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Assessment of Production Systems for Staple Food Crops (Maize, Wheat and Teff): The Case of Toke Kutaye and Ambo Districts, West Showa Zone, Oromia Regional State, Ethiopia

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ABSTRACT

The overall objective of the study was to investigate the production systems of staple food crops such as Maize, Teff and Wheat in specified study areas. The study used multi stage random sampling technique to select 180 potential respondents as sample size for the study. Both primary and secondary sources of data were used. Primary data was collected from sampled respondents using open-ended and close-ended questionnaires. The secondary data were collected from official documents and records. The study used both qualitative and quantitative methods of analysis in which narration, explanation and simple descriptive statistics were applied. This study found that crop rotation has been used by very majority of farmers. Maize mixed farming system is highly used among the major farming systems followed by high land mixed farming system. Planting methods, production and productivity were less although row planting method seems better than broad casting method of planting. There were no modern stores were used which consequently could result high loss of post-harvest. The threshing methods and threshing materials used were primitive and local type which causes losses during threshing. The finding recommends that mechanization of the sector or provision of sufficient farming oxen is indispensable. Further, modern technologies that help to increase the production and productivity of staple food crops and reduce post-harvest losses should be introduced.

Keywords: Staple crops, Production, Productivity, Methods

BACKGROUND OF THE STUDY

In Ethiopia, agriculture accounts for about 85% of the working forces, 90% of exports and 50% of the total gross domestic product (GDP). In the 1980s, the sector grew at only 0.1% per annum which is 2.9 percent below the rate of population growth, while rural unemployment increased, nutrition level declined and food aid imports increased, significantly. The series of African food crises in the seventies and eighties have led to sustained interest in the various factors that influence peasant food security. This in turn is due to some critical production and productivity problems. The roles of crop conditions, government policy and peasant access to economic resources have received particular attention [1].

Deepening food crises in several developing countries especially those in Sub-Saharan Africa (SSA) has increasingly become the concern of many researchers, planners, donors and international development agencies, who have given high priority to the study of food system and the critical problem of production, productivity and food security [2-5]. Per capita food production in SSA including Ethiopia has been declining over the last three decades. Despite the available resources and the efforts made by governments in SSA, agricultural production and productivity problems and food insecurity remained one of the most crucial issues.

The major causes for the slow growth rates of agriculture include various factors such as unfavorable climatic conditions, undeveloped infrastructures, inappropriate agricultural policies and predominantly traditional production systems [6-9]. Ethiopia turned from a food exporter into a food importer during the period 1955-1959 [8]. And it was not uncommon in 1960s and 1970s to speak of Ethiopia as having the potential to be the bread basket of the Middle East. It took two devastating famines for the “bread basket” argument to beat a reluctant retreat, and social analysts

are now awakening to the fact that the periodic disasters that engulf rural Ethiopia are not aberrations but rather dramatic manifestations of a disease that have been afflicting the country for centuries, and continue to do so at present [3].

Ethiopia lies within one of the most food insecure regions in the world, with a large number of its population living at subsistence levels and dependent on farm production highly vulnerable to severe draughts. The smallholder peasant sector is the most important agricultural sub sector in the country. Its emphasis is on food grain crops where considerable improvements of cultivation practices, management and marketing need to be realized. The production volume of food grain crops as well as the per capita food production has shown tremendous fluctuations throughout the 1980s thus resulting in sever food shortage in the country. The main reasons for these are stochastic shocks such as recurrent draught, lack of incentives for the small-scale food producers and poor extension services for the small peasant households [5].

The agricultural production, productivity and food insecurity problems of Ethiopia, the poorest country in the world, should be well known. Famines have occurred throughout the country's history. Moreover, the same source further explained that harvest failure often leads to losses of assets and a fall into poverty. When weather conditions affect food production, the country's food situation deteriorates quite rapidly entailing emergency external food aid imports. In the last two decades, this has happened several times. Over the last fifteen years, Ethiopia has imported food aid on average 700,000 metric tons per annum to cope with the food insecurity in the vulnerable region of the country (FDRE, 2001). This shows an increase in vulnerability and food insecurity as well as an increase in the number of people who are failing to enough food from domestic sources.

Related to critical problems of production, productivity and food insecurity is the level of nutritional deprivation, stunting and wasting of children less than 5 years of age, which is quite wide-spread in Ethiopia. According to the 2000 Demographic and Health Survey, 52% of children under age 5 are under weight (FDRE, 2001). Although food self-sufficiency has remained the stated goal of the Government of Ethiopia, the problem of food insecurity has continued to persist in the country. Many rural households have already lost their means of livelihood due to recurrent drought and crop failures [1].

Therefore, what is needed now is to comprehensively address determine the critical problem of agricultural production, agricultural productivity and food insecurity in the country. Hence, a study of this sort in addressing the critical problem has an important role at least in clearly identifying specific factors and the severity of the critical problems that pertain to the area. Physical access to sufficient food to lead a healthy and productive life is an arduous goal. Rural households are vulnerable to food insecurity not simply because they do not produce enough, but either they hold little in reserve or they usually have scant saving and few other possible sources of income to obtain adequate food to meet their daily subsistence food energy requirements [1].

In addition to the general identification of critical problems in agricultural production, agricultural productivity and food insecurity of the world, regional and country level, disaggregated information on the incidence of agricultural production, agricultural productivity and food insecurity is required both for proper policy design and adequately targeted interventions. This entails identification of different categories of the agricultural production, agricultural productivity and food insecure at the local and household level by sector of economic activity, occupational characteristics and social status by age and gender [7].

Despite some improvements in agricultural production in recent years, overall agricultural growth falls far short of the rapid population growth and food imports in the form of aid and to some extent commercial imports has become an important component of food supply in the country contributing on average about 6.4% of national food production between 1996 and 2010 [6]. Ethiopian agriculture is characterized by low productivity which is associated with low input usage such as improved seed varieties and fertilizer, significant post-harvest loss, population pressure, poor farming practices, and land degradation, among others.

The potential solutions, beside measures that would take population pressure off agriculture, lie in the promotion of agricultural innovations that would improve productivity, sustainably and efficiency of smallholder agriculture. Studies conducted in the country identify risk aversion behaviour [10-12]. Perception about new technology access to extension and advisory services; and access to credit [2]. As the major determinants of technology adoption, agricultural production and productivity.

In the study area even though there were a number of production and productivity and production systems problems, there were no such a survey undertaken. Production and productivity and production systems of the study area are not well known in both districts base on agricultural offices of the study areas. Especially regarding staple food

crops, to increase production and productivity, the production systems have to be studied, identified, prioritized, recorded and appropriate solution should be searched. Thus, the researchers initiated to study technology adoption problems focusing on production systems of staple food crops in case of Toke Kutaye and Ambo districts, west Showa zone, Oromia regional state, Ethiopia

Objectives of the study

The overall objective of the study was to investigate the production systems of staple food crops; specifically to assess the production systems of Maize, Teff and Wheat in the study areas.

Significance of the study

As agriculture is the core of the country's economy due to attention is given to the sector for the 2nd GTP of the Country. Further, the leading role of agricultural sector is expected to continue in Ethiopia. It can contribute much to the development improving productivity. Assessing the production systems of staple food crops in agriculture is mandatory to paving a way for searching appropriate solutions and there by developing necessary policy for short-term and long-term success of agriculture in economy.

In addition to its advantage for farmers, the study could provide some basic information needed by policy makers and institutions interested in designing programs and projects that are appropriate to the needs of boosting agricultural production and productivity. Development actors operating in the areas may also benefit from the result of the research so that they work to fill the gap existing between agricultural production and productivity actors bringing sustainable development. Moreover, it could be a source of knowledge for related researches.

METHODOLOGY OF THE STUDY

The study used multi stage random sampling technique. At first stage, from the existing districts in west Showa zone both Ambo and Toke Kutaye districts were purposively selected based on their relative importance with respect to staple food crops production potential and their accessibility. At the second stage, 6 peasant associations (PAs), 3 from each district were randomly selected randomly. At the third stage, probability proportional to size (PPS) technique was used to select 180 potential respondents for the study as indicated below in Table 1.

Table 1: Population of household heads and sampling Using PPS

No.	Name of PAs	Male	Female	Total	Sample
1	Kolba/Anchabi	502	53	555	30
2	A/Doyo	338	76	459	24
3	Boji/ Gebisa	352	69	421	22
4	Birbirsa	794	38	832	44
5	Toke/Mexi	55	487	542	28
6	Amarro	509	19	609	32
	Total	2212	666	3418	180

Both primary and secondary sources of data were used. Primary data was collected from sampled respondents using open-ended and close-ended questionnaires. Questionnaires were used to collect primary data from smallholder farmers. The secondary data were collected from official document and records related to the case under the study as well as unpublished documents such as journals and internet sources. Further, growers and staff of the ministry of agriculture, agricultural research center and rural development offices were interviewed to gather secondary data.

The study used 18 enumerators, 3 from each PA, who have at least diploma in field of agriculture from agriculture and rural development offices of both districts for data collection. These enumerators were trained on how to conduct a survey and gather relevant data from sampled respondents. Before launching the survey, questionnaire was translated into local language in which respondents able to understand. Moreover, pilot survey was conducted to test appropriateness of the questionnaires. Thereafter, tested questionnaires were distributed and collected by enumerators.

Data analysis takes next step after relevant data collection. Accordingly, the study used both qualitative and quantitative methods of analysis. Techniques of narration and explanation were used for analysis of qualitative data while simple descriptive statistic methods such as mean, standard deviation, percentage, minimum, maximum, and average were used for analysis of quantitative data. Further, tables and charts were used to analyze both collected qualitative and quantitative data.

DATA ANALYSIS AND DISCUSSION

Respondents characteristics

Table 2 specified that 153 (85%) and 27 (15%) of the respondents were found to be male households respectively. This implies that the majority of the respondents were male households.

It can be seen that respondents with no education were found to be 65 (36.1%) while 77 (42.8%), 23 (12.8%), 10 (5.55%), 4 (2.22%) and 1 (0.55%) of them were elementary school complete, junior secondary school complete, secondary school complete, college diploma, and university degree and above, respectively. This shows that the majority of the respondents were elementary school complete and illiterate.

Table 2: Sex and education level of farmers

S/N	Variables	Observation	%age
Sex			
1	Male	153	85
2	Female	27	15
Educational Level			
1	No Education	65	36.14
2	Elementary School Complete	77	42.77
3	Junior Secondary School Complete	23	12.77
4	Secondary School Complete	10	5.55
5	College Diploma	4	2.22
6	University Degree and Above	1	0.55
	Total	180	100

Land ploughed, production and productivity

When land ploughed for maize was 95 hectares, 2672 quintals were produced and productivity was 28 quintals per hectare. Land plowed for Wheat was 151 hectares when 2866 quintals were produced and productivity was 19quintals per hectare. For Teff, 267 hectares of land were plowed, 2937 quintals were produced and productivity of the crop was found to be 11 quintals per hectare preceding the survey. These were considering the general farming practices of the area. The productivity of the three staple food crops was found to be less and the production was also small. Similarly, Yared [11] stated that the series of African food crises in the seventies and eighties have led to sustained interest in the various factors that influence peasant food security due to some critical production and productivity problems as shown in Table 3.

Table 3: Amount of land ploughed, production and productivity of the crops

S/N	Description	Land ploughed	Production	Productivity
1	Maize	95 hectares	2672 quintals	28 quintals
2	Wheat	151 hectares	2866 quintals	19 quintals
3	Teff	267 hectares	2937 quintals	11 quintals

	Total	519	8584	

Crop rotation and methods of planting

It is easy to notice the majority of small farmers, 173 (96%), were practiced crop rotation. But, only 7 (4%) of them were not practiced crop rotation. This indicates as crop rotation has highly practiced by farmers in the study areas. As showed in Table 4, Maize found to be the most row planting crop in the study area. 174 (97%) of household heads were used row planting method while only 6 (3%) of them were used broad casting method of planting. Wheat is the second row planted crop in the study area as of 23 (13%) respondents agreed in usage of row planting method. The rest 157 (87%) of farmers used broadcasting method of planting. All of household heads were planted Teff by broadcasting method of planting.

Table 4: Crop rotation practice and planting methods used

Crop Rotation Practice					
No.	**Description**	**Practicing Crop Rotation**	**% age**	**Not Practicing Crop Rotation**	**% age**
	Crop Rotation Practices	173	96	7	4
Planting Methods Used					
No.	**Types of crop**	**Row planting**	**% age**	**Broad casting**	**% age**
1	Maize	174	96.6	6	3.4
2	Wheat	23	12.7	157	87.3
	Total	0	0	180	100

It is presented in Table 5 that 101 hectares of land was planted in row with which farmers were able to produce 2828 quintals and 28 quintals per hectare were productivity. 418 hectares were planted in broad casting by which 5756 quintals were produced and 13.7 quintals per hectare were productivity. This implies that in both cases of planting methods, production and productivity of the area were less although row planting method seems better than broad casting method of planting.

Table 5: Land ploughed production and productivity under different methods of planting

S/N	**Method of Planting**	**Land Ploughed**	**Production**	**Productivity**	**Average**
1	Row	101 hectares	2828 quintals	28 quintals	
2	Broad casting	418 hectares	5756 quintals	13.77 quintals	
	Total	519	8584		20.88

Kind *of stores*

As of Table 6, the types of store used were Sack (46%), Mud Bricks, Gumbii in local language, (21.7%), Mud Bricks and Sack (16.7%), Local Wooden stores (11.1%), Wooden Local store and Sack (3.4%), Local Wooden store and Mud Bricks (1.1%) in their order of importance. This indicates that as there was no modern stores were used which consequently could result high loss of post-harvest in the study areas although Bekele and Drake [2] discussed as technology adoption is the major determinants.

Table 6: Kind of stores used in the production systems

S/N	**Type of Store Used**	**No. of Farmers**	**%age**
1	Sack	83	46

2	Mud bricks	39	21.7
3	Mud bricks and sack	30	16.7
4	Wooden local store	20	11.1
5	Sack and wooden local store	6	3.4
6	Mud bricks local store	2	1.1
	Total	180	100

Threshing methods

Threshing methods used in the study areas were found to be by Oxen and by Human as 84 (46.7%) of respondents agreed while by Oxen and by Stick and Oxen as 78 (43.3%) and 10 (10%) of farmers said respectively in Table 7. This indicates that the threshing methods and threshing materials used were primitive and local type which causes losses during threshing. Mohamed [9] also indicated as one of the major causes for the slow growth rates of Ethiopian agriculture is predominantly traditional production systems.

Table 7: Threshing methods used in the production systems

S/N	Type of Store Used	No. of Farmers	%age
1	Sack	83	46
2	Mud bricks	39	21.7
3	Mud bricks and sack	30	16.7
4	Wooden local store	20	11.1
5	Sack and wooden local store	6	3.4
6	Mud bricks local store	2	1.1
	Total	180	100

Major farming systems

As depicted in Table 8, the major farming systems of the study areas were found to be maize mixed farming system, high land pernal farming system, agro-pastoral farming system, high land farming system, irrigated farming system and urban and peri-urban farming systems from top to down rank as 63 (35%), 54 (30%), 27 (15%), 18 (10%), 9 (5%) and 9 (5%) of farmers responded respectively. This finding shows that maize mixed farming system is highly used among the major farming systems followed by high land mixed farming system.

Table 8: Major farming systems used

S/N	Major Farming Systems	Observation	%Age
1	Maize Mixed Farming System	63	35
2	Agro-Pastoral Farming System	27	15
3	High Land Pernal Farming System	18	10
4	High Land Mixed Farming System	54	30
5	Irrigated Farming System	9	5
6	Urban And Peri-Urban Farming System	9	5

	Total	180	100

CONCLUSION AND RECOMMENDATION

Conclusion

This study assessed the production systems of staple crops such as Maize, Wheat and Teff in the specified area. The finding shows that the productivity of the three staple food crops was found to be less and the production was also small. Crop rotation has highly practiced by farmers in the study areas as many of farmers agreed. Majority of farmers producing Wheat and Teff were using broad casting planting method while Maize producing farmers were using row planting method. Planting methods, production and productivity of the area were less although row planting method seems better than broad casting method of planting.

Commonly farmers were using sacks and mud bricks to store their crops. This indicates that as there was no modern stores were used which consequently could result high loss of post-harvest to the areas. Majority of farmers were using human and oxen threshing methods in their production system. This indicates that the threshing methods and threshing materials used were primitive and local type which causes losses during threshing. Further, this finding shows that maize mixed farming system is highly used among the major farming systems followed by high land mixed farming system.

Recommendation

Majority of the farming households were owned less number of farming oxen, without which growth and development in the sector is difficult. Thus, mechanization of the sector or provision of sufficient farming oxen is indispensable. Provision of rural education programs are required since the study identified that less than half of the farming households in the study areas were with no education or and elementary school education level. Modern technologies that help to increase the production and productivity of staple food crops and reduce post-harvest losses should be introduced by the concerning bodies of agricultural offices to the study areas.

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