the produce who deliver to wholesaler brokers and final produce reach to wholesalers. At other end distributors buy from wholesalers and distribute to local distributors and then to retailers and consumers.

Farmers are also suffering from long seed chain marketing and there are brokers at each Kebele and Village who are assigned by local retailers.

4.4 Assessment of consumers

Awareness creation and extension service delivered on horticulture are creating a major local market in Amhara region. It has also improved food habit of peoples at town and rural and demand for horticultural produce is increasing.

During field survey hotel Paradise, Blue Bird Hotel owners at Wereta, Tirualem hotel owner at Merawi towns and consumers were interviewed about the source and practice of using horticultural crops. The Hotel owners mentioned that their cuisine/food menu is season dependent and it varies with availability of horticultural crop. The price of fresh produce throughout Amhara region shows extreme variability in prices. Hotel owners and consumers mention in some season it may be difficult to get the food menu recommended by physicians.

Many factors drive the price variability. The availability of suitable environment for horticultural production, season of the year, farmers experience and information flow in supply chain affects the price and access to horticultural produce.
5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

The objective of training needs assessment was to identify where the development agents have gap to accomplish their assigned tasks and to identify area where farmers lack knowledge and skill to produce horticultural crops. Based on these the following conclusions are summarized.

- Based on their education back ground DAs can deliver practical training if they are equipped with practical skill.
- Even though FTCs are Key institution to improve farmers' knowhow and practical knowledge at present the FTCs lack necessary materials. Besides DAs lack skill. As result FTCs are not giving proper practical trainings. In short time it also seems difficult to practice practical trainings of fruits and irrigation trails due to lack of mother trees and irrigation water problems.
- By using appropriate agronomic practices it was possible to extend shelf life of perishable horticultural crops but farmers lack basic cropping skills from seedling raising to storage and marketing.
- Even though farmers are trying to control weeds, disease and insect pest, identification and application of appropriate control measure are unsolved problems. In addition at present farmers as well as DAs lack knowhow and practical knowledge in identification of common disease, insect pests and weed.
- Farmers are not using at least cheap postharvest technologies and they can't prevent their yield even from one day's unexpected rainfall.
- Farmers demand for improved horticultural seeds and seedlings is increasing but they don't have access to prepare their own or to buy at nearby. In addition existing governmental and nongovernmental nurseries are not satisfying and they will not satisfy ever increasing demand.
- Functions and structure of existing nursery sites are not clearly indicated and they are mainly focused on temporary solutions. In addition the nurseries sites are found it don't have managers, lack financial, human and other material resources.
5.2 **Recommendations**

- If DAs have been skilled and have knowhow in horticultural crops cropping, they would have helped farmers at their farms or by acquiring demonstration and trail sites. But neither DAs nor farmers are equipped with practical skill. These require practical trainings to DAs and farmers.

- Irrigation problems may not be solved in short time. As result establishment of farmer's schools, demonstration or trail sites will solve the problems. This helps also to get farmers in their farm, to get irrigated farms at nearby.

- Farmers are becoming specialized in production of some specific crops, for example Fogera area farmers are commercializing on onion. Assistance delivered to these framers should be based on their interest and based on their major produce. As result there should be vocational adult education with curriculum of farmers interest.

- Establishment of nurseries by government fund may not solve the increasing demand of farmers. The farmers should be capable of producing the seedling or some other groups which can produce should be available. But training farmers to produce their seedling for planting or for sell and training DAs so that they can support in fruit production is prerequisite.

- It is difficult to get mother trees of fruit trees in short time. As result even after farmers are capable of producing their seedlings there should be nursery sites which can provide improved mother trees and train employees and other stallholders who participate in horticulture.

- Horticulture is dynamic and Knowledge based enterprise. Hence to have sufficient assistance in horticulture, updating with new technologies access improved mother trees is required.

- Crop disease, insect pest and weed are becoming a major problem, besides their identification and application of proper control measures is difficult without laboratories in their nearby. Through experience some one can come to identify more. To solve these, establishment of FFS and forming some pest scouting and controlling team will solve the problem of pest and mishandling of chemicals.

- Small scale and low-cost postharvest techniques can be highly productive, particularly when coupled with effective training programs and availability of technologies. Hence
there has to be appropriate technologies that can solve existing problem: problems of onion, tomatoes, potatoes and others storage.

- Continuously to update the skill of any actors in horticulture there should be independent institution with its clear functions and structures.
6 REFERENCES


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Janice A. Miller, and Diana M.Osinski 2002- training Needs Assessment.


M. V. Sajeev, A. K. Singha and V. Venkatasubramanian, 2012 Training needs of Farmers and Rural Youth: An Analysis of manipure state, India

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## 7 ANNEXES

### Annex 1 checklist for development agents

1. Identifiers
   - Location/District: 
   - Sex of the respondent: Male = 1 Female= 2
   - Education level of the respondent: Diploma = 1, first degree= 2
   - Field of study 

2. Area and production of major horticultural crops in the Wereda for 2006 crop year:

<table>
<thead>
<tr>
<th>Crops</th>
<th>Under rain fed</th>
<th>Under irrigation</th>
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<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Yield</td>
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</tbody>
</table>

3. What are main purposes (Uses) of horticultural crops in your Wereda?

<table>
<thead>
<tr>
<th>Crops</th>
<th>Major Uses</th>
</tr>
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</table>

4. Cropping system and seed rate

<table>
<thead>
<tr>
<th>crops</th>
<th>Common production system (sole, intercropping, or others)</th>
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5. Inputs and technologies use
   - What are common agro chemicals and their use in your Wereda? (Including Fertilizers)

<table>
<thead>
<tr>
<th>Agrochemical name</th>
<th>Use</th>
<th>Rate (ha)</th>
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</table>

   - What are horticultural crop varieties used in your Wereda?

<table>
<thead>
<tr>
<th>Crops</th>
<th>Varieties</th>
<th>seeds &amp; seedling common Sources</th>
<th>Rate (kg/ha)</th>
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</table>
6. When do farmers practice the following major agronomic practices?
   a. Under rain fed

<table>
<thead>
<tr>
<th>Crops</th>
<th>Land preparation</th>
<th>sowing</th>
<th>Transplanting/planting</th>
<th>weeding</th>
<th>harvesting</th>
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b. Under irrigation

<table>
<thead>
<tr>
<th>Crops</th>
<th>Land preparation</th>
<th>sowing</th>
<th>Transplanting/planting</th>
<th>Weeding</th>
<th>harvesting</th>
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</table>
7. **Irrigation**
   a. What are common irrigation water sources
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   b. Total water pumps ______________ Motor, __________ pedal pumps
   c. Major problems related to irrigation
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________

8. **What skills related problems do farmers in your area face while producing and marketing horticultural crops and how do you handle it?**
   a. In preparing the land, compost etc
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   b. In sawing, seedling preparation and transplanting of seedlings
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   c. In protecting the crop from weeding, pests and disease
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   d. Watering
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   e. Harvesting
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   f. Storage
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________
   g. Marketing
      
     ________________________________________________________________
     ________________________________________________________________
     ________________________________________________________________

9. **What are potential for growth of Horticulture sector in your Wereda?**
   
   ________________________________________________________________
10. What are major constraints of Horticulture sector?
   a. Abiotic (Pleas describe)

<table>
<thead>
<tr>
<th>Crops</th>
<th>In production and use</th>
<th>In market</th>
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<tr>
<th>Crops</th>
<th>In required inputs (seeds and seedlings)</th>
<th>others (list)</th>
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b. Biotic

<table>
<thead>
<tr>
<th>Disease</th>
<th>Host crops</th>
<th>Control measures</th>
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Insect pest
Weeds

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Others

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11. What are major problems related to seeds and seedlings in your Wereda?

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12. What are major problems to farmers to produce seeds and seedlings and to store them?

________________________________________________________________________
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13. Major support/s provided to Farmers?
   I. In production activities/practice

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

II. In input delivery

________________________________________________________________________
________________________________________________________________________

III. In marketing

________________________________________________________________________
________________________________________________________________________

IV. Credit service

________________________________________________________________________
________________________________________________________________________

V. Other supports

________________________________________________________________________
________________________________________________________________________

VI. Whom do they consult whenever they face production and marketing problems?

________________________________________________________________________
VII. Do you think that support/s in horticulture extension is/are sufficient? Yes = 1 No = 2 If No, What is missing and why?

VIII. What do you recommend to fill the gap of farmers skill/capacity and how?

IX. If you recommend training, please suggest time and methodology of training for DAs and farmers?

14. Where do farmers' sale their produces? Mainly horticultural crops?

<table>
<thead>
<tr>
<th>Crop</th>
<th>Buyers</th>
<th>Where do they sell</th>
</tr>
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</table>

15. If farmers are selling at field why do they do so?

16. Do you think that the prices for horticultural crop produce are fair? Yes = 1 , No = 2 If not, what do you think the reason/s

17. What are common practices farmers do to extend shelf life of horticultural crops? (Practice of using field boxes and others)

<table>
<thead>
<tr>
<th>crops</th>
<th>Post-harvest management practice (also their source)</th>
</tr>
</thead>
</table>
18. To improve post-harvest handling of horticultural crops what technologies and strategies do you recommend?

<table>
<thead>
<tr>
<th>Crops</th>
<th>Technologies</th>
<th>Strategies</th>
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19. As horticultural expert what are your main capacity/skill related problems from production to marketing? (Pleases indicate by topics)

________________________________________________________________________
________________________________________________________________________

20. What do you recommend for above problems?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

21. Any other comment for growth horticultural sector

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Annex _2 Checklist for Farmers

1. Identifiers
   e. Location: Wereda __________________ Kebele______________
   f. Sex of the respondent: Male = 1  Female= 2
   g. Education level of the respondent: 1-4=1, 5-8= 2,10-12= 3, certificate = 4, first degree = 5
   h. Total land holding ________________ha

2. Production of vegetables and fruit by households

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Production for 2006 EC</th>
<th>Common production system (Sole=1, Intercropping 2)</th>
<th>Source of seed (Own =1, Fee donated =2, bought =3)</th>
<th>Proportion of produce (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area (ha)</td>
<td>Yield (Qt)</td>
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3. When do you practice the following major agronomic practices?

<table>
<thead>
<tr>
<th>Crops</th>
<th>Land preparation</th>
<th>Sowing</th>
<th>Transplanting/planting</th>
<th>Weeding</th>
<th>harvesting</th>
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4. What are common varieties used ( list in their order of importance)

<table>
<thead>
<tr>
<th>Crops</th>
<th>Common varieties</th>
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<tbody>
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5. Do you plan what to produce every year Yes =1, No= 2
   a. If yes, what are your criteria?
      __________________________________________________________
      __________________________________________________________
   b. What is the role of women in planning decision?
6. What are common agro chemicals you used in 2006

<table>
<thead>
<tr>
<th>Crop</th>
<th>Agrochemical name</th>
<th>Rate (kg or Lt per ha)</th>
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</table>

7. What are your common storage and transportation facilities

<table>
<thead>
<tr>
<th>Crops</th>
<th>Storage facilities</th>
<th>Transportation facilities to market</th>
</tr>
</thead>
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8. Who are major buyers of your produce

<table>
<thead>
<tr>
<th>Crop type</th>
<th>Major buyers</th>
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</table>

9. Do you practice the following post-harvest handling techniques?(Specify)

<table>
<thead>
<tr>
<th>Crop types</th>
<th>Sorting (Yes =1 No =2) If yes what is</th>
<th>Grading (Yes =1 No =2) If yes what is</th>
<th>Curing (Yes =1, No= 2) If yes</th>
<th>Washing Yes =1 ,No= 2</th>
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</table>
your criteria to sort If no why? your criteria to for grading? If no why? for how long? If no Why?

<table>
<thead>
<tr>
<th>Crops</th>
<th>Lack of Know how in production and use</th>
<th>Market</th>
<th>Perish ability</th>
<th>Lack of required inputs (seeds and seedlings)</th>
<th>Others (list)</th>
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b. What are major biotic factors that affect horticultural production in your area?

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<thead>
<tr>
<th>Disease</th>
<th>Host crops</th>
<th>Control measures</th>
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<td>Insect pest</td>
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</table>
11. What are your common problems regarding agro chemicals?
____________________________________________________________________
____________________________________________________________________

12. Do you use any safety equipment when you apply chemicals?  Yes =1 No= 2
13. Do you have faced problems when you apply chemical in previous years? Yes =1 No =2

14. What is your seedling source for major fruits?
____________________________________________________________________

15. What are your common problems regarding horticultural seeds and seedlings?
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

16. What common farm tools and equipments do you use

<table>
<thead>
<tr>
<th>Crop s</th>
<th>Activities</th>
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<tr>
<td></td>
<td>Land preparation</td>
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17. Irrigation

a. Do you practice irrigation farming? Yes=1   No=2
b. If no what are the main reasons?
c. If yes what is the source of your irrigation water? Lake=1 River=2 Well=3 Other specify………………..=4
d. Is there any problem with your irrigation system? Yes=1 No=2
e. If yes what are they?
………………………………………………………………………………………………………………………………………………
f. Do you pay for irrigation water? Yes=1 No=2
g. Do you have any conflict during irrigation water use? Yes=1 No=2
h. If yes what is/was it?
………………………………………………………………………………………………………………………………………………
i. If yes again how did you solve the problem?
………………………………………………………………………………………………………………………………………………
j. How often frequent do you water your horticultural crops?

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<thead>
<tr>
<th>Crop</th>
<th>Frequency of irrigation</th>
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k. From whom you have learned to apply in this way? DAs=1 Local investors=2 Neighbor=3 Other (Specify)…………………=4

18. Agricultural supports
a. How often local DAs or Experts contact you to provide supports in past year?

........................................................................................................................................................................
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b. What services do you get from DA regarding horticultural production?

........................................................................................................................................................................
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c. Are you satisfied with extension provided regarding Horticultural production? Yes =1 Somehow =2 No =3 If No what is missing?

........................................................................................................................................................................
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d. Have you ever participated in any horticultural crop production demonstration? Yes=1 No=2
e. Whom do you consult whenever you face some problem in
   i. What, how and when to production

   ________________________________________________________________

   ii. Marketing?

   ________________________________________________________________

f. Have you ever participated in horticultural training/s? Yes =1 No =2
   i. If No, why

   ________________________________________________________________

   ii. If yes, what benefits do you got?

   ________________________________________________________________

   iii. If yes, have you practiced in your farm accordingly Yes =1 No =2 If No
        why

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

   g. For above question if yes was it supported by demonstration? Yes =1 No =2

   h. Do you have cooperative in your area Yes =1 No =2 If Yes what is its
      contribution in vegetables and fruits production?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

   19. Any comment if you have?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

   Name of Respondent: ____________________________

   Name enumerator: ____________________________ Sig _______________
Annex_ 3. Checklist for Hotel Owners

1. **Location**: Wereda __________________________ Town __________________________

2. What are the vegetables and fruits you use to provide your day to day services to your customers? Please describe the type of use /foods prepared/ by using each vegetables and fruits

<table>
<thead>
<tr>
<th>Crop type used</th>
<th>Food types prepared</th>
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</table>

3. Who is your supplier of the vegetables and fruit? Where do you get them?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

4. What problems do you experienced in getting these vegetables and/or crops?
   a) Problems related to quality
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
   b) Problems related to getting the proper variety
________________________________________________________________________
________________________________________________________________________
   c) Timeliness and seasonality
________________________________________________________________________
   d) Fluctuation of price and so on
________________________________________________________________________

5. What do you recommend as a solution to the problems?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Annex_4. Urban consumers

1) Location: Wereda___________________ Town____________________

2) Which vegetables and fruits do you use as a common food in their diet? In what forms do you use the vegetables and fruits? Describe the type of food you prepare from every vegetable and fruit type. Also indicated from whom do you get each?

<table>
<thead>
<tr>
<th>Types crops</th>
<th>Types/Forms of foods</th>
<th>Source</th>
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</table>

3) What are the main problems you experience in getting and using the vegetables and fruits?
   a. Problems related to quality
      ________________________________________________________________
      ________________________________________________________________
   b. Problems related to getting the proper variety
      ________________________________________________________________
   c. Timeliness and seasonality
      ________________________________________________________________
      ________________________________________________________________
   d. Fluctuation of price and so on
      ________________________________________________________________
      ________________________________________________________________

4) What do you recommend as a solution to the problems?
   ________________________________________________________________
   ________________________________________________________________
Annex 5. Checklist for traders

PART 1: PRODUCE TRADERS

22. Identifiers
   i. Location/District: ________________________
   j. Sex of the respondent: Male = 1  Female= 2
   k. Education level of the respondent: 0-4 =1, 5-8 =2, 9-12= 3 Diploma 4, first
degree= 5

23. In which commodity do you participated

<table>
<thead>
<tr>
<th>Crops</th>
<th>Traded (Yes =2, No =2)</th>
<th>Dominance (Rank)</th>
<th>Market destination (Local = 1, Central =2)</th>
<th>Buying price</th>
<th>Selling price</th>
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24. Explain the channel of Vegetable marketing (From farm to consumers)
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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________________________________________________________________________

25. What problems do you observe (related to quality, to getting the proper variety, timeliness and seasonality, Fluctuation of price and so on)
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

26. What do you recommend as a solution?
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
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27. What factors affect availability of vegetable produce on market?
28. How do you evaluate trends of horticultural produce? (Increasing =1, Decreasing =2)

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<thead>
<tr>
<th>Crop</th>
<th>Trend</th>
<th>Reason</th>
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29. Distinguish main purposes of vegetable production? Mainly those produced for sale.

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<th>Crops</th>
<th>Purposes</th>
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30. What are the opportunities and threats in vegetable business in your area?
   a. Opportunities
      ____________________________________________________________
      ____________________________________________________________
   b. Threats
      ____________________________________________________________
      ____________________________________________________________

31. Any comment you fell in horticultural production
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
PART 2: SEED TRADERS

1. Identifiers
   l. Location/District: __________________________
   m. Sex of the respondent: Male = 1  Female= 2
   n. Education level of the respondent: 0-4 =1, 5-8 =2, 9-12= 3 Diploma = 4, first degree= 5

2. In which seeds trade do you participated

<table>
<thead>
<tr>
<th>Crops</th>
<th>Traded (Yes =2, No =2)</th>
<th>Dominance (Rank)</th>
<th>Seed source (Local farmers = 1, Central =2)</th>
<th>Buying price</th>
<th>Selling price</th>
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3. Who is/are your supplier? Indicate the organization

<table>
<thead>
<tr>
<th>Crops</th>
<th>Suppliers</th>
<th>Rank</th>
<th>Varieties</th>
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4. Explain the channel of seed flow (from source to the farmer). who are the actors of the chain

______________________________________________________________________
5. What factors affect availability of seeds on market?

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

6. How do you evaluate trends of vegetable seeds? (Increasing =1, Decreasing =2)

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<th>Seed type</th>
<th>Trend</th>
<th>Reason</th>
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7. Are the seeds you traded certified? Yes =1 No =2 , No idea =3

8. What are the opportunities and threats in vegetable seed business in your area?
   a. Opportunities
      ____________________________________________________________________________
      ____________________________________________________________________________
      ____________________________________________________________________________
   b. Threats
      ____________________________________________________________________________
      ____________________________________________________________________________
      ____________________________________________________________________________

9. If you have any additional comment

   ____________________________________________________________________________
   ____________________________________________________________________________