

Major Pulse and Oil Crops Production in South Omo Zone Southern Ethiopia

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ABSTRACT

Increasing agricultural production and productivity of one's country requires fostering the linkage between the agricultural and non-agricultural sectors that are growing in agriculture does not occur without non-agricultural sectors. The major pulse and oil crops production and productivity in the South Omo Zone is very low in relation to the land coverage due to poor improved agricultural technology utilization and low skill on-farm management practices by producers. To solve the major pulse and oil crops production and productivity problems, strong farmers training centers and research extension system are important. The study was conducted in major pulse and oil crop producing districts of South Omo Zone like Dehub Ari, Malle, Bena-Tsemay, Hammer, and Dasenech Districts of South Omo Zone. The major pulse and oil crops grown in the area are haricot bean, field pea, mug bean, ground net, sesame, and sunflower.

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Introduction

Agriculture is considered as one of the strong option and fundamental instrument for spurring economic growth and sustainable development, poverty reduction, and a tool for enhancing food security in developing countries like Ethiopia. Agriculture employs more than 65% of Africa's productive labor force and the sector has been identified as the main source of income for most rural households in Africa [1]. Africa in general and Sub-Saharan African countries in particular ranks high in the world in terms of the proportion of people living in severe poverty, and agriculture has been identified as one of the main potentials for reducing poverty and promoting economic growth and development in the region. There is the need to improve the production and productivity of the sector at national level for it to have higher impacts on the aggregate economic indicators and ultimately to reduce poverty [2].

Ethiopia is among one of the countries having a rising economies in sub-Saharan Africa with a median GDP increase rate of 8.3% consistent with the annum and the agricultural sector has been a dominant contributor having a median of 45.4% to the overall GDP within 2002 and 2011 [3]. Agriculture is the most component and driver of Ethiopia's development and enhances long-term food security. The contributions are very high: 15 to 17 percent of the Government of the Ethiopia's expenditures is committed to agriculture. Agriculture directly employs more than 80 percent of the total population, 43 percent of gross domestic product (GDP), and over 70 percent of the country foreign export value [4].

These include the agriculture's contributions to socio-economic development through income generation, food security, household livelihoods, poverty alleviation, gender empowerment, and environmental sustainability in the country. Particularly in Ethiopia, smallholder farmers cultivate approximately 95 percent of the total area cultivated and produce more than 95 percent of the total agricultural product. The major part of the sector consists of small land holder farmers operating on less than 2 hectares of land. On the other hand, the production and productivity of the sector was and is almost stagnating over the last decades [5-7].

Agriculture is one of the most important sectors for Southern Nation Nationality and Peoples' Regional State of Ethiopia's economy and it will continue to play a very important role in the overall economic development of the region. However, the agricultural production system in the region is still at its subsistence level. The livelihood of over 93% of the people of the region depends on it, level and food insecurity problems are increasing at a shocking rate. Moreover, rapid natural resource degradation is prevalent [8]. Also, Agricultural production activities in the country as a whole and in regions, in particular, have been taking place under widely varying dynamic bio-physical and climatic contexts such as physio-graphic, agro ecology, climate change and variability, and soil conditions. The success in the agricultural production sector is then strongly influenced by many factors such as topographic settings, degree of human interference, and underlying biophysical features [7, 9].

The food insecurity problems occurring consecutively in Ethiopia in general and South region in particular caused by complex factors

ranging from natural ones such as recurrent drought, degradation of natural resources, lack of appropriate agricultural technologies, weak institutional linkage and support, and lack of alternative employment. Also, the farmer's cultivation practices brought disturbances to the ecosystems particularly on soils by disrupting the entire stable natural and biochemical processes of the nutrient cycle, causing rapid nutrient depletion in the soil and attributing to changes in the landscape characteristics [10-13].

Six major pulse and oil crops (haricot bean, field pea, mug bean, ground net, sesame, and sun flower) contributing the major part of crop production in Southern Ethiopia in general and South Omo Zone in particular. Other important crops grown in the Zone, like cereal crops, root and tubers, fruits, and vegetables play their great role in food security in the area. Oil crops like Sesame, ground net, and Sunflower are an important source of cash income for the households. So; this research focuses on the production of major pulse and oil crops in South Omo Zone, Southern Ethiopia. It was conducted in two agro-pastoralists, two pastoralists and one agricultural farming system based, such as; (Malle, Bena-Tsemay, Hammer, Dasenech, and Debub Ari,) of the Zone with the following objectives: (1). To assess the area coverage production and productivity of major pulse and oil crops (2). To identify the major disease and insect pest of the major pulse and oil crops (3). To identify mechanisms that farmers used in the study area to control disease and insect pest of major pulse and oil crops.

Methodology

South Omo Zone is one of the administrative Zones found in Southern Nations, Nationalities, and People's Regional State in Ethiopia. The Zone is found in southern part of the region in Ethiopia and is located at 4°27'-6°26' north and 34°57'-37°49' east and bordering with Gamo, Gofa and Keffa zones; Kanta and Besketo special districts to the north; Konso Zone and Derashe special districts to the east; Borana Zone to the southeast; Kenya to the south; Sudan to the southwest, and Mirab Omo Zone to the west. The Zone covers a total area of about 22,360.76 km² and its altitude which ranges from 380 to 3,300 m.a.s.l [14].

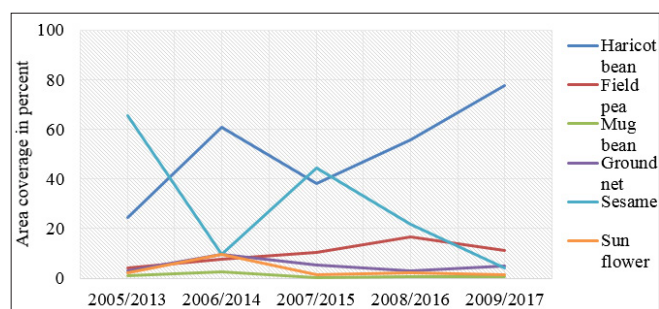
This study was conducted in Five Districts (Malle, Bena-Tsemay, Hammer, Dasenech and Debub Ari,) of South Omo Zone. These five districts were selected purposively from the Zone based on crop production experience among eight districts found in the Zone. From these eight districts one agrarian from two agrarian districts and two pastoralist districts from four pastoralist districts were selected by probability sampling respectively, whereas the two agro-pastoralist districts were taken as they are purposively because there are only two agro-pastoral districts in the Zone. The study was conducted and handled by agricultural economics and gender issue researcher of Jinka Agricultural Research Center. Before starting the study, agricultural economics and gender issue researchers' team made short discussion on the preparation of checklist that helps to cover the study areas in accordance with the objective of the study.

Based on the checklist prepared in collaboration with each district Agricultural and natural resource management office data were collected from zonal and districts key informant interview and previously sesame production and marketing related documented hard and soft copy materials found in each office with the help of crop extension and protection experts of the Zonal and district offices from the year 2005-2009 Ethiopian calendar or 2013-2017 Gregorian calendar onwards.

Results and Discussion

Trends of Major Pulse and Oil Crops Area Coverage

The majority of producer farmers in Ethiopia in general and in the study area in particular are smallholder farms. These farms, having though small landholding is often fragmented, produce mostly for own consumption and generate only a small marketed surplus. From the total of 12.4 million hectares of farmland in Ethiopia, among this farm land the majority is used for production of cereals (9.16 million hectares); a relatively small amount of area is seeded to pulses (1.41 million hectares). The oil seeds production sector is one of the fastest growing sectors; which is the second export and incoming earning sector, which of over three million small, medium and large scale Ethiopians are involved. Among the major pulse crops haricot bran accounts largest acreage followed by field pea and mug bean, while among the major oil crops, sesame accounts for the largest acreage followed by sun flower and ground net. Fig 1 below shows the percentage of area coverage under major pulse and oil crops in five consecutive years 2005-2009 Ethiopian calendar or 2013-2017 Gregorian calendar [15-18].



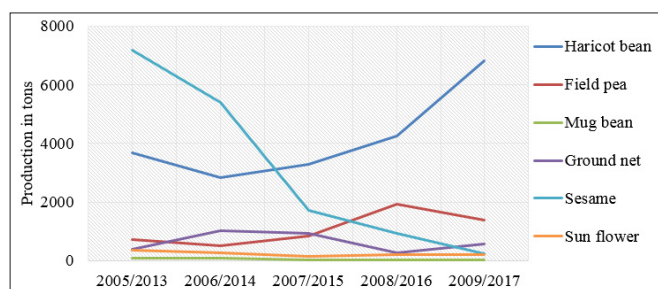
Source: Woreda and Zonal Agriculture and Natural Resource Management Office, 2021

As shown in Fig 1 above, out of the total area under major pulse and oil crops in the year 2005/2013, the area under haricot bean, field pea, mug bean, ground net, sesame and sun flower were 24.42%, 4.12%, 0.9%, 3.03%, 65.44% and 2.02% respectively. In 2006/2014 the area of haricot bean, field pea, mug bean, ground net and sun flower increased to 60.96%, 7.55%, 2.39%, 9.7 and 9.7, while the area of sesame declines to 9.7% respectively. In 2007/2015 the area of haricot bean, mug bean, ground net and sun flower declines to 38.04%, 0.32%, 5.16% and 1.49% while the area of field pea and sesame increased to 10.49% and 44.5% respectively. From 2008/2016-2009/2017 the area under haricot bean and ground net increased from 55.71% to 77.6% and 2.88% to 4.91%, while the area under field pea, mug bean, sesame and sun flower declined from 16.77% to 11.33%, 0.71% to 0.68, 21.86% to 4.08% and 2.07% to 1.4% respectively.

Trends in the Production of Major Pulse and Oil Crops

The production of grain legume crops is highly concentrated in the Oromia and Amhara regions in Ethiopia in which the two regions together account for 92% of chickpea production, 85% of faba bean production, 79% of haricot bean production, and 79% of field pea production [19]. Amhara and Oromia regions alone produce 83.17% of total grain legumes [20]. During the last 11 years, Oromia region has been the largest producer of faba beans, field peas and haricot bean among pulse crops in Ethiopia, whereas Amhara region is the leading region in Ethiopia to produce chickpeas, lentils and fenugreek. Next to Oromia region, SNNPR is the largest haricot beans producer in Ethiopia. Oilseeds production plays a significant role to improve the lives of the Ethiopian agrarian community and stakeholders in the national economy in Ethiopia. Fig 2 below shows the production of major

pulse and oil crops in the study area from 2005-2009 Ethiopian calendar or 2013-2017 Gregorian calendar.

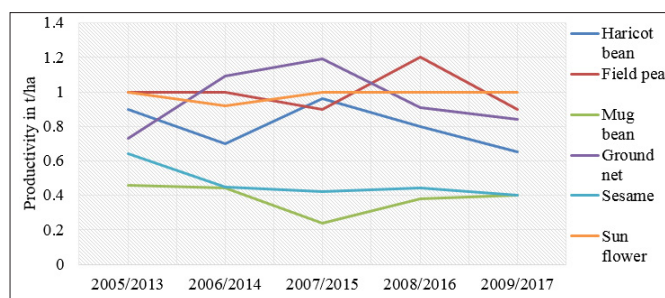


Source: Woreda and Zonal Agriculture and Natural Resource Management Office, 2021

As shown in Fig 2 above the production of major pulse and oil crops haricot bean, field pea, mug bean, ground net, sesame and sun flower were 3669.8 tons, 710 tons, 76.3 tons, 382.28 tons, 7187.91 tons and 348.8 tons respectively in 2005/2013. In 2006/2014 only the production of ground net increased to 1023.43 tons, while the production of haricot bean, field pea, mug bean, and sesame and sun flower declined to 2825.27 tons, 500.81 tons, 69.25 tons, 5396.86 tons and 277.4 tons respectively. In 2007/2015 the production of mug bean, ground net, sesame and sun flower declined to 6.85 tons, 934.37 tons, 1702.92 tons and 134.5 tons, while the production of haricot bean and field pea were increased to 3299.59 tons and 851.4 tons respectively. From 2008/2016-2009/2017 the production of haricot bean, mug bean and ground net increased from 4250.62 tons to 6831.28 tons, 25.88 tons to 37.0 tons and 250.71 tons to 559.65 tons, while the production of field pea, sesame and sun flower declined from 1920 tons to 1387.8 tons, 919.64 tons to 223.49 tons and 197.88 tons to 192.5 tons respectively.

Trends in the Productivity of Major Pulse and Oil Crops

Grain legumes are, thus, critical to smallholder livelihoods in Ethiopia. However, the current production and productivity of legumes falls significantly below the potential. For instance, the productivity of legumes crops varies between regions and countries in the world, in which Canada is producing over 2 tons per hectare on average and most of the African and South Asian countries have an average yield of less than 0.5 tons per hectare from 2011–2013. However, Ethiopia stands as an exception with yields of close to 1.5 tons per hectare. The productivity of oil crops have been decreasing due to dramatic decline in the area of land under oil seeds cultivation and to lesser degree due to decrease in the productivity of land. Fig 3 below shows the major pulse and oil crops productivity in the study area from 2005-2009 Ethiopian calendar or 2013-2017 Gregorian calendar [19- 23].



Source: Woreda and Zonal Agriculture and Natural Resource Management Office, 2021

As shown in Fig 3 above the productivity of major pulse and oil haricot bean, field pea, mug bean, ground net, sesame and sun flower 0.9t ha⁻¹, 1.04t ha⁻¹, 0.461t ha⁻¹, 0.73t ha⁻¹, 0.64t ha⁻¹ and 1.0t ha⁻¹ respectively in 2005/2013. In 2006/2014 only the productivity of ground net increased to 1.09t ha⁻¹ and the productivity of field pea is constant, but the productivity of haricot bean, mug pea, and sesame and sun flower declined to 0.7t ha⁻¹, 0.44t ha⁻¹, 0.45t ha⁻¹ and 0.92t ha⁻¹. In 2007/2015 the productivity of haricot bean, ground net and sun flower increased to 0.96t ha⁻¹, 1.19t ha⁻¹ and 1.0t ha⁻¹ while the productivity of field pea, mug bean and sesame declined to 0.9t ha⁻¹, 0.24t ha⁻¹ and 0.42t ha⁻¹ respectively. From 2008/2016-2009/2017 only the productivity of mug bean increased from 0.38t ha⁻¹ to 0.4t ha⁻¹ while the productivity of haricot bean, field pea, ground net and sesame declined from 0.8t ha⁻¹ to 0.65t ha⁻¹, 1.2t ha⁻¹ to 0.9t ha⁻¹, 0.91t ha⁻¹ to 0.84t ha⁻¹ and 0.44t ha⁻¹ to 0.4t ha⁻¹ respectively, but the productivity of sun flower is 1.0t ha⁻¹ that remains constant.

Source and Utilization of Inputs for Major Pulse and Oil Crops

The market demand estimation for agricultural inputs in Ethiopia are based entirely on official projections that are developed at the lower (kebele) level and then pass through the official channels to the Zonal and Regional levels, after aggregated nationally to produce estimates of the type and total quantity (but not preferences for specific varieties or traits) of seed that needs to be supplied to the farmers in the coming season [24]. Yet, shortcomings in seed quality, quantity and timeliness of delivery have been the main issues in Ethiopia. Low seed qualities such as poor cleaning, broken seeds, low germination rates, and the presence of mixed seeds have been reported in ESE-supplied seed. In addition, seeds being distributed after the optimal planting time or of varieties being distributed that are not appropriate to changes in farmers' expectations of seasonal weather conditions at the local level are commonly reported. Table 1 below indicates, in the study area producers' uses the well-known inputs like seed and fertilizer in which some of the seeds they utilize were from government source and majority of the seed were from local or farmers themselves. Most of the time they use improved seed for pulse and oil crops like haricot bean and sesame [25- 27].

Table 1: Inputs used to increase production and productivity

Type of Crop	Name of Crop	Type of Seed	Name of Variety	Seed Source	Fertilizer Used in (Kg)	
					NPS	Urea
Pulse Crops	Haricot bean	Improved	Nassir	Gov't	No	No
	Field Pea	Local	Local	Farmers	No	No
	Mug bean	Local	Local	Farmers	No	No
Oil Crops	sesame	Improved	Humera	Gov't	50	50
	Sun flower	Local	Local	Farmers	No	No
	Ground nut	Local	Local	Farmers	No	No

Source: Woreda and Zonal Agriculture and Natural Resource Management Office, 2021

Supply of chemical fertilizer is a more obvious private good than seed, also the stages are complicate during the market development. On the demand side, the cost fertilizer is high where final consumers are widely dispersed geographically, or they are small landholder farmers and have limited cash resources mean that they purchase only small quantities of fertilizer that are more costly for retailers to sell. Furthermore, in rain fed areas, fertilizer consumption is highly seasonal (a two to three month market window), and year-to-year fluctuations in rainfall patterns contribute to high intra and inter year variability that reduces the demand of fertilizer, with corresponding risks to dealers of high carryover stocks from year to year. Most of the time they use fertilizer for oil crop like sesame which is below recommended rate [28-31].

Diseases and Pests of Major Pulse and Oil Crops and Their Controlling Methods

Major pulse and oil crops production and productivity are mainly affected by biotic factors. Among the biotic factors affecting agricultural production and productivity are endemic diseases and insects pests which result in huge losses of yield are common problems in pulse and oil crops. Diseases and insect pests attacking pulses and oil crops under field and storage conditions have been identified in table 2 below. Diseases and insect pests affecting the major pulse and oil crops are Leaf miner, Pod borer, Pizzeria and Root Root for haricot bean, Leaf rust and Pod borer for field pea, Leaf miner, Pod borer, Pizzeria, Root Root for mug bean, Mile Bug, Sting bug, Green bug and Cricket for sesame, Fruit fly for sun flower and Root rot and mole rate for ground net respectively.

Table 2: Disease and pests of major pulse and oil crops and their controlling methods

Type of crop	Name of crop	Diseases/pests affecting them	Controlling methods
Pulse Crops	Haricot bean	Leaf miner, Pod borer, Pizzeria and Root Root	Mechanical and chemical
	Field Pea	Leaf rust and Pod borer	Mechanical and chemical
	Mug bean	Leaf miner, Pod borer, Pizzeria, Root Root	Mechanical and chemical
Oil Crops	sesame	Mile Bug, Sting bug, Green bug and Cricket	Mechanical and chemical
	Sun flower	Fruit fly	Mechanical and chemical
	Ground nut	Root rot	Mechanical and chemical

Source: Woreda and Zonal Agriculture and Natural Resource Management Office, 2021

As shown in Table 2 above smallholder producer farmers undertake many activities to control diseases and insect pests affecting crop production to enhance production and productivity of the major pulse and oil crops. Among the methods, they use improved and disease resistant seed, increasing frequency of tillage, Crop rotation and shifting cultivation, Mechanical and chemical and that of cultural methods widely.

Conclusion and Recommendations

Agriculture remains the key sector for food security, employment, growth, despite improper land use, agro-ecological zones, and production and consumption patterns. Agriculture lead growth and development has the largest impact on reducing the depth of poverty. The livelihood of over 93% of the people of Southern Nation Nationality and peoples Regional state of Ethiopia dependent on agriculture; however, agricultural system in the region is at subsistence level. Much effort has been needed to produce enough products and to adapt improved agricultural technologies that would help to boost production and productivity, but only few improved agricultural technologies adopt by the end users. There are a number of production problems which occurs

at different section of production like input utilization (seed and fertilizer), land fragmentation pests and diseases. Producers in the study area do not uses production inputs in a recommended amount for all of the crops listed at a right time to enhance the production and productivity. To enhance production and productivity of the major pulse and oil crops introduction of packages of modern inputs like improved seeds, fertilizers, pesticides and chemicals that dramatically increases crop production is important at a recommended amount and at a right time to enhance food the food security problem of the country. To address the improved agricultural input packages to the small holder farmers, public interventions in agricultural production decision making were also crucial, so there should be strong linkage and relationship between research, extension, and the small land holding farmers involved for alleviating these production, and technological problems. Finally adoption of improved agricultural technologies which helps in production and marketing of these agricultural products are very essential in the studied area as a result all of the crops and others are recommended based on amount of land that farmers have, market demand of produced goods and other natural and manmade factors which affects productivity.

Conflict of Interests

The author declares that there is no conflict of interests regarding the publication of this paper.

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