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Characterization and Analysis of Farming System in Chiro District, West Hararghe Zone

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Abstract
This study was conducted to identify and prioritize the production systems and major production constraints of Chiro district. The selection of the kebeles was done purposively based on the agro ecology. For the study, one PRA group in each kebeles was formed composed of male, female and youth group to collect primary data. The main methods used to gather the data were interviews with the district Agricultural office experts, Focused Group Discussions (FGDs) with selected farmers and reviewing of secondary data from different unpublished sources. Descriptive ways of analysis method were applied using SPSS version 20. The study was focused on major constraints of crop production, livestock production and natural resource production with respect to all factors of production. The study indicated that major constraints of agricultural production in the area are drought, soil erosion, lack of improved seed, invasive weeds, disease, insect-pests and inadequate feed resources, absence of improved breeds, poor animal health, labor shortages, lack of inputs and market opportunities.
Keywords: Farming system characterization, opportunities, constraints, PRA

1. Introduction

A farming system is the result of complex interactions among a number of inter-dependent components, where an individual farmer allocates certain quantities and qualities of four factors of production, namely land, labor, capital and management to which he has access (Mahapatra, 1994). "The household, its resources and the resource flows and interactions at the individual farm levels are together referred to as a farm system" (FAO, 2001). Farming systems research is considered a powerful tool for natural and human resource management in least developed countries such as Ethiopia. This is a multidisciplinary whole-farm approach and very effective in solving the problems of small and marginal farmers. The approach aims at increasing income and employment from small-holdings by integrating various farm enterprises and recycling crop residues and by-products within the farm itself (Behera and Mahapatra, 1999; Singh et al., 2006).

Ethiopian economy is predominantly rural and agricultural, and the declining trend in size of land holding poses a serious challenge to the sustainability and profitability of farming. The crop and cropping system based perspective of research needs to make way for farming systems based research conducted in a holistic manner for the sound management of available resources by small farmers (Jha, 2003). Under the gradual shrinking of land holding, it is necessary to integrate land based enterprises like fishery, poultry, duckery, apiary, field and horticultural crops, etc. within the bio-physical and socio-economic environment of the farmers to make farming more profitable and dependable (Behera et al., 2004). No single farm enterprise is likely to be able to sustain the small and marginal farmers without resorting to integrated farming systems (IFS) for the generation of adequate income and gainful employment year round (Mahapatra, 1992; 1994).

The present critical situation in the countries food supplies, especially in drought prone and food insecure areas demands that all available agricultural resources be utilized to the full to maximize food production through improved agronomy, better soil management and crop husbandry, the use of improved seeds and fertilizers, efficient use of water, effective weed control, effective crop protection and improved livestock husbandry practices.

To implement the above mentioned agricultural technology interventions, farming system study is very crucial and hence, improves agricultural technology interventions in the area. Past experiences show that most of the time technologies disseminated to the farmers did not bring the required change on the livelihood of the farming community. This is mainly due to lack of detail farming system analysis of the environment in which the technology are disseminated. Moreover, farmers` perspectives have been not adequately considered in the development and dissemination of technology to alleviate their problems. Therefore, conducting farming system study is very important to develop and disseminate appropriate agricultural technologies that fit to the environment, which is also important for further agricultural research and development intervention in the area.

1.1. Research Objectives

- To assess and identify the production systems of the study area and;
- To identify and prioritize major constraints agricultural production in the study area.

2. Methodology

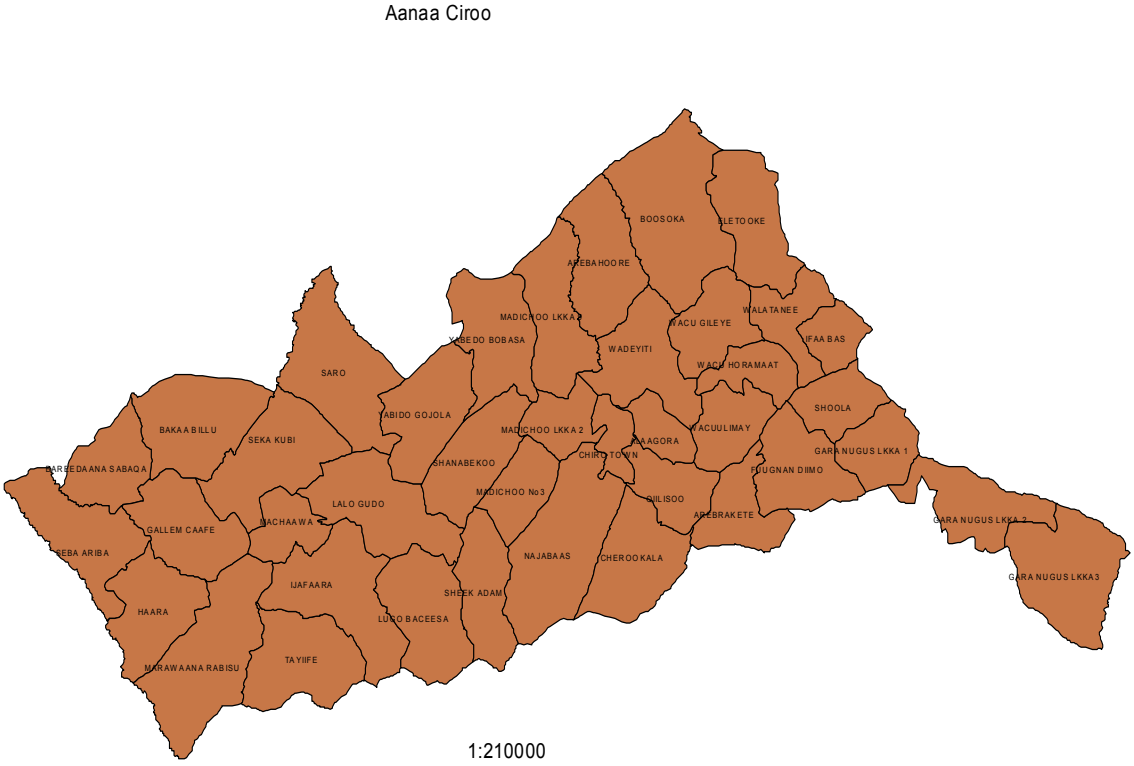
The activity was conducted in Chiro district. The selection of the kebeles was done with agricultural experts of

the district. Accordingly, three (3) kebeles (Arberekete, Medicho and Nejabas) were selected from the district. For the study, one PRA group in each kebeles was formed composed of male, female and youth group. The multidisciplinary team consisted of 6 members drawn from socio-economics, crop, livestock and natural resource at McARC was organized to conduct the Participatory Rural Appraisal. Prior to conducting the study, awareness on the checklists and PRA was created to the team members. The main methods used to collect both primary and secondary data were interviews with the district agricultural bureau experts, Focused Group Discussions (FDGs) with farmers and reviewing of secondary data from different unpublished documents.

2.1. Description of the study area

Chiro district is located in West Hararghe Zone of the Oromia National Regional state at about 324 km East of Finfine, the capital city of Oromia regional national state. The capital town of the district is Chiro, which is also the capital town of the Zone. Normally the district is divided into three major agro-ecological zones. These are Lowland with 22 kebeles, Midland with 13 kebeles and highland altitude with 4 kebeles. The district bordered with Miesso in the North, Gemmechis in the South, Guba-koricha in the West and Tulo in the East. Mixed farming, both crops and live stocks production, is the dominant practice in the district covering 98% and the rest is of pastoral production system with a share of 2%.

Fig.1: Political Map of Chiro district



The district is founded at an average altitude of 1800 m.a.s.l. From the total land area/topography of the district 45% is plain and 55% steep slope (data from Office of Agriculture and Rural Development of the district). The district is mainly characterized as steep slopes and mountains with rugged topography, which is highly vulnerable to erosion problems. It has a maximum and minimum temperature of 23 ºc and 12 ºc respectively and the maximum and minimum rainfall of 1800 mm and 900 mm respectively (2003 E.C data from Office of Agriculture of the district). Rainfall type is bimodal and erratic in nature. Main rainy season is from June to September for the highland and midland areas and from March to April for the lowland. Short rainy season is from March to May for highland and midland and for that of lowland around July. The amount of the rainfall is relatively adequate in the highland and midland than the lowland.

Soil type

In the district there are sandy soil, clay soil (black soil) and loamy soil types covering 25.5%, 32%, and 42.5% respectively according to 2003 E.C data from Office of Agriculture and Rural Development. The soil types vary with the topography mainly black soils are observed in the highland and midlands while one can see red soil in the lowland areas.

2.2. Socio Economic Setting

Population

The total number of population of the district is estimated to 184,705 out which 95,751 are male and 88,954 are female. Out the total number of population in the district about 30,579 are male household and 5363 are female household (2000E.C data from Office of Agriculture of the district). Average family size in the district is 3.9.

Infrastructure Development

The district has all weather gravel road that connects Chiro to Bedesa highway and asphalt road that connects Chiro to Miesso and Hirna. The problem of road is much serious during rainy season. Infrastructure development is relatively good than the remaining districts in the zone. Road development has a great role for the farming community for agricultural input supply and for supplying their product to the market.

Marketing and marketing systems

In Chiro district local markets exist at different small market place on different days within a week. The major marketable items supplied by the farmers are chat, coffee, groundnut, hot pepper, onion, banana, poultry, cattle and etc. Among these products like live animals, coffee, groundnut, hot pepper, and chat that are taken to Finfinne and Diredawa. Mainly the farmers sell their product to middlemen who latter sell to whole buyers in Baddesa, Chiro, Harar and Adama. The marketing decision on all items especially when it's in large quantity is the responsibility of household head.

However, there is general complaint that farmers have no bargaining power and traders fix a price that is not reasonably benefit able for farmers with regard to all commodities. This necessitates initiatives, which have already started, to organize farmers in to cooperatives.

The biggest problem however, is lack of market information. If they get a price of information that price of a crop is good this year the majority of will allocate most of their land and flood the local markets with produces which favors those blood trusty traders.

3. Results and Discussion

3.1. Farm resources of the district

Land

The total land area of the district is 70,912.8 hectare out of which 31659.1 hectare is cultivated land, 30667.4 hectare is uncultivated land, 8104.3 hectare is covered by forest, and 482 hectare is grazing land. Shortage of land is common in the district. Among the main reasons are the increasing population density at a very alarming rate and the land fragmentation due to high number of children in the household. The average land holding status in the area is 4 "qindi" (0.5 ha) & range lies between 2-6 *"qindi"* (0.25-0.75ha) where (8 *"qindi"* equals 1 hectare).

Land fragmentation also causes shortage of land in the area, which results in low yield, low income, shortage of grazing land, over cultivation of the land, which highly reduces the fertility of the land, and this causes deforestation in the area because farmers are looking for new land and as a result they deplete the forest. There are different measures taken by the farmers to offset the land shortage and increase production under conditions of land shortage. Those measures are use of fertilizers and improved seeds, compost and manure, crop rotation, share cropping locally called "Hirta", livestock rearing and accomplishing other non-farm activities like daily laborer, selling fire wood, petty trade, selling charcoal and the like as additional source of income. Farmers allocate fertile lands for crops like maize, chat and Teff while allocate infertile lands for sorghum. Land is owned by both female and male and has equal power in decision making on land resources.

Labor

The major source of labor for agricultural activities in the area is family labor with some hiring of labor in rare case. In the communities male accomplishes the major farm activities like land preparation, weeding, sowing, weeding, harvesting, threshing, storage, looking after live stock, marketing, etc while women engaged highly in reproductive activities like fire wood collection, cooking, caring for children and aged people, fetching water, washing clothes, etc and also involved in some productive activities like weeding, harvesting, threshing, transporting the harvested crops from the field to home, preparing threshing ground and to some extent in harvesting. Male children herd livestock and help their family on farm activities and female children participate in home activities in addition to learning.

There is seasonal labor shortage in the area. Labor shortage occurred during peak season of agricultural activities mainly in April, March, June, July, December, and January. During labor shortage there is a practice to overcome these shortage such as local labor arrangement; like "Debo" and labor exchange and there is labor hiring to some extent.

Farm implements

Major traditional farm implements used in the district include Shovel, Saw, hoe, "Moofara/", rake and there is no availability of improved farm implements/farm mechanization. Farmers mainly get these farm implements from local and district markets and sometimes made themselves

Agricultural production constraints

Table 1: Major problems identified by farmers in the district

Major problems	Rank
Drought	1
Land shortage	2
Lack of improved technologies	3
Diseases and pests	4
High price of fertilizer	5
Shortage of draught power	6
Feed shortage	7
Soil fertility decline	8
Cash shortage	9
Low price of agricultural products	10

Source: group discussion

3.2. Crop Production in the district

The production system in the area is predominantly rain fed. Based on the agro ecological classification, the sub-systems vary in such a way that in low land one finds livestock dominated type of production system and as one goes up to midlands and highlands cash and food crop based mixed production system. Among major crops grown in the district are sorghum, maize, teff, barley, wheat among cereal crops; haricot bean, pea, linseed among pulse and oil crops; chat and coffee among cash crops; potato, tomato, sweet potato, Garlic and onion among horticultural crops mainly in highland and midland area were irrigation potentials available. Sorghum, maize and sweet potato are mainly produced for food consumption while chat, onion, tomato and potato are produced and supplied to the market.

Sorghum is the first leading food crop produced in large amount in Chiro district. The reason for high production of this crop is; it is used both for human and animal consumption (stalk and leaf), for home fuel consumption and construction purpose, adaptable to weather condition of the area. Maize is the second major cereal crop produced next to sorghum mainly for household food consumption.

Table 2: Area coverage of different crops in the district

No.	Crop type	Area allocated in hectare	Total yield harvested (Qt)
1	**Major cereal crops**		
	Sorghum	9881	192,766
	Maize	5520	80,596
	Wheat	749	5988
	Teff	586.5	3520.5
	Barely	805	6440
2	**Pulse and oil crops**		
	Haricot bean	495	1039.5
	Ground nut	15	105
	Sesame	80	184
3	**Cash crops**		
	Coffee	1815	19,230
	Khat	2330	-
4	**Vegetable crops**		
	Onion	9884	65,554
	Banana	85	17,000
	Mango	17	680
	Papaya	13	1300
	Orange	5	120

Improved Varieties Used

Both local varieties in majority and improved to some extent are available in the area. Major problems with local cultivars are late maturing, susceptible to disease, low yield due to drought etc.

Table 3: Crop type, available local varieties, farmers' selection criteria and its sources

Crops type	Local name/varieties	Selection criteria for improved variety	Seed preservation methods	Improved varieties	Source of varieties
Sorghum	Shafare, Abdalloota, Gababe, Masugii, Wagare, Waraabe	Large head and seed size, disease resistant, drought tolerant, smut free, high yield, suitable for food, early maturity	Tied and hanged outside the resident room by mixing with hot pepper, Using chemical	Bombered, Calanqoo, Chiro	DAO, NGOs, Research centers
Maize	Bukuri (early maturing) Shashamane	Cob size and number, early maturity, seed uniformity		Nazirit, Katumani, BH-660	”
Haricot bean	Folodde(white), Sartu	High yield, demanded at market		Phosolia red and white, keniiyaa	”
Barley	Hifaato (late maturing)	High yield			”
Onion	Habasha			Qinijito, Fadiso, Bombered	”
Potato	Sargal, Mokkor”(late maturing)	High yield			”

Source: - group discussion

3.3. Cropping system and Agronomic practices in the area

The major cropping systems in the study area are intercropping, relay cropping, mixed cropping, and double cropping. Maize relayed with teff, haricot bean, chickpea, linseed, and fenugreek while intercropped with cash crops such as chat, coffee, haricot bean and with food crop sorghum. Teff is mixed with safflower, etc. Double cropping is also practiced in the area.

Table 4:- Land preparation and major crops production calendar

Crops	1st plowing	2nd plowing	Planting	Methods of planting / sowing	Seed covering methods
Maize	February	April	May	Row planting and Broadcasting	Oxen and hand
Sorghum `	February	March	April	Row planting and Broadcasting	Oxen and hand
Teff	May	June	July	Broadcasting	
Haricot Bean	April and March	May	June	Broadcasting- local Row– improved	Oxen and hand

Source: - Group discussion

In the communities land preparation is carried out dominantly by male group. Female also participate by helping male farmers by performing activities such as providing meal and water, feeding oxen at farm, clearing weed and crop residues from the land etc. Major problems encountered in land preparation were late starting of rainfall and lack of draught power and farm implements for plowing.

Weed and its control mechanism

Weed is among the top problems faced by the farmers in crop production in the district which hampered production and productivity of agricultural production?

Table 5:- Major weeds and control methods

Major Weeds	methods used to control	Frequency of weeding of major crops
Coach grass	-Hand weeding -Frequent plowing -Hoeing -Ploughing between row -Use of chemical(especially for Coach grass) in rare case because farmers can't afforded the price of chemical	Maize – 3 times
Bidenpilosa		Teff – 3 time
Perthinium*		Sorghum – 3-5 times
Striga*		Wheat and barley – once
Cynodundactylon		H. Bean- 2 times
“Walgabbis”		

Source: Group Discussion, * Shows very invasive weeds

Fertilizer and manure utilization

Fertilizer and manure are the most common inputs used by the farmers to increase crops productivity in the area. Fertilizer type available to the area are DAP and UREA. farmers use/apply DAP during planting while UREA applied at ploughing between row locally called "babeqa/shilshaaloo". Major crops receiving fertilizer in order of importance as suggested by farmers were sorghum(1), maize(2), onion(3), chat(4), wheat(5), barley(6).

Problems encountered by farmers in using fertilizer are high fertilizer price, rainfall shortage and inadequacy, lack of awareness of some farmers and unavailability at the right time and place. Manure collection, preparation /storing and application is also commonly practiced in the area. Manure is collected during dry season and applied mainly to; chat, sorghum, and maize. Problems related to manure preparation are low number of livestock possession especially in high and mid lands and lack of means of transporting from source to the field.

Harvesting, Threshing, Storage

In the district, farmers use traditional harvesting materials like Saw, and use oxen and hand for threshing. There is no improved harvesting and threshing technology available in the study area. Farmers have their own traditional knowledge of storing their products. There is no improved storage technology available in the study area. Storage types used by farmers are indicated in the table below as follows.

Table 6: storage types used farmers in the district

Storage type	Crop(s)	Duration
underground storage /"Boolla"	maize and sorghum	2-5 years depending on construction method of the ground
aboveground storage/"Gotera"	Maize, wheat, barley	1-2 years
Sack	Maize	-

The underground storages were treated with tobacco while mixing aboveground storage/"gotera" and sacks with hot pepper, exposing crops to the sun; tetracycline treatment to reduce the prevalence of storage pests. The major storage pests are rodents (rat) and weevil are prevalent on maize, sorghum, haricot bean, wheat and barley.

3.4. Crop diseases and Pests

Disease and pest is another problem of crop production in study area. These diseases attack crops mainly at the very beginning of germination, vegetative stage, at flowering stage and grain filling stage of the crops. Diseases and pests and crop(s) affected summarized in the tables bellow.

Table 7:- Major diseases and crops damaged

Disease	Attacked Crop(s)
Honey dew	Maize, sorghum
Smut	Sorghum
Cancer	Chat
Rust	Onion, potato

Source: - group discussion

Table 8:- Major Field pest and crop(s) attacked

Pests	Crop(s)	Control methods used by farmers
Stalk borer	Sorghum	Cutting stalk at vegetative stage, spraying DDT and Malathyne
Moulds	Khat	
Termite	Maize, sorghum	
Grass hopper	All crops	

Source: - Group Discussion

Finally, the major constraints of crop production identified are drought (lack of sufficient rainfall), diseases and pests, shortage/lack of improved (early maturing and drought tolerant) crop varieties.

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