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# Analysis of Crop Production Constraints Through Participatory Rural Appraisal in Harari Region, Eastern Ethiopia; Implications for Research and Development

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## Abstract

Participatory rural appraisals (PRA) were conducted in July 14 to 30, 2016 in AGP-II project target districts: Erar waldiya and Dire Teyara in Harari region of Ethiopia. PRA exercises were conducted using various PRA tools which included review of secondary data, focus group discussions, field observations (Transact walk) and pair-wise ranking. The tools were used to identify the biophysical and socio-economic constraints, opportunities and developments within the kebeles. Agricultural and animal productions are common in the surveyed Kebeles of the AGP-II target districts. Mixed farming is widely practiced in the kebeles of both districts. Staple food crops like maize and sorghum, and cash crops like vegetables and khat (Catha edulis Forsk) are commonly produced across all targets of AGP-II districts and also as region as well. Growing maize and sorghum in khat alleys is another cropping system practiced in both districts. The PRA work has also identified various categories of constraints to increasing crop production in the areas. The major bottlenecks include lack of improved crop varieties, low soil fertility, deforestation, moisture stress, disease and insect pests, and lack of awareness on soil fertility crop management. In most of the PRA Kebeles, it was found that continuous cropping, complete removal of crop residues from farm lands, soil erosion, deforestation, absence of fallowing, and inadequate soil fertility management practices are the major causes for low soil fertility and crop yields. In most cases, farmers apply Di-ammonium phosphate (DAP), urea and farmyard manure to improve soil fertility and crop yield. However, very few farmers use integrated application of chemical fertilizers and farmyard manure for crop production. In addition, no scientifically formulated and recommended fertilizer rates are available for the specific soils and environments. Thus, due to the lack of scientifically recommended rates of fertilizers and high costs of mineral fertilizers, farmers often use smaller rates of mineral N and P fertilizers based on haphazard estimations.

**Keywords:** AGP-II districts; Constraints.



## 1. Introduction

In Ethiopia a majority of the rural livelihoods depends on subsistence farming based on low external input systems. These systems face major challenges in relation to productivity which is often low and sustainability which is in many cases questionable. Low productivity and lacking sustainability have a pronounced negative impact on development of involved livelihoods. In Harari, eastern part of Ethiopia is an example of an area with livelihoods based on such systems. Here low crop productivity results in food insecurity and a high vulnerability [1]. In most households no surplus of food will be available and even during normal rainfall years around 40% of the farm households structurally depend on food aid (pers.com staff Bureau of Agriculture and Rural Development). Food aid in such cases might have become part of the livelihood strategy of farmers in Ethiopia [2]. Identification of crop productivity constraints and relevant opportunities are very important to design interventions aiming at improved agricultural productivity and related to that improved livelihoods. Therefore, the Government of Ethiopia is committed to scaling up best practices through its Agricultural Growth Programme (AGP-II). To complement this programme, Fadis agricultural research center has been designed to demonstrate integrated best practices to the AGP-II implementation team so as to raise awareness on the need for an integrated farming systems approach to agricultural production. To address the various community problems, it is imperative to design technically sound, economically feasible and culturally acceptable research, extension and development strategies. To this end, Fadis agricultural research center initiated a participatory rural appraisal (PRA) study in Harari Region, eastern Ethiopia. The main objectives of the study were to assess the farming systems, determine major biophysical and crop production constraints and opportunities for farming communities and identifying, documenting best practices and

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innovations with respect to environmental, socio-economic and agricultural production constraint conditions for further testing and possible scaling up.

# 2. Material and Methods

## 2.1. General Profile of the Harari Regional State

Harari People's National Regional State is located in the Eastern part of Ethiopia. The total geographical area is about 343.21 km2 and located between 42°03'–42°16'N and 9°11'-9°24'E. The region shares common boundaries with Jarso district in the North and Babile district in the East; Fedis district in the south and Haramaya district in the West. The region comprises six urban and three rural districts. These administrative districts are further divided into 19 urban and 17 rural kebeles. The city of Harar is the located in the East at a distance of 510 Km from Addis Ababa (HRWSSA, 2008). The region is mainly categorized into two agro-ecological zones, mid-high land and lowland or kola. The mid-high land (1400 – 2200 masl) which is called *weynadega* constitute 90% of the land area of the region while the low land (<1500 masl) which is called *Kola* the constitute 10% of the total land area of the region.The mean annual temperature of the region varies from18-27 °C. The mean annual rainfall of the region ranges from 700 mm-900 mm. The total population of the region is 183,344 of which 92,258 are male and 91,023 female. Mixed farming is the dominant production system in the region. Food crops such as sorghum, maize, wheat and cash crops such as groundnut, Khat and Coffee are grown by farmers. Vegetables (potato, tomato, garlic onion, sweet potato, hot paper and green red paper), fruit (banana, mango, and citrus) and sugar cane are grown under irrigation.

## 2.2. Site Selection and Sampling Procedure

The survey was conducted in the AGP-II districts of Harari region where the AGP-II program is being implemented. Field level data collection was conducted using PRA techniques during July 14 to 30, 2016. Prior to the field survey, a team of experts consisting of five members was established and the team held a series of discussions to sort out issues pertaining to the survey and to have a common understanding among all members of the team. More specifically, the discussion held on the checklists provided by regional team, PRA approach and tools to be used, procedures to be followed during the PRA and roles of each team members during the PRA. Following this, AGP-II targeted districts and Kebeles were identified and listed in consultation with experts from the Agricultural Offices of the respective regions. Accordingly, Dire Teyara and Erer Waldeya districts were selected purposely based on their potential in agriculture, agro ecology and available resources such as land and irrigation water. Similarly, based on agro ecology, potential in agriculture and available resources, a total of 3 Kebeles were selected for the survey. Finally, a total of 100 farm households were selected based on stratified random sampling techniques. Of the total sample households, female accounts for 18%. In addition to farmers, a total of 11 DAs have also participated in PRA.

**Table-1.** Number of farmers and experts involved in the PRA study, 2016

| Districts | Agro-ecology | Kebeles | Rural communities | | Total | No of experts | Total |
|---|---|---|---|---|---|---|---|
| | | | Male | Female | | | |
| Erer Waldeya | Lowland | Waldeya | 27 | 7 | 34 | 5 | 39 |
| | | Dodota | 26 | 3 | 29 | 2 | 31 |
| Dire Teyara | Midland | Dire Teyara | 30 | 7 | 37 | 4 | 41 |
| Total | | | 83 | 17 | 100 | 11 | 111 |

## 2.3. Method of Data Collection

Both primary and secondary data were collected from different sources during the survey.

## 2.4. Review of Secondary Data

The survey started with review of different published and unpublished documents and reports about the Harari region. Secondary data regarding AGP-II districts were collected from Agriculture Offices of the selected districts using a detailed checklist prepared for this purpose. Moreover, thorough discussions were made with development agents and experts of respective regions and selected districts.

## 2.5. Focus Group Discussions (FGDs)

Discussions with farmers, development agents and other key informants were used to collect the relevant data. The data about constraints to crop production, natural resource management, livestock production, marketing, institutions, and socio-economic conditions were collected through intensive focus group discussions held at kebele levels. The FGDs were held with elders and youth male and female farmers, community leaders, development agents and experts from district offices.

## 2.6. Field Observations

The data generated in FGDs was supported by field observations. Accordingly, the survey team made visual field observations of existing resources, existing cropping practice and constraints to crop production, natural resources management practices and problems, livestock management, marketing facilities with farmers, key informants, development agents and experts to complement the data collected through FGDs.

### 2.7. Data Analysis

The data and information collected from different sources were checked for consistence and completeness and analyzed using descriptive statistics to draw and generate useful information.

## 3. Results and Discussions

### 3.1. Description of Study Districts

Erer Waldiya district is one of 3 districts found in the Harari region. This district is situated north east to south east of Harar city. It is delimited by Jarso in the north, Gursum in the north east, Babile in east, Dire Teyara in west and Sofi in the south west. The area of the district is about 84.19 $km^2$ which accounts to 26.01% of the total rural area. The district comprises of 4 kebeles, 1 of urban kebele and 3 of rural kebeles such as Erer ulanula, Eer Awaye, Erer Dodota and Erer Waldiya. Among Erer Waldiya is the urban kebeles of district. The district is 13 km away from Harar, which is located in east at a distance of 523 Km from Addis Ababa. Similarly, Dire Teyara district is situated north east of Harar. It is delimited by kombolcha in the north, Jarso in the north east and Haramaya in west. The area of the district is about 70.54 $km^2$ which accounts to 21.79% of the total rural area of the region. The district comprises of 6 kebeles, 1 urban kebele and 5 rural kebeles such as Sukul, Hasengey, Dire Teyara, Sigicha, Aboker Muti and Miyay. The district is 8 km away from Harar, which is located in east at a distance of 518 Km from Addis Ababa. As in the most of the Horn of Africa, two rainy seasons characterize in both Districts. The first is short rainy seasons (*Belg*), takes place between March and May, while the second and the most important is main rainy season (*Meher*) between July and October [3]. Therefore, PRA survey was implemented in two districts, Erer Waldiya district stand for lowland and Dire Teyara district stand for midland based on the accessibility and agricultural potential selected for target AGP-II project.

**Table-2.** Agro-ecology and population of the districts

| | **Erer Waldiya** | | | **Dire Teyara** | | |
|---|---|---|---|---|---|---|
| **Agro-ecologies** | **Altitude** | **Rural Pas** | **Area coverage** | **Altitude** | **Rural PAs** | **Area coverage** |
| Mid land | 1800 | 1 | 25% | 2000 | 5 | 83.3% |
| Low land | 1300 | 3 | 75% | 1200 | 1 | 16.7% |
| Climatic | Maximum | Minimum | Average | Maximum | Minimum | Average |
| Rainfall(mm) | 500 | 300 | 400 | 917.9 | 636.7 | 757.7 |
| Temperature(°C) | 35 | 25 | 30 | 28.4 | 22. 6 | 25.5 |
| Population | Male | Female | Total | Male | Female | Total |
| Rural population | 6,743 | 6,464 | 13,208 | 14,778 | 14,172 | 28,950 |
| Urban population | 4,655 | 4,464 | 9,119 | 4,533 | 4,347 | 8,880 |
| Total | 11,398 | 10,928 | 22,327 | 19,311 | 18519 | 37830 |

**Source**: Ethiopia's Rural Facilities and Services ATLAS, 2014, BOA, 2016

### 3.2. Major Soil type

The major soil types which occur in both midland and lowlands of the Erer Waldiya district are Luvisols (Sandy soil) 90%, nitisols (clay soil) 10%. The major soil texture in midland of Dire Teyara district are Sandy soil, sandy loam, clay soil and black soil. More percentage of the soil texture of the district is dominated by sandy loamy soil.

### 3.3. Land Use System

According to data obtained from Demographic and socio-economic profile of Erer waldiya district, the total area of the district is 8419 hectares of the total cultivated land is estimated to be about 2,080 hectares (24.7%) which are under the temporary crops, 25.3% under arable land, 12.7% forest land, 12.7% area closure and 5.9% are under land used for construction, about 1619 hectares (19.2%) of the total land area of district is not suitable for agricultural production and others. Secondary data information at Erer Waldiya district reviewed that the average land holding in Midland (0.35ha) and lowland(0.52ha), and the numbers of farmers with average land holding of less than 0.5, 0.5-1 and 1-2 ha where 3500, 500 and 100, respectively. Whereas, Dire Teyara district, the total area of the district is 7054 hectares of the total cultivated land is estimated to be about 2,180 hectares (31%) which are under the temporary crops, 0.35% forest land, 0.51% grazing land and 1.7% are under land used for construction, about 4693 hectares (66.5%) of the total land area of district is more of covered by Khat and partly not suitable for agricultural production and others. Secondary data information of reviewed that the average land holding in Dire Teyara district was 0.35ha and the numbers of farmers with average land holding of less than 0.5, 0.5-1 and 1-2 ha are 4636, 1468 and 532, respectively

### 3.4. Major Vegetation Type

In both districts the major vegetation types found are natural forest, bush land, shrubs and wood land tree. Scattered forests trees and shrubs with few indigenous tree species are found on mountain and hill sides of the Kebeles. Some tree species which include Cordia, Acacia, muka Garbi, Gravellia (shawshawe), sesbania sesban and various fruit tree species are grown on the farmlands as agro-forestry trees.

# 4. Farming Systems and Management

## 4.1. Crop Production

A typical house hold in the rural area may grow cereals crops such as sorghum and maize are produced in the both districts and wheat and barley only cultivated in midlands of Dire Teyara districts. FGDs and secondary data reviewed the relative importance of major crops grown in the districts is shown in the following table.

**Table-3**. Area under major crops production in the districts

| **Commodity crops** | **Erer Waldiya (low land)** | | **Dire Teyara** | |
|---|---|---|---|---|
| **Cereal crops** | **Area(ha)** | **Ranking** | **Area(ha)** | **Ranking** |
| Sorghum | 965 | 1 | 2183 | 1 |
| Maize | 370 | 2 | 847 | 2 |
| Wheat | - | | 491 | 3 |
| Barley | - | | 5 | 4 |
| Pulse and oil crops | | | | |
| Groundnuts | 724 | 1 | 313 | 1 |
| Haricot beans | 20 | 2 | 45 | 2 |
| Vegetables | | | | |
| Potato | 205 | 1 | 149 | 1 |
| Cabbage | - | 2 | 80 | 2 |
| Tomato | 820 | | 56 | |
| Onion | 57 | | 70 | |
| Fruit | | | | |
| Mango | 150 | 1 | - | |
| Papaya | 54 | 2 | - | |

**Source**: BOA, 2016. The number ranked is indicated that major crop production

## 4.2. Cropping Systems and Pattern

Mixed cropping system is the most dominant cropping system in the study areas. However, sorghum, maize, wheat and barley are produced in sole crop but some farmers intercrop sorghum with maize, groundnut and Haricot bean in respective districts. Intercropping sorghum with maize and sorghum with groundnut is especially common in both districts. In lowland of Erer Waldiya district, there is rainfed farming in the existing land with single growing period for short maturing crops. In the area, except few farmers that are advantaged to use irrigation, the rest majority of farmers rely on rainfed crop production of which the distribution rain fall is often erratic. Currently, very little development on irrigation has been undertaken in lowlands and mid lands of districts. These are the two seasonal rivers such as Laga Fal'ana and Gafire together with streams flow to Erer River in Erer Waldiya and Amaresa River in Dire Teyara districts.

**Figure-1.** Caltivated area of crop production for the last five years at Erer Waldiya districts

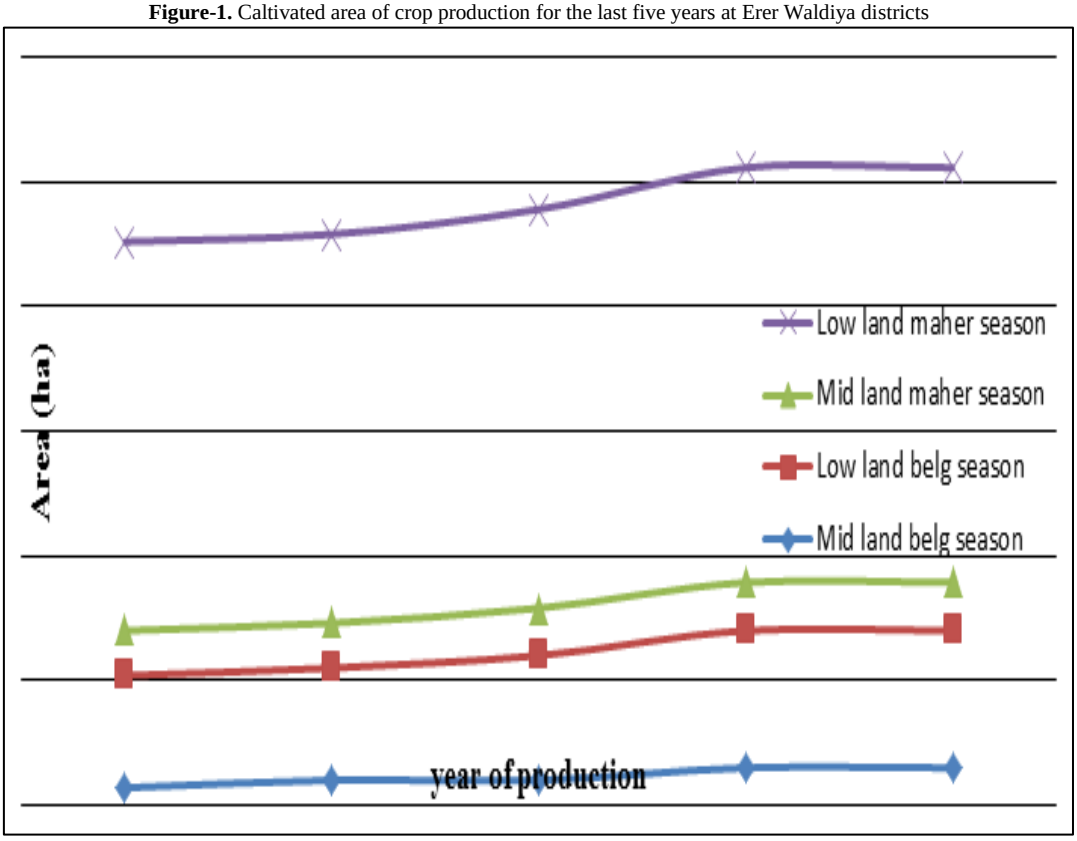
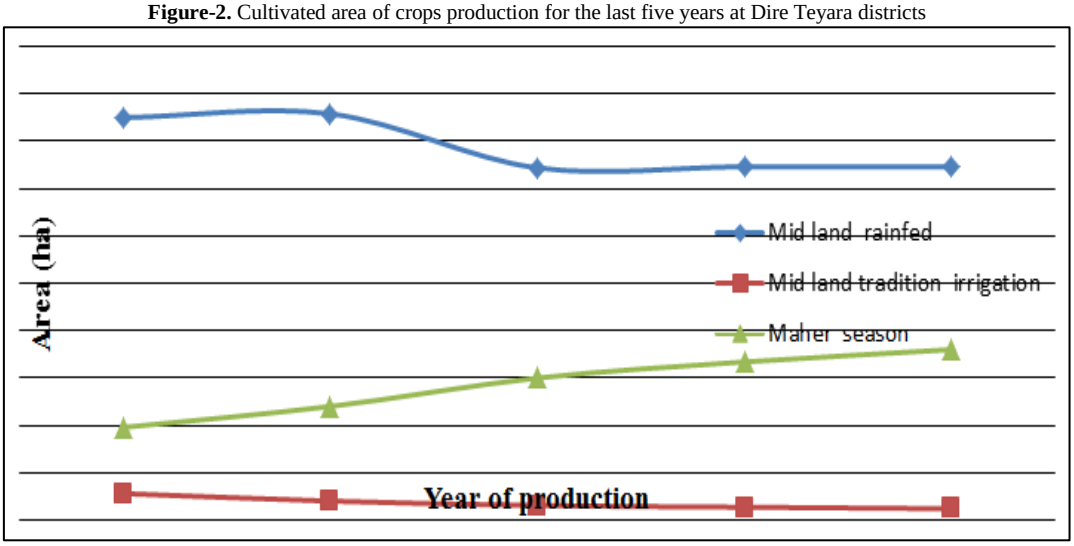


**Figure-2.** Cultivated area of crops production for the last five years at Dire Teyara districts




## 4.3. Trends of Major Crop Production and Productivity

The two major cereal crops produced in the study areas are maize and sorghum. The FGDs and secondary data information stated that the average productivity of local and improved sorghum per hector is 15.94 to 20 qt/ha and 24.9 to 30 qt/ha, respectively, and local and improved maize is 24.6 to 30 qt/ha and 36 to 45 qt/ha, respectively, in low lands of Erer Waldiya and 22 to 40 and 30 to 45 qt/ha of local sorghum and maize, respectively, in midlands of Dire Teyara districts. The production amount of cereal crops shows an increasing trend up to the year of 2014/15 and it starts declining the next one year in Erer Waldiya whereas increasing in Dire Teyara districts. FGDs reported that declining was associated with shortage improved varieties, low soil fertility, low soil moisture due to erratic rainfall and its poor distribution in the area. The cultivated area of land under major crops production both by rain fed and irrigation are shows a gradual positive change for the last five consecutive years in figure 3 and 4 below.

**Figure-3.** Productivity of major crops for the last of five years at Erer Waldiya district

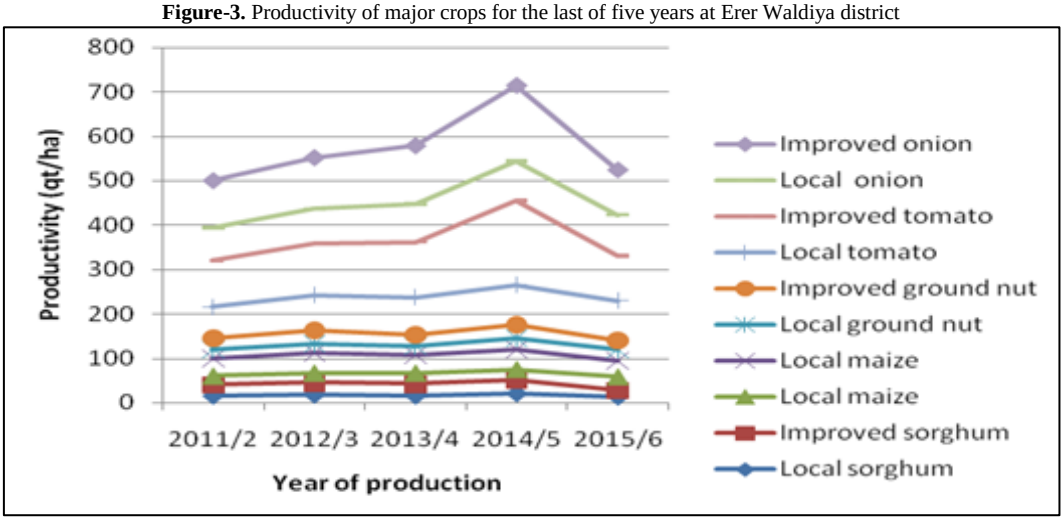
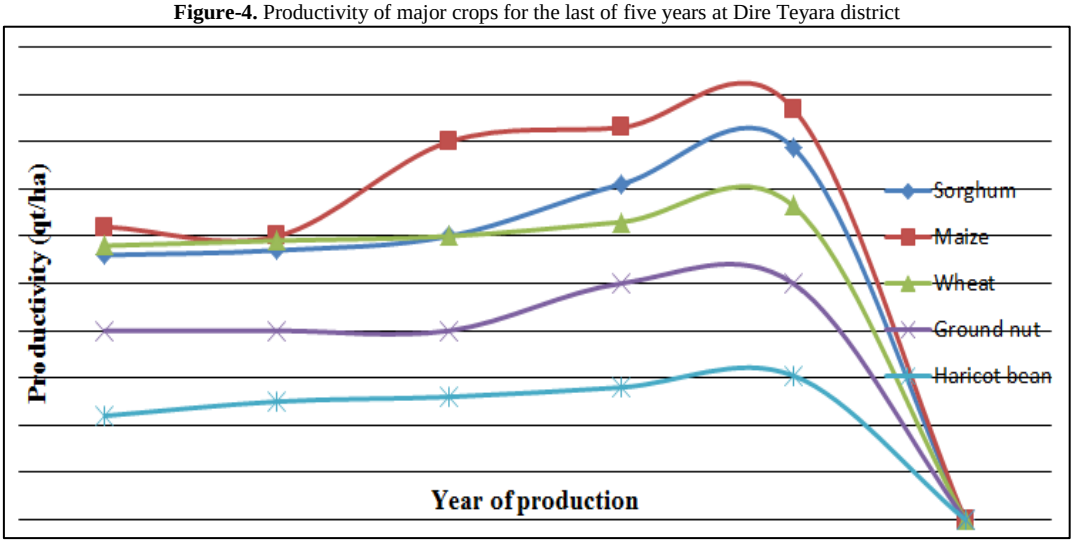



**Figure-4.** Productivity of major crops for the last of five years at Dire Teyara district



## 4.4. Crop Management

### 4.4.1. Soil Fertility Improvement

The low soil fertility in the districts has been attributed to low inherent soil fertility, loss of nutrients through erosion, intensive cultivation of the land which encourages oxidation reaction, total removal of crop residues for animal feed and source of energy and little or no addition of organic matters and inorganic fertilizers. This is particularly evident in the intensively cultivated areas, traditionally called high potential areas that are mainly concentrated in the lowlands and midlands of districts of Harari region. To address the problems of soil fertility, several technological interventions, especially those geared towards nutrient management and soil moisture conservation, have been suggested. Results of FGDs and secondary data indicated that use of inorganic and organic fertilizers and soil conservation measures are the major practices.

Use of inorganic fertilizers:- DAP, NPS and Urea fertilizers are the main inorganic fertilizers applied by farmers during cropping season. Band, broadcasting and dressing method of fertilizer application is common practices for all crops in both districts. Some discussants in Erer Waldiya noted that in maize and sorghum, urea is applied only one time that is at knee height of the crop. Use of the inorganic fertilizers depends on the availability of rainfall and the cost of fertilizers. Most of the discussants of Erer Waldiya and Dire Teyara districts noted that use of inorganic fertilizers during moisture stress burns the crops.

Use of organic fertilizers:- Use of animal manure is a common practice in both districts. Most farmers use combination of manure with inorganic fertilizers for major crops like sorghum, maize, tomato, potato and onion. However, the amount of manures used depends on the number of livestock the households owned. Those farmers who own more number of livestock use more manure than those who own less number of livestock. Manure is collected from the barn and, directly transported and spread over the fields before planting for vegetable fields in both districts. However, for sorghum and maize fields, farmers collect the manure and make heaps in barns for certain months and later transport and spread on fields before planting, especially at off-season.

Soil conservation measures:- Soil conservation measures are the important and decisive activities undertaken by the farmers in the study areas because of the land topography is undulating and fragile nature. Moreover, the area is known for practicing soil fertility improvement measures particularly use animal manures. To this end, FGDs participants have indicated that soil conservation measures are practiced to conserve the top soil from being eroded and to conserve moisture. Soil and stone bunds are the common soil erosion control measures practiced by the farmers in the study areas.

### 4.4.2. Agronomic Practices

In the study areas, land preparation practices are undertaken by oxen. Participants of FGDs of Erer Waldiya and Dire Teyara districts reported that cultivation is performed with traditional local ploughing and hand tools such as Hararghe Akafaa and Dongora. The land ploughing methods used by farmers is more or less similar for all crops in both districts. The Power sources used in the study areas are human and animal. Mechanical power is not totally used. The traditional animal plow implement is known as ard ‘maresha’ which known for its long time use. Tillage frequency for most of the crops is 2 to 3 times. Both broadcasting and row planting methods are used for planting maize and sorghum. Wheat and barley are planted using broadcasting method while vegetable crops such as tomato, onion and potato and fruit crops like mango are planted in row.

## 4.5. Pest Management Practices

### 4.5.1. Weed Management Practices

The most economically important weeds include parthenium, Cyprus and *Striga* species such as *Striga hermonthica and Striga sciatica*. Among economically important crop weeds, the parasitic weed such as *S. hermonthica* and *S. asiatica* are the most biotic constraints. At present, *Striga* is a serious constraint to sorghum and maize production particularly in dry areas of the study districts. Seasonal fluctuations and/or climate change had impact on weed infestation. Farmers in the area use cultural practices such as shallow cultivation tillage, deep ploughing, and repeated cultivation of maize and sorghum fields using an ox-plough and hand hoe for controlling weeds. Deep ploughing is done to uprooting parthenium and burring into the soil with its seed so that the crops able to grow up before parthenium infestation. Roundup and herbicides are used for different weed types such as couch grass, Bermuda grass and Cyprus grass whereas 2-4D is used for broad leaf weeds. High value crops like tomato, onion and potato require repeated hand weeding to keep the fields clean from any weed infestation. Use of chemicals for controlling weeds is not a common practice in the case of sorghum, maize, wheat, barley and sesame. In both districts, weed control practices is usually undertaken 2-3 times manually by hand. The most important weed species, time of weeding, weeding frequency and their management practices for AGP-II targeted crops are presented in Table 2 and 3 below.

### 4.5.2. Insect Pest Management Practices

The major insect pests prevailing in the study areas include stalk borer, grubs, aphid, army worm and grass hoper for sorghum and maize, shoot fly, grubs and grass hopper for wheat and barley and army worm for sesame. Similarly, the major insect pests for vegetable crops include tomato leaf minor (*Tuta absuluta*), aphid and white flies for tomato, thrips for onion, aphid and moth for potato. Mango is highly affected by thrips, midge, fruit fly and termite whereas aphid is known to be the major insect affecting banana in Erer district. Insecticides like DDT and MALATHION are applied on vegetable and fruit crops to control aphid, leaf minor (Tuta absuluta), white flies,

moth, spider mite, thrips, midge, fruit fly and termite. No insecticides used for controlling insect pests affecting cereal crops. Farmers use insecticides with two to four time of spray per season. In addition to insecticides, farmers in the area use traditional or cultural practices such as farm site cleaning, removing and burning the affected plant, burying into the soil and then apply urine for three days for controlling insect pests. Removing and burning of the affected plant is a common practice to control maize and sorghum stalk borer while burring into the soil is for grubs. Furthermore, farmers of the Dire Teyara district reported that cattle urine is used to control all cereal worms. The most important insect pests and their management practices for AGP-II targeted crops in table 2 and 3 below.

### 4.5.3. Disease Management Practices

Smut, leaf spot, root rot were found to be major diseases for sorghum and maize while rust was for wheat and barley. No diseases were reported on sesame. Similarly, powdery mildew, down mildew, early blight were reported for tomato while downy mildew and Purple blotch and Late and Early blight were found to be important diseases for onion and potato respectively. Vegetable and fruit diseases include Dieback, blight, powdery mildew and anthracnose for mango and white mold for banana. Furthermore, there are unidentified diseases locally called "Deyma and waab" affecting sorghum and maize. According to farmers in Erer Waldiya and Dire Teyara districts, they do not take control measure for disease on wheat and barley, but use DDT, MENCOZEB and MALATHION for sorghum, maize and mango and MENCOZEB for vegetable crops such as tomato, potato and onion. In addition to these, farmers in the area use different traditional or cultural practices such as cleaning farm site and removing and burning the affected parts of the plant. Moreover, farmers of the Erer district reported to use smoking and ash application to control blight, powdery mildew, Anthracnose for mango and white mold for banana. The most important diseases and their management practices for AGP-II targeted crops is presented in table 4 and 5 below.

**Table-4**. Major cereal and pulse crop pests of in Erer Waldiya and Dire Teyara districts

| No | Major Pest | Sorghum | Maize | Wheat | Barley | Sesame |
|---|---|---|---|---|---|---|
| **1** | **Weed** | *Striga hermonthica, Striga asiatica, Parthenium hysterophorus,* Amaranthus hybrida (pig weed), couch grass, Cocklebur, Common nettle(Anamale ) Oxalis (wanjalii), Cyprus (qunni), | *Striga hermonthica, Striga asiatica, Parthenium hysterophorus,* Amaranthus hybrida (pig weed), Couch grass, Cocklebur, Common nettle(Anamale ), Oxalis (wanjalii), Cyprus (qunni), | Amaranthus hybrida (pig weed), Couch grass, Cocklebur, Common nettle (Anamale ), Oxalis (wanjalii), Cyprus (qunni), | Amaranthus hybrida (pig weed), Couch grass, Cocklebur, Common nettle (Anamale ), Oxalis (wanjalii), Cyprus (qunni), | Amaranthus hybrida (pig weed), Couch grass, Cocklebur, Common nettle (Anamale ) |
| | Time of weeding | April-sept. | April-sept. | April-sept. | April-sept. | June – July |
| | Frequency of weeding | Three times(two times weeding plus one time cultivation) | Three times(two times weeding plus one time cultivation) | Three times(two times weeding plus one time cultivation) | Three times(two times weeding plus one time cultivation) | Three times(two times weeding plus one time cultivation) |
| **2** | **Insect** | Stalk borer , Grubs, Aphid , Army worm (Geri), grass hoper | Stalk borer , Grubs, Aphid, grass hoper | Shoot fly, Grubs, grass hoper | Grubs, Shoot fly, Grass hoper | Army worm (Geri) |
| | Management | Farm site cleaning, Removing and burning the affected plant by borer, Grubs is controlled by inverting weed in to underground the soil and then apply the urine after burying in the soil for three days, Insecticide (DDT, MALATHION) the last option | Farm site cleaning, Removing and burning the affected plant by borer, Grubs is controlled by inverting weed in to underground the soil Insecticide (DDT, MALATHION) the last option Cattle urine used for all worms | Cattle urine used for all worms | Cattle urine used for all worms | Cattle urine used for all worms |
| **3** | **Disease** | Smut, Leaf spot, Root rot | Leaf spot, Root rot | Rust | Rust | - |
| | Management | Removing and burning the affected plants DDT, MENCOZEB, MALATHION | Removing and burning the affected plants DDT, MENCOZEB, MALATHION | - | - | |

**Table-5.** Major vegetables and fruit crop pests of in Erer Waldiya and Dire Teyara districts

| No | Major Pest | Tomato | Onion | Potato | Mango | Banana |
|---|---|---|---|---|---|---|
| 1 | **Weed** | *Toma bashoo (Orobanche) Anamale(nettle) Orome (Amaranthus hybrida) Dhimbil (parthenium) Sardoo(Bermuda grass) Burana(couch grass)* | *Anamale(nettle) Orome (Amaranthus hybrida) Sardoo(Bermuda grass) Burana(couch grass Dhimbil (parthenium)* | *Anamale(nettle) Orome (Amaranthus hybrida) Sardoo(Bermuda grass) Burana(couch grass Dhimbil (parthenium)* | *Bakargate (Lantana camara)* | *Bakargate (Lantana camara)* |
| | Frequency of weeding | 2-3 times | 2-3 times | 2-3 times | Depend on weed occurrence | Depend on weed occurrence |
| 2 | **Insect** | *Aphid,* Leaf minor (Tuta absuluta) white flies, *Spider mite* | *Thrips* | *Aphid, Moth, Spider mite* | *Thrips Midge Fruit fly Termite* | *Aphid* |
| | Management | Site cleaning and removing affected part of the plants Insecticide (DDT, MALATHION) | Site cleaning Insecticide (DDT, MALATHION) | Site cleaning Insecticide (DDT, MALATHION) | Site cleaning and removing affected part of the plants Insecticide (DDT, MALATHION) | |
| 3 | **Disease** | *Powdery mildew, Down mildew, Early blight* | *Down mildew, Purple blotch* | *Late blight Early blight* | Die back *Blight powdery mildew* Anthracnose | white mold |
| | Management | Fungicide application (Mancozeb) | Fungicide application (Mancozeb) | Fungicide application (Mancozeb) Removing affected part of the plant | Smoking Application of ash DDT, MENCOZEB, MALATHION | Smoking |

## 4.5.4. Crop Production Constraints

Various production constraints were identified through the PRA study conducted in the two districts. The identified constraints were generally categorized into three categories as production related (such as Weed, Insects, disease rainfall, improved technology and soil infertility), Post harvest handling (threshing, harvesting, transporting, storage structure and) and market related (market access, market organization, credit access, input acquisitions) constraints. The major bottlenecks identified include lack of improved crop varieties, moisture stress, low soil fertility, deforestation, disease and insect pests, knowledge and skill gap on agronomic practices and soil fertility management, poor post harvest handling, low access to market and credit services Table 6.

**Table-6.** Matrix ranking for crop production constraints in district

| Crop production constraints | Erer Waldiya kebele | | Dire Teyara kebele |
|---|---|---|---|
| **Management related** | **Waldiya** | **Dodota** | **Dire** |
| Shortage of improved variety | 1st (5) | 2nd(4) | 3rd(3) |
| Insect and diseases | 4th (2) | 3rd(3) | 2nd(4) |
| Weed | 3rd (3) | 3rd(3) | 1st(5) |
| Moisture stress | 2nd (4) | 1st(5) | 2nd(4) |
| Poor Soil fertility | 6th (0) | 5th(2) | 4th(2) |
| Knowledge and skill gap | 5th (1) | 6th(1) | 5th(0) |
| **Post harvest related** | | | |
| Harvesting and threshing technique | 1st (3) | 1st (3) | 1st (3) |
| Transportation | 2nd (2) | 2nd (2) | 4th (0) |
| Storage | 3rd (1) | 3rd (1) | 2nd (2) |
| Processing (quality) | 4th (0) | 4th (0) | 3rd (1) |
| **Marketing related** | | | |
| Market access | 1st (4) | 1st (4) | 1st (4) |
| High price of inputs | 2nd (3) | 2nd (3) | 4th (1) |
| Credit access | 5th (0) | 5th (0) | 5th (0) |
| Market information: | 4th (1) | 4th (1) | 3rd (2) |
| Lack organized market | 3rd (2) | 3rd (2) | 2nd (3) |

**Note**: Figures in the parenthesis are the score values; numbers outside the parentheses are matrix ranking

# 6. Conclusions

Based on the information obtained from the PRA survey the following can be recommended to improve crop production in the area.

- There is a need to improve supply of improved seeds.
- Research on soil fertility and other agronomic management practices for the major crops of the districts are very important.
- Disease, insect and weed control technologies should be developed as the area is highly prone to crop and coffee diseases, insect pests and weed.
- Local and indigenous knowledge of farmers should be supported scientifically for better control of crop pests.
- Emphasis should be given for on-farm demonstration and popularization of improved crop production technologies.

# References

[1] Kassie, M., Zikhali, P., Manjur, K., and Edwards, S., 2009. *Adoption of sustainable agriculture practices: evidence from a semi-arid region of Ethiopia, natural resource Forum*. Wiley Online Library, pp. 189–198.

[2] Siyoum, A. D., 2012. *Broken promises food security interventions and rural livelihoods in ethiopia, disaster studies, wageningen university*. The Netherlands: Wageningen. p. 172.

[3] Canali, M. and Slaviero, F., 2010. "Food insecurity and risk management of smallholder farming systems in Ethiopia." In *9th European IFSA Symposium, 4-7 July 2010, Vienna (Austria).*