Food Science and Quality Management
ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online)
Vol.74, 2018

Identification of Major Crop Production Constraints in Bena-Tsemay District, South Omo Zone, Southern Ethiopia

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Abstract
A survey was carried out during 2016 at Bena-Tsemay district, South Omo zone, SNNPRS, Ethiopia to identify the major crop production constraints. Before the inception of the study, the team made short meeting at JARC for the way of interview and given direction on the sampling method and the data to be collected. Then the whole multidisciplinary team was started the work by collecting secondary data from zonal and woreda respective offices. Discussion was made with woreda respective offices to get information with regard to the important preliminary conditions for the study such as selection of the representative kebele for the district, accessibility of the kebele's and the general background of the district. Primary data were collected through discussion between the disciplinary based sub-groups and the corresponding farmers' sub-groups. For the purpose of discussion, the farmers were grouped in to three interviewee sub-groups of plant breeders, agronomists and protection researchers each containing females, youths and male elders with proportionate number and participated in the discussion. The discussion was guided by the checklist prepared by multidisciplinary team at regional level and issues raised during discussion were incorporated. Visual observations were also made at farm level. Upon completion of the sub-group level discussion, information particularly agricultural production and production related constraints identified by each sub-groups of farmers were summarized together. Then, all informant farmers were gathered as one group and summarized series of constraints had been briefed to them and then they ranked the problems by consensus in order of their importance. Based on the study, in Benatsemay woreda there is no improved crop variety and package use, not used improved agronomic practice, serious disease and pests, no market institution, information, linkage, accessibility and weak processing of end product and lack of post-harvest handling and food processing technology on fruit, root and tuber crops.
Keywords: Major crop production constraints, Insect pests, Farming system.

1. INTRODUCTION

Agriculture is the most important determinant of the Southern Nations, Nationality and Peoples' Region's economy and it will continue to play the leading role in the overall economy development of the region. The livelihood of over 93 % of the people of the region dependent on it, however, agricultural system in the region is at subsistence level and food insecurity problem is increasing at alarming rate (FRE, 2009). Moreover, rapid natural resource degradation is prevalent.

The food insecurity problem is caused by complex of factors ranging from natural ones such as recurrent drought, degradation of natural resources, pest infestation to institutional one which includes population pressure, lack of appropriate technologies, weak institutional support and lack of alternative employment (Matous and P.Y.Tado, 2013). Therefore, there is a greater need to increase agricultural production and productivity, increase in supply of industrial raw materials and production of export products, maintenance and improvement and judicious use of natural resources. Though such a big goal is can be realized through coordinated efforts of various development institutes, the roles and contribution of the agricultural research and development institutes are believed to be irreplaceable and indispensable.

Over the last five decades, researchers and extensions have put much effort to generate improved agricultural production technologies and deliver to the users (Almekinders SJM and Elings A, 2001). Despite that several technologies have been developed, the conventional agricultural research and innovation pursued in the past has not been very successful to deliver appropriate technologies to the end users. As a result, very few technologies developed previously are adopted by the end users and a considerable number of technologies are shelved or kept in laboratory with out significant contribution to the objective they are designed for. This is due to several factors, of which the important once is usually the critical process by which information is collected at grass root level from farmers and pastoralists to understand their specific farming system, production practices and production problems and their technology need is ignored. A top-bottom approach that dominantly centered researchers/ professional attitudes has been followed since long time for both research planning and technology generation. The technologies generated in this way might not address the real problems of the farming community as they were users' demand-driven and hence the farming community would be passive recipient of the new technology. The research approaches have also been blamed for not targeting agro-ecologies and for disregarding the valuable indigenous technical knowledge's.

After the successful completion of AGP-1, AGP-2 has been started by adding additional components. One

of the components which added in the second phase was Agricultural Research with the general objective to increase the supply of demand driven agricultural technologies that directly link to the other components and specific objectives of Technology adaptation and generation, Pre-extension demonstration and participatory on-farm technology piloting through FRGs and Source technology production and Capacity development. For the successful completion of these objectives there should be need assessments in the respective AGP-2 mandated districts.

The five year program has been started in year 2015. During the first year of the program, two sets of assessments were planned to be conducted to inform detailed annual planning. The first focuses on needs assessment to identify organizational capacity gaps at national and regional levels to determine priority capacity building interventions to be supported through the research component and this is envisaged to ensure that the investments be demand driven. The second set of need assessment activities were focus on identification of agricultural production constraints at district level and this will serve as a basis for planning research activities to be implemented under technology adaptation and generation by the different research centers beginning from the second year of the program.

The assessment study is a take-off for the subsequent research and extension activities and meant to identify agro-ecology based agricultural production constraints and technology needs of the farming, agro-pastoral and pastoral community.

Therefore

- The objective of this assessment was to spell out the constraints of agricultural production and needs of technology using community level participatory planning (CLPP) approach in the selected woreda's of AGP-2 mandated districts.

With specific objectives of;

- To identify farmers' technology needs.
- To understand farmers' indigenous technical knowledge (ITK)
- To analyze and prioritize the major agricultural production problems
- To better understand and describe the existing conditions of the farming system, and production practices in the agro-ecology and avail information to researchers and development workers.

2. Material and Methods

2.1. The study Methodology and Procedures

Before the inception of the study, the team made short meeting at JARC for the way of interview and given direction on the sampling method and the data to be collected. Then the whole multidisciplinary team was started the work by collecting secondary data from zonal and woreda respective offices.

Discussion was made with woreda respective offices to get information with regard to the important preliminary conditions for the study such as selection of the representative kebele for the district, accessibility of the kebele's and the general background of the district.

Primary data were collected through discussion between the disciplinary based sub-groups and the corresponding farmers' sub-groups.

For the purpose of discussion, the farmers were grouped in to three interviewee sub-groups of plant breeders, agronomists and protection researchers each containing females, youths and male elders with proportionate number and participated in the discussion. The discussion was guided by the checklist prepared by multidisciplinary team at regional level and issues raised during discussion were incorporated. Visual observations were also made at farm level.

Upon completion of the sub-group level discussion, information particularly agricultural production and production related constraints identified by each sub-groups of farmers were summarized together. Then, all informant farmers were gathered as one group and summarized series of constraints had been briefed to them and then they ranked the problems by consensus in order of their importance.

Following the field study, disciplinary based data organization, analysis, and report writing were undertaken. Finally, the whole findings were produced in this report.

2.2. Sampling method (Sample size determination and cluster selection)

Sample size was estimated as the number of households required to ensure representativeness at the district level and to achieve the objective of assessing technology demand in the districts. Profiles were collected from Woreda offices, AGP-2 focal persons of the woreda, technical committee. Then the woreda was clustered in to respective administration and agro-ecology for the purpose of sampling. Based on this from the woreda 20% of the PA's were selected for the key informant interview. CLPP was based on target commodities by using cluster approach and the cluster districts.

In the selected PA's

- ✓ Office of the Agriculture with administration and PA manager selection of participants

on the discussion were identified and appointed.

- ✓ Key informants from elders, females and youths were then selected based on the PA population (about 20% of the population).

The study used 20% degree of variability, a 95% confidence level, five percent margin of error, based on the formula (Wilson *etal*, 1998);

$n= P(1-P)/\{A^2/Z^2 + P(1-P)/N\}/R$

Where; n = sample size required

N = number of people in the population

P = estimated variance in population (0.2 for 80-20)

A = Precision desired (i.e., 0.03, 0.05, 0.1 for 3%, 5%, 10%)

Z = Based on confidence level: 1.96 for 95% confidence,

R = Estimated Response rate

Therefore based on this from each district the sampled numbers are described below

Table 1. Study districts and PA's with sample number

District/woreda	Sampled PA	Total HH	Sampled HH
Debub Ari	6	4178	835

2.3. The study agro-ecology

This study was conducted in South Omo zone AGP-2 mandated woreda of Bena-Tsemay Woreda. Benna-Tsemay (Key Afer) is located at about 739 km from the capital city of Ethiopia, Addis Ababa with a total land area of 3,754 Km^2. Geographically, it is found at E 36^0 43' 30.1" Longitude and N 05^0 29' 57.1" latitude and at an altitudinal range of 1436-1553 masl. The maximum and minimum monthly average temperature of the area is 28.9 ^{0}c and 17.3 ^{0}c respectively with a total mean annual rainfall of 1167 mm. It is characterized by highly sloppy land features even more than 17 %. The woreda has a huge livestock population with 490,739 cattle, 174786 sheep, 443179 goats, 94,056 poultry, 29,240 donkeys and 249 camels.

The district is characterized by semi arid and arid climatic conditions. The rainfall is bimodal, with the long rain season from April to June and the small rains in September and October. In general, the study area has an erratic, variable rainfall and high ambient temperature ranging from 26-35ºC. The vegetation cover of the study area is a mixture of *Acacia*, *Boswellia* and *Commiphora* woody species and short grasses type with varying density of woody vegetation.

Identification of Major Crop Production Constraints in Benatsemay Woreda, Southern Ethiopia

1 Introduction

Objectives

- ✓ To identify the major crop production constraints in Benatsemay woreda
- ✓ To describe and understand the nature of the farming system, and production practices,
- ✓ To understand farmers/pastoralists indigenous technical knowledge,
- ✓ To identify farmers/pastoralists technology needs and to better understand the existing condition in the agro ecology and avail information to researchers and development workers.

2. The Study AreaAgro-ecology and Methodology

3. Major Crops Production, Farming Systems, Agronomic Practice/Cropping Pattern and Pests in Mid-Land Areas ofBenatsemay Woreda

3.1 Major crop Production in Mid-Land Areas of Benatsemay Woreda

The major crops grown in the mid land areas of Benatsemay woreda are cereals (maize, sorghum, teff and pearl millet), pulse and oils(common bean, pigeon pea, ground nut andsesame),root and tuber(sweet potato, cassava, taro, Irish potato and yam), fruits (banana, mango, avocado, papaya, kazmir and citrus),coffee and spices (coffee, and turmeric)and vegetables (cabbages, hot pepper,onion and tomato) in respective order of their total production and potential.

3.2 Farming System and Agronomic Practice/Cropping Patternin Mid-Land Areas of Benatsemay Woreda

The major cropping season in mid land areas of Benatsemay woreda are ;'Belg' and 'Mehere' farmers produce their major crops by rain fed and they have a little bite traditional irrigation practice for vegetables on dry 'bega' season. The major agronomic practice/cropping pattern/ ismixed cropping (sorghum with common bean) and mono cropping which is practiced deliberately but not in scientific manner.

In order to maintain soil fertility, they apply inorganic fertilizer practice on farm land which obtained from woreda agricultural office.Also they used fallowing to improved soil fertility purposely. Pulses (ground nut and common bean) are used in the cropping pattern as soil fertility improving crops.Seeds of major crops are

obtained from local market except maize and vegetables. Recently farmers used common bean improved variety seed.

Land preparation is mainly done by oxen and the frequency of tillage determined by crop type, soil type and oxen availability. Farmers planted they crops after two up to three frequency of tillage. Maize, ground nut and sweet potato are planted by row with recommended seed rate and the rest of major crops are planted by broadcasting with farmers seed rate.

3.3 Major Pests in the Mid-Land Areas of Benatsemay Woreda

Table 1: The major pests in the mid land areas Benatsemay woreda in terms of crop

No.	Crop type	Major Insect pest	Major Disease	Weeds
1	Maize	Stalk borer, termite, weevil, mole rat, rodents and grain midges	Maize Lethal Necrosis Disease(MLND)	-Amaranthus (hukuma), Commelinabenghalensis(aba ayele), Cyprus and Lantanacamara
2	Sorghum	Sorghum grain midges, aphid, bird, weevil and stalk borer	Head smut and anthracnose	
3	Finger millet	Locust, birds and rodents	Smut	
4	Teff	Leaf cutter and locust,	Rust	
5	Common bean	Pod worms	Common bacterial blight	
6	Pigeon pea	Grain midges		
7	Ground nut	White grub andmole rat		
8	Sesame	Aphid and mealy bug		
9	Enset	Mole rat	Enset bacterial wilt	
10	Sweet potato	Mole rat, white worm , cut worm and weevil		
11	Onion	Mole rat	Rusts and leaf blight	
12	Cabbages	Aphid		
13	Hot pepper		Bacterial wilt	
14	Tomato	Tomato fruit worm and birds	Blights	
15	Banana		Banana bacterial wilt	
16	Avocado	Fruit fly		
17	Mango	Fruit fly	Anthracnose	
18	Coffee	Coffee steam weevil	Coffee berry disease	

From the above mentionEnset Bacterial Wilt (EBW) on banana and enset, Maize Lethal Necrosis Disease (MLND) on maize and sorghum grain midges on sorghumare the most serious diseases in the study area. Insect pest like mole rat on root and tuber crops, weevil on storage product, termite and stalk borer on maize and fruit fly on mango are the most serious. The most serious weeds areamaranthus(hukuma), commelinabenghalensis(aba ayele), cyprus and lantana camara.

4. Major CropProduction, Farming Systems, Agronomic Practice/Cropping Pattern and Pests in Low-Land Areas ofBenatsemay Woreda

4.1 Major crop Production in Low-Land Areas ofBenatsemay Woreda

The major crops grown in the low land areas of Benatsemay woreda are cereals (sorghum, maize, pearl millet and teff), pulse and oils(common bean, sesame, cow pea, ground nut andsun flower),fibbers (cotton), root and tuber(sweet potato), fruits (mango, banana and lemon) and vegetables (onion, hot pepper, tomato, cabbages, pumpkin and moringa) in respective order of their total production and potential.

4.2 Farming System and Agronomic Practice/Cropping Pattern in Low Land Areas Benatsemay Woreda

The major cropping season in low-land areas of Benatsemay woreda are; 'Belg' and 'Mehere'.Except Enchete kebele pastoralists the total lowland Benatsemay kebeles pastoralists produce their major crops by rain fed. Enchete kebele pastoralists using Weito River which isgoes through different Kanals by gravitational force and finally it rich the farm land. The major agronomic practice/cropping pattern/ is mixed cropping (common bean with maize) and mono cropping which is practiced deliberately but not in scientific manner.

In order to maintain soil fertility, they apply organic fertilizers 'manure' on home garden and have a little biteinorganic fertilizer practice on farm land which obtained from woreda agricultural office.Also they used crop rotation and fallowing to improved soil fertility purposely. Pulses (ground nut and common bean) are used in the cropping pattern as soil fertility improving crops. Seeds of major crops are obtained from local market except

maize, sesame and vegetables. Recently farmers used common bean improved variety seed.

Land preparation is mainly done by oxen; the frequency of tillage determined by crop type, soil type and oxen availability. Almost all crops are planted after two up to three frequency of tillage. Maize, ground nut and sweet potato are planted by row with recommended seed rate and the rest of major crops are planted by broadcasting with farmers/pastoralist seed rate.

4.3 Major Pests in the Low- Land Areas of Benatsemay Woreda

Table 2: The major pests in the low- land areas Benatsemay woreda in terms of crop

No.	Crop type	Major Insect pest	Major Disease	Weeds
1	Maize	Stalk borer, termite grass hopper (locust) and weevil	Maize lethal necrosis disease(MLND)	Amaranthus (hukuma), Cyprus, Accathonspermumhispidum (mugr), Trbulusterrestris, Calotropis gigantean, Echinochloacolona and Withaniasomnifera
2	Sorghum	Stalk borer, weevil, birds, grass hopper (locust) and Sorghum grain midges	Anthracnose, smut	
3	Finger millet	Stalk borer and grain midges		
4	Common bean	Aphid and leaf cutter		
5	Ground nut	Weevil and white grubs		
6	Sesame	Seed bug, mealy bug, aphid and cricket	Bacterial wilt	
7	Cow pea	Grain midges		
8	Sun flower	Grain midges		
9	Cotton	Aphid, mealy bug, crickets and African boll worm		
10	Sweet potato	Sweet potato weevil, cut worm and white worms		
11	Cabbages	Aphid		
12	Tomato	Red spider mites and Bird	Blights	
13	Moringa	Aphid and cabbage looper		
14	Pumpkin	Grain midgesandsquash vine borer		

From the above mention Maize Lethal Necrosis Disease (MLND) on maize and bacterial wilt on sesame are the most serious diseases in the study area. Insect pest like mealy bug, crickets and aphid on sesame and cotton, seed bug on sesame,stalk borer on maize, sorghum and finger millet, sorghum grain midges on sorghum, red spider mites on tomato, weevil on storage product and fruit fly on mango and avocado are the most serious. The most serious weeds areamaranthus(hukuma), cyprus, accathonspermumhispidum(mugr), calotropis gigantean, echinochloacolona andwithaniasomnifera.

5. Harvesting Techniques

Major crops harvested manually by household members and social groups (debo, edir, 1 to 5 groups, etc). The harvested crops transported with donkey and human power and then stored at different storage system. Life span of stored crop is depends on crop type, availability pesticide and amount of producer. Maize is stored in gotera; sorghum and sesame in hip; haricot bean and ground nut after harvested they stalk on tree and ladder and then trashed after dry enough and stored in quintal.

6. Marketing Constraints

In Bena-Tsemay woreda, there is no market linkage, no market information and no accessibility in terms of road and alternative market. Also they produce not standardize quality due to lack of awareness, lack of market competition and accessibility.

In case of coffee growing mid land farmers/pastoralists have no market alternative except one private coffee processor and supplier. The market linkage is too weak and no market institution that attract the producer. So, a farmer does not return as their potential producer from the cash crop.The only credit access in most high land areas is Omo Micro Finance.

In the study areas there are number of governmental institution that serves the society. The major institution is kebele agricultural office, school, health post and micro finance. Pastoralists trained by extension agents on agricultural health and supported by different experts at different level of constraints they face.

7. Summery

In general, in Benatsemay woreda the major crop production constraints in terms of improved crop variety and package use, agronomic practice, disease and pests, processing and marketing:-

- ✓ Except maize, common bean and vegetables crop all other crops are grown by using local varieties.
- ✓ Not use improved agronomic practices (row planting, fallowing, crop rotation etc.) and also they not use inorganic fertilizer.

- ✓ Serious disease, insect and weeds on major crops
- ✓ No market institution, information, linkage, accessibility and weak processing of end product
- ✓ Lack of post-harvest handling and food processing technology on fruit, root and tuber crops.

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