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BUDAPEST BUSINESS SCHOOL  
FACULTY OF INTERNATIONAL MANAGEMENT AND BUSINESS  
International Economics and Business MSc

The Role of Agricultural Sector Economy for the development of Ethiopia



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## **Abstract**

Agricultural sector is the main source of country's economic development and livelihood for millions of Ethiopians. The sector accounted 32.7 percent of country's GDP, 66 percent of employment and 87 percent of export. This paper examines the trends of the governments to improve the agricultural sector and capability to ensure food security and reduce poverty. By applying different measurement methods, it analyzes the productivity and efficiency of country's dominant crops. The paper evaluates the level of agricultural inputs utilization and output growth. The overall performance of the agricultural sector has failed to ensure food security, reduce poverty, and bring economic development in Ethiopia. The research result showed that Ethiopia's agricultural sector has been tied up by different challenges like series political instability, Climate change impact, weak agricultural policy and implementation and poor agricultural input utilization, in order to increase agricultural productivity and bring sustainable development in the country stringent efforts of all stakeholders including governments, educators, agrarian communities, NGO's and international community are crucial to overcome the deep-rooted agricultural challenges of Ethiopia and change the economic status of the people

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## **Acronyms**

|       |  |
|-------|--|
| ADLI  | Agricultural Development Led Industrialization |
| CSAE  | Central Statistics Agency of Ethiopia          |
| EATA  | Ethiopia Agricultural Development Agency       |
| EHR   | Ethiopia Human Right                           |
| MoA   | Ministry of Agriculture                        |
| MoARD | Ministry of Agriculture and Rural Development  |
| MoFED | Ministry of Finance and Economic Development   |
| MoWR  | Ministry of Water Resources                    |
| NBE   | National Bank of Ethiopia                      |
| NPC   | National planning Commission                   |



## Chapter one

### **INTRODUCTION**

Agricultural sector plays a significant role to reduce poverty, raise incomes, and improve food security for 80% of the world's poor rural farmers(World Bank, 2020). Agriculture value added grew up 68 percent between 2000 and 2018, its share in global GDP has been 4 percent in 2018 and accounted 27 percent of global workforce in 2019(FAO, 2020, P.1), it is the main source of livelihood, employment, and GDP for developing countries. Reasonably agricultural productivity in the continent is low, as a result food insecurity persisting as a threat in many countries. Sub-Saharan African agricultural sector has failed to attain its potential, in order to fulfill its agricultural promise, it will need 8 times more fertilizer, 6 times more improved seed, at least \$8 billion of investment in basic infrastructure and more than \$65 billion in irrigation( Goedde, et al, 2019).

Ethiopia is one of the populous countries in Africa next to Nigeria. World population review estimated 115 million in 2020, more than 78 percent of the population living in rural area. Ethiopia is one of the oldest countries in the world, its economy is depending on agricultural sector, it is the livelihood for millions of Ethiopian and the backbone of country's economy. Agricultural sector accounted 32.7 percent of country's GDP, 66 percent of employment and 87 percent of export(NBE,2019/20). Country's smallholder farmers shared 95 percent of farmland and contributed 90 percent of total agricultural output(Addisu,2020 and FAO, 2016). Traditional Agricultural system is dominant, and majority of farmers had one or less than one-hectare farmland(MoARD,2010 p.3). Most of smallholder farmers practiced mixed farming system dominated with crop production, more than 65 percent of cereal crop products used for own household consumption(CSAE, 2019/20). Coffee is one of the major export products and accounted 28.6 percent of country's total export, similarly oilseeds and pulses contributed 11.5 and 7.9 percent of the total export(NBE, 2019/20). Ethiopia imports nearly \$2 billion worth of food and agricultural products per annum(USAD,2020, p.3). Imported Grain crop estimated 4,674,500 metric tons in 2019/20.

Ethiopia has a total area of about 1.13 million km<sup>2</sup> and more than 51 million hectares of arable land(MoARD,2010). According to CSAE in 2019/2020 estimated that 14.6 million hectares of farmland area was cultivated, of this grain crops accounted 88.3 percent of cultivated land and cereal crop alone shared 71.9 percent of the total cultivated land. Annual grain crop yield was

26.1 quintal/hectare , similarly cereal crop yield accounted 28.32 quintal/hectare. Ethiopia has a huge number of livestock(FAO,2019). It has nine types of livestock, among these Cattle, Goats and Sheep accounted 65,354,090, 50,501,672 and 39,894,394 respectively(CSAE 2019/20). Ethiopia's crop and livestock production share were unevenly distributed, 80 percent of crop and 82 percent of livestock production concentrated into three regions of the country(Oromia, Amhara and SNNP), while the majority of the regional state agricultural activities has been poorly operated and productivity was low, as a result food insecurity is high in these regions. Agriculture is mainly dependent on rainfed systems, and it is highly probable that the rainfed agriculture will be vulnerable to its effects( Ayan& Awulachew, 2010).

Ethiopia has untapped natural resource; it has 12 river basins with annual surface runoff volume of 122billion m<sup>3</sup> and estimated irrigation potential of 5.3 million hectares(Awulachew et al, 2007, p.4-8; MoWR, 2002). The groundwater potential is estimated at 2.6-6.5billion m<sup>3</sup>, which could realize about 1.1 million hectares irrigation development (Awulachew, 2010, p.17-18). Moreover, rainfall is available to be tapped through rainwater management for household level small-scale irrigation. However, from such a huge irrigation potential only 154,424 and 211,047 hectares of land has been cultivated in 2009/10 & 2019/20 respectively(CSAE, 2009/10&2019/20). Despite these tremendous agricultural land and water resource, the country couldn't ensure food security and economic development. Half a century food insecurity, extreme poverty and slow economic development is persisting in Ethiopia, it is terrible that rich in natural resource country unable to breakout from the vicious circle of poverty. The study assessed the main challenges of agriculture development in Ethiopia, among them agricultural policy and implementation, political instability of the country, climate change impact on the agricultural sector and lack of agricultural inputs.

Agricultural policy during the imperial regime were focused on commercial agriculture and agro-industrial performance(Crummey,2020), the policy was ignored the majority of smallholder farmers who operated on cereal crop production which accounted more than 80 percent of country's cultivated land(Shikur,2020 & welteji, 2018). In this period government lacked the administrative and technical capabilities to implement the policy, as a result government failed to achieve the deigned goal(AMFE,2018 & Crummey,2020).Derge regime from 1974 agricultural policy was established and implemented based on the state interest in collaborated with farmer

association and cooperation and state farm, the policy was ignored massive smallholder farmers, it was created a big gap between the state supported farmers and the others, this wrong agricultural policy was not moved longer and failed to achieve the required goal, as a result millions of people failed under food insecurity. During EPRDF regime somehow better agricultural policy was established and a slight change was seen on the development of agriculture, mainly ADLI strategy expected to increase food security, income for the farmers and reduce poverty, however as a result of poor implementation it failed to resolve food insecurity, mass poverty and economic development. Ethiopia remains one of the poorest countries in the world (World Factbook, 2020).

Political instability is a serious challenge for the development of agriculture in Ethiopia. The land issue was one of the causes for the unrest, it was started during the imperial regime, but internal and external conflict aggravated during Derge regime, thereby the agrarian society were highly affected and food insecurity and poverty grew in the country. The worst was emerged from the formation of EPRDF regime, for three decades ethnic based conflict inside the country persisting and displacing millions of farmers and made them unproductive. Under ethnic federalism Ethiopia's people lost their unity and sense of nationality; one ethnic group is against to the other one, persistent instability in the country highly affected especially the agricultural sector, as a result continuous food insecurity, extreme poverty and low development is practiced. Similarly, climate change is the other challenges for the agricultural productivity of Ethiopia. Drought suffers the agricultural sector and threatening over 10 million people with hunger (Crux staff, 2020). Climate change related born pesticides, locust swarm and others had a significant impact on Ethiopia's agricultural development. Moreover, lack of agricultural input, including Fertilizer, improved seeds, technology, and infrastructure resulted low agricultural output (Bekabil, 2014). Overall, these factors slowing down the agricultural development and aggravate food insecurity, poverty, and low economic development.

## **1.2 Statement of the problem**

Agricultural sector plays a vital role in the process of economic development of a country. Historically the current developed country's economy was relied on traditional agriculture system. On the process, modernization of the agricultural sector was the countries powerful achievement, as a result the agricultural output was increased, thereby the income of the farmers

was increased, raw materials for manufacturing were available. Gradually, agricultural sector transformed into industrialization. The history of England is a clear evidence that the increase in agricultural production and technological advancements during the Agricultural Revolution preceded the industrial revolution. In USA and Japan agricultural sector development has played a significant role in the process of their industrialization growth (Praburaj, 2018).

Many countries in the world have similar age of formation, countries are classified as developed and developing. Developed countries are less dependent on agricultural sector economy, but most of developing countries are until now rely on agricultural economy. Traditional agriculture system is widely used, innovative and modernization agriculture system is poorly exercising, nevertheless in developing countries like Africa, agriculture contributed the highest share of country's GDP than industry and service sector, for example in 2001 share of agriculture to Liberia GDP was 76.9 percent, this is similar to South Korea agriculture share to GDP was 67.3 percent in 1911, but in 2001 it was 3.56 percent (Roser, 2013 and world Bank 2020). The economic development gap between the two countries is very high GDP per capita South Korea in 2019 was \$31,846 and Liberia was \$694 (IMF & World Bank, 2021). Most of developing countries are poor, majority of them are in Africa. All most all Sub-Saharan African countries economy are depending on agricultural sector.

Ethiopia is among the Sub-Saharan Africa countries. It is one of the oldest countries in the world and current total area covers 1.1km<sup>2</sup> and total population is 115 million (UN, 2019). Agriculture is the largest sector in the economy, in 1961 agriculture share to Ethiopia's GDP was 81.1 percent and number of populations was 22.7 million, similarly in 2019 agriculture share to GDP was 33.88 percent and population was 112 million (Roser, 2013, & UN, 2019). Ethiopia has available farmland area about 51 million hectares and different climatic condition for agriculture work (MoARD, 2010). The agricultural sector provides employment to 67 percent of the population (World Bank, 2021). It generated approximately 92 percent of country's export earnings and supplies estimated 70 percent of raw materials for country's industries (CSA, 2018/2019); Lie and Mesfin, 2018, p.22). Agricultural sector plays an important role to the development of the country; however, Ethiopia's agricultural sector follows the same trend that was existed before hundreds of years ago, more than 90 percent of agriculture activities are performing by traditional system with rapid growth of population. History told us modern and

innovative agriculture practice was the driving force to transform into industrialization, this was implemented by many of developed countries.

Ethiopia has abundant resources, huge agricultural land, manpower, rivers and lakes and largest livestock population in Africa. Most of the farmers are struggling for survival, the country could not achieve food security, it is importing huge tones of agricultural products and millions of people are needs food help every year. Despite the fact that Ethiopia has potential land and human resources, but the country couldn't ensure food security and reduce poverty, why improve the welfare of households? Why did the regimes failed to improve the productivity of the sector? What to be done to break the misery of food insecurity in the country? The study focuses on the role of agricultural sector to the development of Ethiopia, the commitment of the government to improve agricultural sector for the development of country's economy. Moreover, the study explores the challenges of agricultural sector, national agriculture policies and its implementation, stakeholder's commitment, and farmers capacity building to increase agriculture productivity and reduce poverty. Finally based on the finding, the researcher will provide recommendation and conclusion.

### **1.3 Objective of the study**

The aim of this study is to understand the role of agricultural sector in the development of Ethiopia, create appropriate guideline for the improvement of the sector and to guaranty food security and sustainable development. Based on this aim, the specific objectives are:

- To examine the status of major players in the agricultural sector
- To assess the performances of agricultural sector
- To investigate the challenges of agricultural sector in the country
- To explore the evolution and trends of agriculture in Ethiopia

### **1.4 The Significance of the study**

This study is significant for agriculture-based economy dependent country like Ethiopia. Agriculture is the backbone of the country's economy and livelihood for the majority of Ethiopian. Agricultural products from conception to consumption is an important factor for

identifying main actors, stakeholders, value added and gross returns in the role of agriculture to the development of the country. Agriculture is one of the most significant economic sectors to Ethiopia, however, production has remained subsistence level with most commodity exports coming from smallholder farmers( infomineo, 2015). The study examines the reason why the agricultural sector has always performed poor output, many of rural residents in the country are living below the national poverty line(Fantu, 2009). The study assesses the agricultural policy and its implementation pursued by the government and the support given to stimulate growth in agricultural sector.

I believed that there are some research were conducted on the agricultural sector of Ethiopia, but it needs more research on how to improve the sector in order to sustain economic growth, reduce poverty and ensure food security. Moreover, how to modernize agricultural sector to transform into industrialization, so this study will provide feedback for educators and researchers enable to conduct further study on this basic issue under discussion. On the other hand, for government and policy makers it will help to review the efficiency and performance of agricultural sector.

### **1.5 Research methodology**

Document analysis is preferably used to collect all relevant information for the purpose of this study. According to( Glenn A. Bowen 2009),Document analysis can be a form of qualitative research that relevant documents are interpreted by the researcher to develop voice and meaning on the assessment topic. Document analysis focus on the documents that contain relevant information to the targeted goal(Altheide and scheider,2013).The objectives of the researcher using in qualitative research is to develop theoretical concepts and patterns from observed data, usually inductive reasoning( Igwenagu,2016). In the process of working this research, I used to secondary sources of data such as government official documents, IMF, World Bank, Journal articles, Ethiopian economic association publications, Research based reports, Known economic professor's audio and video presentation and Internet sources. However, it might be challenging to get enough information from the Ethiopian government officials for analyzing the issue, because the nature of the topic is sensitive, and it is a highly politicized part in the current political situation of the country, however all the possibility will be applied to get real information for the study.

## Chapter two

### 2. REVIEW OF LITERATURE

#### 2.1. Contribution of Agriculture to the development of global economy

Agricultural sector accounts small share of the development of global economy, but it remains significant sector to the lives of many people in the world(Alston and Pardew 2014). According to FAO annual report more than half of world population depends on agriculture for surviving. Some of the agriculture sector contribution to world economy came from developing countries, so far it accounted 25 percent of GDP in developing, 9 percent in middle-income and 1 percent in high-income countries. Billions of people are living in developing countries, of this 55 percent of them live in rural areas. Agriculture is the main source of livelihood for 86 percent of these rural households, some 75 percent of poor people still live, in rural areas and derive the major part of their income from the agricultural sector and related activities (Dethier and Effenberger, 2011). Based on World Development indicator (2020), World agricultural land area in 1990 covered 38.97 percent and in 2019 it was 37.43 percent. Most of the farming land is situated in Latin America and sub-Saharan Africa which accounts 90 percent of it and half of 90 percent concentrated in seven countries like Brazil, Democratic Republic of the Congo, Angola, Sudan, Argentina, Colombia, and Bolivia(zavatta,204). Agricultural sector contribution to world economy in 2000 and 2018 has counted 4.34 and 4.00 percent respectively in the growth of global GDP, while the industrial sector in 2000 and 2018 accounted 28.03% and 27.81% respectively and the service sector share to world GDP in 2000 and 2018 were 60.18% and 61.19 % ( world development indicator 2020). The table below indicated that agricultural sector shared to global GDP is very small compared to the other sectors.

Table 1. Sectoral value added to world GDP %

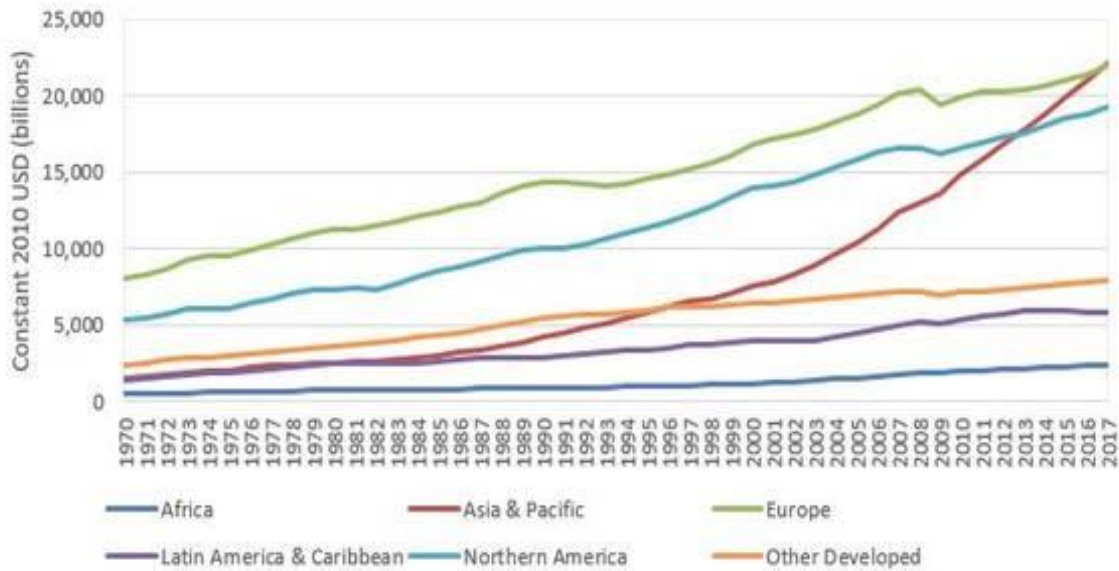
| Indicators         | 3013  | 2014  | 2015  | 2016  | 2017  | 2018  |
|--------------------|-------|-------|-------|-------|-------|-------|
| Agriculture sector | 3.68  | 3.59  | 3.52  | 3.47  | 3.44  | 4.00  |
| Industry sector    | 26.60 | 26.36 | 25.52 | 25.03 | 25.36 | 27.81 |
| Service sector     | 63.75 | 64.03 | 64.93 | 65.43 | 65.13 | 61.20 |

Source: Compiled from World Bank data( updated in 2020)

The table above show that the agricultural sector value is declining and accounted the lowest share as compared to the other sectors. Evidence showed that agricultural productivity in industrialized countries for the last 50 years have consistently achieved the highest levels of agricultural output per worker and per acre of agricultural land but developing countries lag far behind these productivity measures(Fuglie, et al 2012). “Agricultural development is one of the most powerful tools to end extreme poverty, boost shared prosperity and feed a projected 9.7 billion people by 2050”(World Bank, 2020, p.1).

The data below is adapted from FAO macroeconomic statistics, described regional GDP growth to 2017, Africa’s GDP growth seems flat, it has a huge gap between Africa and Europe, Asia & Pacific and North America from 2014.

Figure 1 .GDP by region, constant 2010 US dollars (billions), 1970-2017



Source: FAO

Figure 1 shows regional GDP, but how to narrow the gap between developed and developing countries agricultural productivity to ensure world food security? For example, produced tons of Maize, Rice and Wheat per hectare in some top developed countries are 9.2, 8.1 and 4.9 respectively, while 2.0, 2.9 and 2.0 respectively in some least developed countries(Gollin, Lgakos and Waugh ,2014). How to transform poor agricultural output into middle or high



productivity level to feed the world and increase global market share? The growth of total agricultural output implied that the total factor productivity has improved (Fuglie and Wang, 2014). Utilization of agricultural input is more effective in developed countries than developing. Despite natural resource availability agricultural output in developing countries are low, how developed world could support the sector? It is obvious that world population is growing rapidly, and food demand is increasing too, but agricultural sector inefficiency in any region is a threat of the world. To overcome the challenges of food insecurity, world must cooperate to modernize the traditional agriculture system in the developing countries. In order to achieve the goal to feed 9.7 billion in 2050, world must invest more knowledge, technology, and capital to improve agricultural sector.

The agricultural sector accounted high labor forces in the world. Most employed people are found in developing countries. Share of agricultural sector employments are decline in developed countries. In 1500 agriculture sector employment in France 73.4 percent, England 58.1 percent and Netherland's 58.8 percent, but in 2012 agricultural sector employment reduced to in France 2.9 percent, England 1.2 percent and Netherland 2.5 percent. However, the current percentage of agricultural sector employed people in developing countries are the same as the status of developed countries in 1800. Example in 2017 Niger 75.65 percent, Chad 87.19 percent, Madagascar 74.41 percent, Ethiopia 68.22 percent and India 42.74 percent (Roser, 2013). Share of the labor force working in agriculture decline continuously, thereby agricultural share of GDP to world economy decreases (Dethier and Effenberger, 2011).

Table 2. Share of world employment by economic sectors in %

| Items       | 2014   | 2015   | 2016   | 2017   | 2018   | 2019   |
|-------------|--------|--------|--------|--------|--------|--------|
| Agriculture | 29.432 | 28.835 | 28.321 | 27.802 | 27.221 | 26.756 |
| Industry    | 23.291 | 23.125 | 23.008 | 22.857 | 22.928 | 22.66  |
| Services    | 42.276 | 48.037 | 48.671 | 49.342 | 49.851 | 50.580 |

Source: Compiled from World Bank data ( updated 2020)

Table 2 shows that employment in agricultural sector is declining continuously, while the service sector is increasing rapidly, this indicated that most agriculture employer's lower income level

per head over time and persisting poverty push to shift the other sectors or self-activities. Many studies indicated that majority of developing countries smallholder farmers engaged in less than 2 hectares, moreover low utilization of agricultural input in the farmland resulted low agriculture output, thereby employees forced to shift from agriculture sector.

The table below indicated that the share of employment in agricultural sector with different income level in the regions.

Table 3. Employment in agriculture % Modeled ILO estimate 2020

| Items          | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  |
|----------------|-------|-------|-------|-------|-------|-------|
| High income    | 3.60  | 3.50  | 3.30  | 3.20  | 3.20  | 3.10  |
| Middle income  | 32.70 | 32.00 | 31.40 | 30.70 | 30.00 | 29.40 |
| Low income     | 61.30 | 60.70 | 60.30 | 59.90 | 59.50 | 59.10 |
| SS.Africa      | 54.90 | 54.20 | 54.00 | 53.50 | 53.40 | 52.60 |
| LDC            | 58.30 | 57.50 | 57.00 | 56.10 | 55.50 | 55.00 |
| Arab World     | 22.20 | 21.60 | 21.20 | 20.80 | 20.40 | 20.20 |
| LA & Caribbean | 14.10 | 13.90 | 13.80 | 13.80 | 13.70 | 13.70 |
| E.Union        | 5.30  | 5.10  | 4.80  | 4.70  | 4.50  | 4.40  |
| World          | 29.40 | 28.90 | 28.40 | 27.80 | 27.30 | 26.90 |

Source: Compiled from World Bank data updated in 2020

## 2.2. Role of agriculture in reducing poverty

Poverty level steadily declining worldwide , but it is persisting as a serious problem especially in low-income countries, according to (world bank, 2021) poverty data, Poverty headcount ratio at \$1.90 a day (2011 PPP) (% of population) in 1981 it was 42.5 percent and in 2017 it became 9.3 percent, that is equivalent to 689 million people living on less than \$1.90 a day. World Bank report states that the majority of poor people are existed in Sub-Saharan Africa and South Asia which accounted 84.5 percent, that's just over 700 million people living on less than \$1.90 a day.

The top poorest country in the world found in Sub-Saharan Africa, 41 percent of the population is living at less than \$1.90. Similarly, UN report revealed that , around 1.2 billion people are living in extreme poverty, which means that they are living on USD 1.25 or less per day. Three out of four of these people are living in rural areas and most of them are working in agricultural sector or other job linked to agriculture. According to (FAO,2003, p.215) estimated and projection of poverty showed as follow:

Table 4. Poverty % of population

| Regions                          | 1990 | 1999 | 2015 |
|----------------------------------|------|------|------|
| Developing Countries (%)         | 32.0 | 24.6 | 13.2 |
| Sub-Saharan Africa (%)           | 47.7 | 46.7 | 39.3 |
| Middle East and North Africa (%) | 2.4  | 2.3  | 1.5  |
| Latin America and Caribbean (%)  | 16.8 | 15.1 | 9.7  |
| South Asia (%)                   | 44   | 36.9 | 16.7 |
| East Asia (%)                    | 27.6 | 14.2 | 2.8  |

Source: FAO (2003)

Economic development is vital to eradicate/ reduce poverty or inequality gap. However, most poor people are living in rural area which is industry and service sectors are inexistence, but agriculture is dominant sector for survival and Majority of the people are relied on it. Growth within agriculture can be two to three times more effective at reducing poverty than growth generated in other sectors (Christiansen & Martin, 2018). Similar evidence showed that low-income countries growth within agriculture can be five times as effective as growth within other sectors in order to reduce poverty. For sub-Saharan Africa, agriculture can be ten times more effective than other sectors to get out of poverty and hunger (Gunnarsson and Wingborg 2016). The study shows that one percent of agricultural sector growth yields, on average 2.2 times more poverty reduction than one percent growth in other sectors(Christiansen, Demery and Kühl,2006, p.30).

Agriculture is in the hand of poor rural society and performing in traditional farming system. In order to improve the output of agriculture, the traditional way of farming should be changed by modernization of agricultural system, full utilization of agricultural land, sufficient utilization of agricultural input, farmers capacity building and institutional strength are the most effective mechanism to improve productivity and reduce extreme poverty. Alexander Sarris explained in his study that the engine to make faster agricultural total factor productivity growth, which includes agricultural R&D, extension, rural infrastructure, and human capital such as education, and health( Sarris, 2001). Agricultural productivity improvements cannot made only by farmers but also external donors, including major contributions of the international agricultural research centers and investors, as an efficient growth enhancing and poverty reducing strategy overall support for agricultural sector is crucial. As many literatures showed that historically current developed countries like England, USA, Japan, and others avoided poverty by modernizing the agricultural sector and industry led policy transformed the countries into modern industrialized economy zone. Emerging countries, India, China and Taiwan, where agriculture led economy growth increases the productivity of agricultural outputs, thereby improved agricultural incomes directly led to increases in the domestic demand for the larger quantities of food produced domestically, as a result poverty is reduced to minimal level ( Pennisi,2012).

It can be measure poverty headcount, poverty gap and poverty severity using different tools, for example Foster Greer Thorbecke ( FGT) poverty measures is among one of it and the formula is

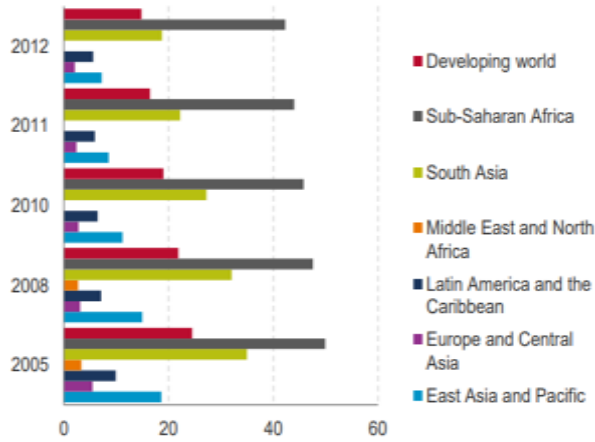
$$p_{\alpha}(Z, Y) = \frac{1}{n} \sum_{i=1}^q \left[ \frac{z - y_i}{z} \right]^{\alpha}$$

given by:

. The following figure is taken from Development initiatives(2016) data. Sub-Sahara Africa poverty index is highest followed by south Asia. poverty gap and severity in south Asia is much lower than Sub-Sahara Africa. Europe and Central Asia and East Asia and Pacific decreases poverty gap and severity better than the others. The figure show that poverty level in all cases decreases slightly, however Africa especially Sub-Sahara Africa keep highest and persisting as threat of millions of people.

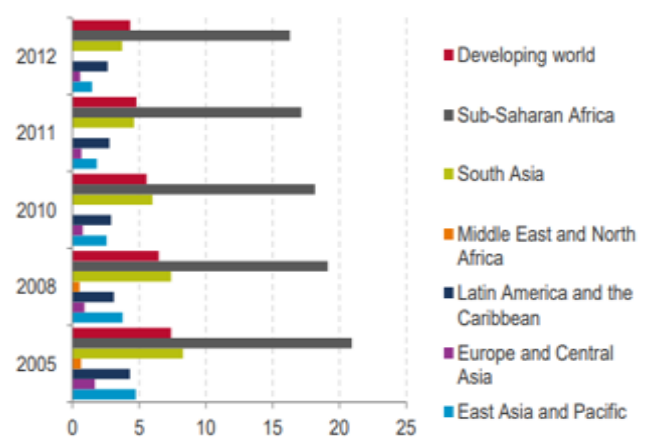
Figure 2. poverty measurement

Poverty headcount ratio across selected global regions over time regions



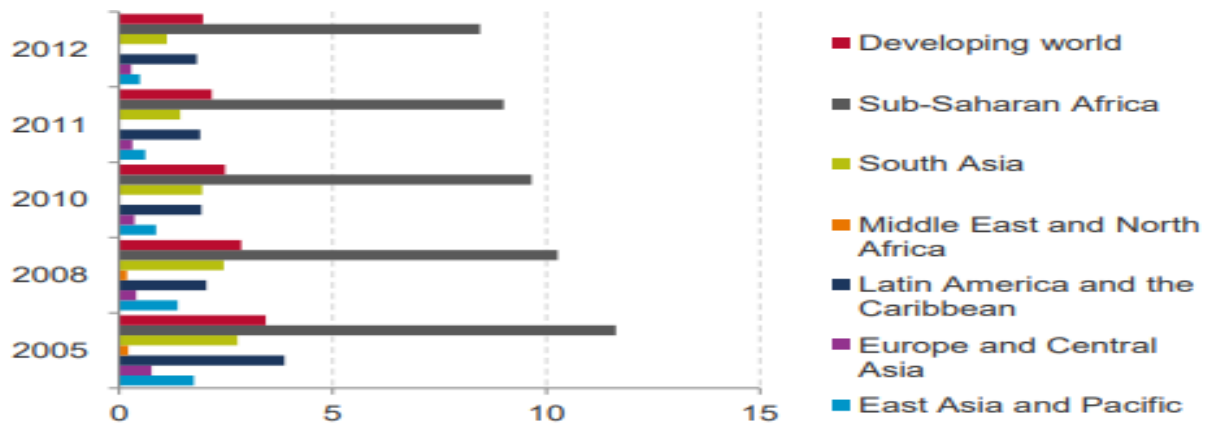
Poverty headcount ratio( %)

Poverty gap ratio across global



Poverty gap

### Poverty severity across global regions



Poverty severity

### 2.3. Challenges of Agricultural sector development

Agriculture is the main source of livelihood for millions of people and raw materials for the industry. However, the sector globally faces different daunting challenges, as a result food insecurity and poverty persisting specially in developing world(World Bank, 2014 and Gassner et al, 2019). Some of the major agricultural challenges including the ongoing emergency of

climate change, inadequate physical infrastructure to support the sector, Poor farming techniques, lack of farm inputs, Weak implementation of agricultural policies(UKEssays,2018).

### **2.3.1 Impact of climate change**

Nowadays climate change is a global threat and has become an important issue. Global warming causes a change in average temperature and precipitation and increases the frequency of floods, droughts, heat waves(Lindsey and Dahlma,2021). Agricultural sector is sensitive to weather and then directly affected by climate change (Nelsona, et al,2013). The agricultural productivity is based on the nature of climate. Mostly climate change impact is a serious challenge in African region agricultural development, its consequences left millions of people for food shortage(Sikapizye and Childs,2019).Top 10 most drought prone countries in the world are Ethiopia, Sudan, Eritrea, Afghanistan, China, Pakistan, Iran, Somalia, Uganda, and Morocco(Kiprop, 2018). Report in 2019 by the UN international panel on climate change participated more than 50 countries focused on the risk of climate change to millions of people, desertification, land degradation and food and livelihood insecurity. Similarly, IPCC report stressed and predicted global crop yields decline every decade by 2 to 6 percent going forward, as a result drought, heat, flooding, superstorms, weather volatility, shifting seasons, insect infestations and others are symptoms of a warming planet(little, 2019).

To mitigate climate change impact in agricultural productivity, researcher's effort is continuing and then "plants capable of surviving disease, drought and climate change will be made possible by speed-breeding, scientists have claimed"(Pinkston,2018 p.1).The Global Forum on Innovations for Marginal Environments( GFIME) group researching to tackle climate change related impact on the agriculture productivity and ensure food security. Developed countries have been proposed several mitigation measures like breeding more resilient crop varieties, and diversification of crop species, using improved agroforestry species, capture and retention of rainfall, and use of improved irrigation practices, increasing forest cover and Agroforestry and use of emerging water harvesting techniques( Dinesh and Vermeulen,2016). Climate resilience crop adaption can be the way to ensure future world food security(FAO/OECD. 2012, P.30). Cloud seeding technology has a huge potential for rain enhancing technologies to increase rainfall volume in dry areas, as a result precipitation can be increased up to 20 percent( Flossmann, MantOn and Abshaev,2019).

### **2.3.2 Financial constraints of farmers**

Financial constraints are one of the challenges in agricultural sector. Financial problem is not a serious problem for farmers in developed nation compared to developing countries. Developed countries are allotted huge budget for supporting agricultural sector, European Union 85 percent of agricultural subsidies received for 1.6 million farmers (EUFACTCHEK,2019). United Kingdom alone £3billion support to farmers in 2020 ( Gov.UK,2019). United state funds \$11.5billion in 2017 and \$ 32 billion in 2020 for farmers (Mccimmon,2020). OECD and EU countries, plus 12 key emerging economies spend \$700 billion a year in total support to the agricultural sector (Calder, 2020). However, developing country's farmers are not sufficiently benefited from financial subsidies. The joint work of governments, financial institutions, and NGOs with farmers can improve the development of agricultural sector economy and ensure food security. Agriculture finance helps for poor farmers to increase their income and food production and enable to feed 9 billion people by 2050 (World Bank, 2020). Globally there are an estimated half billion smallholder farming households relying on agricultural production for their livelihoods, agriculture finance and agricultural insurance are strategically important for eradicating extreme poverty and boosting shared prosperity(World Bank 2020). Most of African farmers are poor financially to support their agriculture inputs and adopt new farming practice(Yaron,1992). Africa's agricultural productivity can only be efficient if smallholder farmers gain access to finance(Langyintuo,2019), particularly Sub-Saharan African farmers has low access to financial support, that is why agricultural productivity is low in this sub region.

### **2.3.3 Lack of infrastructure**

Lack of Infrastructure is one of the challenges in agricultural development. Jessie Scott ( 2016) quoted that, infrastructure have a direct linkage to agriculture and rural development. Physical infrastructure network is poor in developing countries, as a result huge agricultural product cannot be reached to the consumers on time and created a huge lose. African countries to create competitive industrial sector and promote industrial linkages poor infrastructure is the big challenge (UN,2020). Africa have huge potential, but lack of infrastructure leaves millions of people in poverty (Easen, 2018). In India more than 30 percent of farmer's harvest spoils because of the poor infrastructure( Lokesha and Mahesha,2016). Infrastructure challenge is not a serious problem in developed nations, however, US infrastructure deterioration impacted on

agriculture’s position as a world leader and farmers unable to perform their job easily (AFBF, 2020). According to world bank group data the Rural access Index (RAI) is one of the most important global indicators in the transport sector and It measures the proportion of people who have access to an all-season road within an approximate walking distance of 2 kilometers. The table below shows some countries RAI. Armenia has a good road network and 66 percent of the people in the country have road network access, however 610,000 rural people do not have good access road network. Madagascar has a poor road network in the country only 11.4 has good access road network, but 16.9m rural people do not have good road network access. Based on the table only 20 percent of the people have good road network access to transport agricultural products, while 80 percent of the people have no good road network to transport their products, that is why huge agricultural products has spoiled before reached to the market.

Table 5. Rural access index

| Country    | Years | RAI% | Total population | No. of rural people have no access R.N |
|------------|-------|------|------------------|--|
| Armenia    | 2015  | 66   | 2.9 million      | 610,000 million                        |
| Burundi    | 2015  | 24.9 | 11.2 million     | 6.3 million                            |
| Lesotho    | 2016  | 18   | 2.2m             | 1.29 m                                 |
| Liberia    | 2015  | 41.9 | 4.5m             | 2.3m                                   |
| Madagascar | 2016  | 11.4 | 24.9m            | 16.9m                                  |
| Malawi     | 2017  | 28.1 | 24.3m            | 11.3m                                  |
| Mali       | 2016  | 22.3 | 18.6m            | 9.1m                                   |
| Nigeria    | 2015  | 25.5 | 182.2m           | 92.5m                                  |
| Peru       | 2016  | 37.2 | 31.8m            | 12.3m                                  |
| Rwanda     | 2015  | 55.3 | 10.8m            | 3.9m                                   |

Source: compiled from World Bank group data



## 2.4 The share of agricultural products in global market

Agricultural trade has a long history. It was started from selling and buying agricultural products between domestic society. Agricultural trade grew up and become global issue and today it is regulated by WTO, bilateral and multilateral trade agreements( Delich,2020). Agriculture plays a vital role in raising incomes for farmers, reducing global extreme poverty, and improving global food security(Khanna and Solanki, 2014; Christiansen, Demery and Kuhl, 2011). Agriculture has its own contribution to the global market share. Global agriculture trade increased steadily with averaging over 3.5 percent(Beckman et al,2017). Growth can happen on major agricultural products like trade in oilseeds/oilseed products are growing fastest however, growth in agricultural trade was uneven across countries and regions( OECD/FAO and Beckman et al 2017). Categories of agricultural production is depending on the regions of the world, example agricultural product in Africa may not grow in Europe or Asia, as a result importing and exporting trade grew rapidly. Importing and exporting agricultural products are higher in developed countries than developing countries. According to FAO (2018) data, in 2016 European Union and United State of America share of total export value in agricultural products accounted 41.1 percent and 11 percent respectively and ranked 1<sup>st</sup> and 2<sup>nd</sup>. Similarly share of total import value in agricultural products accounted 39.1 percent and 10.1 percent respectively and had the same rank. Both countries had a positive trade balance in agricultural product trade. An increase emerging economy in global agricultural market is a major development, China's share of world imports of agricultural products increased from 2.3 percent in 2000 to 8.2 percent in 2016. Similarly, Chin's share of world exports accounted 4.2 percent in 2016. In export and import world agricultural trade market China ranked 3<sup>rd</sup> and 4<sup>th</sup> respectively. However, it has negative trade balance in 2016. Average share of global agricultural import value of developing and developed regions in 2010-14 accounted 42 percent and 58 percent, respectively. Similarly, average share of global agricultural export value of developing and developed regions in 2010-14 accounted 46 percent and 54 percent respectively( Beckman, et al, 2017). The regional average global market share of import and export agricultural products illustrated below.

Table 6. Average share of global agricultural import and export value in 2010-14

|  | EXPORT in % | IMPORT in % |
|--|-------------|-------------|
|--|-------------|-------------|

|                              |    |    |
|------------------------------|----|----|
| Europe and Central Asia      | 26 | 24 |
| North America                | 17 | 22 |
| Other East Asia and Pacific  | 17 | 16 |
| High income Asia and Pacific | 15 | 8  |
| Middle East and North Africa | 11 | 3  |
| Latin America and Caribbean  | 6  | 19 |
| South Asia                   | 4  | 4  |
| Sub-Saharan Africa           | 4  | 4  |

Source: Compiled from USDA Economic Research Service Economic Information Bulletin No.181

South Asia and Sub-Saharan Africa are typically the world's poorest sub regions and lowest in export and import agricultural products and North America and LAC recorded a negative trade balance between 2010-14. Africa's agricultural productivity is remains low and far from developed world standards, because over 90 percent of agriculture activities are depending on rainfall without artificial irrigation aid( Veras ,2017). Africa's agricultural productivity is deteriorating time to time, as a result it is hard to be a player of agricultural product exporter to global market. Africa's agricultural share to global market in 1960 was less than 10% of the world's total agricultural exports, today this number has dropped to a negligible 2.5 percent (Greyling,2015).

Agricultural product harvested for profit or subsistence purpose. Crops categorized as food, feed, fiber, oil, ornamental and industrial crops. The crops used to human consumption, animal consumption, for textile, industries, and gardening. The crops are grown in different regions of the world with different quantities of yields, according to FAO(2018) data, in 2018 the highest cereal crop yield registered in United State 8.69 tones/hectare, New Zealand 8.06 tones/hectare and New Caledonia 7.48 tones /hectare. Cereal crops are grown in all regions of the world and it is common to use for consumption and profit. Similarly, oil crops: rapeseeds yield in 2018 Chile 3.89 tones/hectare, Ireland 3.86 tone/hectare and Belgium 3.79 t/h and in palm oil fruit

Nicaragua 58.73 h/t, Thailand 21.69t/h and Colombia 20.37h/t. Average yields of coffee bean in 2018 Malaysia 3.77t/h, China 2.96 t/h and Vietnam 2.61 t/h. The other types of crops like roots and tubers, legumes and nuts, sugar crops and fruits and vegetables are produced in different regions of the world and the yields quantities determined by geographical location, some crops like Cereal crops production increased 1.105 metric tons in 1971 to 2.98 metric tons in 2017(World Bank, 2020).

## **2.5 The Value of irrigation for agricultural sector development sustainability**

Irrigation plays a significant role in agricultural and economic development of many countries. Double or triple cropping in a year is possible by irrigation. Irrigation is possible with available water resources. A reliable and suitable irrigation water supply help to increase productivity in agricultural sector and assure economic development, many civilizations have been dependent on irrigated agriculture to secure their people ( Walker,2001, p.1). Adequate amount of water resource is very essential for Irrigation and help to increase crop productivity when rain full is not enough(Rossi,2019, p.2-3).Many of the farmers in the world get their water for irrigation from surface water, in order to have sustainable water resources, surface water management is crucial(Qureshi,2018).Worldwide available area of irrigation land has been estimated at 1 billion hectares, however,230-240 million hectare were irrigated and about half of them in developing countries (Worthington,1977). Land used for irrigation is high in middle- and low-income countries than high income countries (FAO, 2015). Many evidences showed that irrigation farm is more efficient than rain fed farm, in irrigation it has a possibility to produce crops at least twice in a year. The major global food production sustains in rain-fed agriculture, but it is highly dependent on climate conditions and vulnerable to changes in precipitation and temperature patterns(Harvey et al ,2018).

Irrigation expansion over water-stressed rainfed croplands is an effective agricultural adaptation measure in response to climate change. Irrigated cropping systems, which use both rainwater and surface water and/or groundwater, contribute to a more reliable and resilient crop production while boosting agricultural productivity and Irrigation provides higher yields than rain-fed agriculture ( Rosa et al,2020).Many countries that have available farmland and sufficient water resources can used irrigation farm effectively and achieved high yields. However, many LDCs especially African countries are poorly performed irrigation farming as compared to Asian(

IFPRI,2010). Africa’s population grows rapidly , there are available agricultural land and sufficient water resources in the continent, but it is so long time that cannot be self-sufficient in food security and agriculture output is remained lowest in the world. The table below has been adapted from ICID(2016)show that how five top countries performed irrigation farming in different economic levels and regions:

Table 7. Irrigation Area by country and Economic status

| St. No .                   | Country   | Irrigated Areas Millions hectare | Reference Year | St. No.                              | Country   | Irrigated Areas Millions hectare | Reference Year |
|----------------------------|-----------|----------------------------------|----------------|--------------------------------------|-----------|----------------------------------|----------------|
| <b>Developed Countries</b> |           |                                  |                | <b>Emerging/Developing Countries</b> |           |                                  |                |
| 1                          | USA       | 24.74                            | 2009           | 1                                    | India     | 62.000                           | 2010           |
| 2                          | Spain     | 3.605                            | 2014           | 2                                    | China     | 60.004                           | 2010           |
| 3                          | Japan     | 2.920                            | 2013           | 3                                    | Pakistan  | 19.080                           | 2013           |
| 4                          | France    | 2.900                            | 2011           | 4                                    | Iran      | 8.570                            | 2015           |
| 5                          | Australia | 2.550                            | 2011           | 5                                    | Indonesia | 6.722                            | 2011           |

| St. No.                          | Country     | Irrigated Areas<br>Millions hectare | Reference<br>Year | St. No.      | Region                        | Irrigation Area<br>million ha | % of<br>irrigation<br>Area |
|----------------------------------|-------------|-------------------------------------|-------------------|--------------|-------------------------------|-------------------------------|----------------------------|
| <b>Least developed countries</b> |             |                                     |                   | 1            | Emerging/Developing countries | 47.32                         | 15.8                       |
| 1                                | Bangladesh  | 5.217                               | 2010              | 2            | Emerging/Developing countries | 233.33                        | 78                         |
| 2                                | Afghanistan | 3.208                               | 2011              | 3            | Least developed countries     | 18.4                          | 6.2                        |
| 3                                | Myanmar     | 2.292                               | 2011              | <b>Total</b> |                               | <b>299.04</b>                 | <b>100</b>                 |
| 4                                | Sudan       | 1.890                               | 2011              |              |                               |                               |                            |
| 5                                | Nepal       | 1.180                               | 2012              |              |                               |                               |                            |

| St. No. | Regions          | Irrigation Area million ha | % of irrigation Area |
|---------|------------------|----------------------------|----------------------|
| 1       | Africa           | 14.74                      | 4.9                  |
| 2       | Americas         | 46.51                      | 15.6                 |
| 3       | Asia and Oceania | 2014.41                    | 71.7                 |
| 4       | Europe           | 23.38                      | 7.8                  |
|         | <b>Total</b>     | <b>299.04</b>              | <b>100</b>           |

Source: compiled from ICID

In the table above described that Irrigated area covered in LDCs was the lowest, especially region of Africa was poorly performed. Modern and innovative agriculture is the way to develop the region. Over 70 percent Africans dependent on agriculture sector for livelihoods, agriculture is pivotal to the economies of African countries. The growth of agriculture is crucial to increasing prosperity, food security, industrialization, intra-African trade and to bolstering Africa's contribution to global trade(Biteye , 2016). Irrigation in Sub Saharan Africa has been performed poorly, it is obvious that irrigation can make a big difference, but in Sub Saharan

African's cultivated land is irrigated as little as 4%–6% , despite water being available to irrigate larger areas (Wiggs and Lankford,2019).

## Chapter Three

### 3. RESEARCH METHEDODOLOGY

#### 3.1 Ethiopia's agricultural sector overview

Ethiopia is the second populous country in Africa next to Nigeria. More than 80 percent of the population are living in rural area (World Bank, 2018). The agricultural sector is a backbone of Ethiopia's economy. From the formation of the country till now agriculture remains a very significant economic and employment sector of Ethiopia. Ethiopia's agriculture includes crops, livestock, forestry, fisheries, and apiculture. Ethiopia has a total land area of 1.1 millionSq.km and about 38 million hectares of land suitable for producing crops, but less than 17 million hectares of land cultivated annually(CSAE,2019/20). Rainfed annual crop production accounted more than 95 percent(,Deressa,2007, p. 5). The majority of the farmers in Ethiopia are smallholder farmers that are working on one hectare or less and producing mostly for own consumption and generating only a small, marketed surplus (MoARD,2010 p.3). In the total agricultural land, 95 percent of it is cultivated by smallholder farmers and contribute 90 percent of the total agricultural output(Getahun ,2020 and Welteji ,2018). The agricultural products produced by the farmers used for own consumption, sale , seed, wage in kind, animal feed and other purposes (CSAE, 2019/2020 p.9). In the survey by CSAE in the same year, the majority of agricultural product was consumed by the farmers, for example in Ethiopia 65.93 percent of cereals product were used for household consumption, 11.18 percent used for seed , 18.18 percent used for sale to buy like other food items, clothes, etc and others used for other purposes such as wages, animal feeds, etc. Ethiopia's farming activities are depending on almost all traditional system. The farming tools like plow, pickaxe and sickle are made of metal and plough shaft, beam and ploughshare are made of wood. Ploughing the farmland by using this traditional tool with Oxen is inefficient and time consuming. Most of the farmers produce crops once in a year. Mixed farming system crop production is common, and in livestock population Ethiopia is one of the top countries in Africa.

Ethiopia's agriculture heavily relying on rain fed, it has different agro-ecological zones such as golla ( tropical zone), Woina dega (Subtropical zone), Dega (Cool zone). The pattern of crops and livestock productions are dependent on the climatic zones. Major exports coffee, oilseeds, pulses, and others are growing in sub-tropical zone. Agriculture accounts more than 80 percent of exports of the country, according to NBE,2018/2019 annual report shows that share of agriculture to GDP compared to the other sectors:

Table 8. Sectoral contribution to GDP (in Billions of Birr)

| Items                        |             | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 |
|------------------------------|-------------|---------|---------|---------|---------|---------|---------|
| Sector                       | Agriculture | 499.8   | 531.7   | 544.1   | 580..4  | 600.9   | 623.8   |
|                              | Industry    | 225.9   | 281.3   | 343.9   | 413.8   | 464.4   | 526.2   |
|                              | Services    | 479.5   | 530.0   | 575.9   | 619.3   | 673.9   | 745.7   |
| Total                        |             | 1205.2  | 1343.0  | 1463.9  | 1613.5  | 1739.2  | 1895.7  |
| Share<br>in<br>GDP<br>in (%) | Agriculture | 41.1    | 39.6    | 37.5    | 36.3    | 34..9   | 33.3    |
|                              | Industry    | 18.6    | 21.0    | 23.7    | 25.9    | 27.0    | 28.1    |
|                              | Services    | 39.4    | 39.5    | 39.7    | 38.8    | 39.2    | 39.8    |

Source : compiled from NBE

The decline in the share of agriculture in GDP is an indication of structural shift from agriculture to industry and service sectors as has been already noted.

Table 9. Employment by sector in %

| Items       | 20013 | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  |
|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Agriculture | 78.12 | 70.07 | 69.10 | 68.19 | 67.35 | 66.7  | 66.13 | 65.67 |
| Industry    | 7.36  | 8.71  | 9.08  | 9.48  | 9.84  | 10.02 | 10.19 | 10.35 |
| Services    | 14.52 | 21.81 | 21.82 | 22.34 | 22.82 | 23.27 | 23.68 | 24.03 |

Employment in agriculture slightly decline annually unlike increases in the other sectors. Inefficient agricultural output achievement and having small size farmland discourages agricultural employees, thereby gradually employments are shifting to the other sectors.

Table 10. poverty related data of Ethiopia

| Indicators                                  | 1995   | 1999   | 2004   | 2010   | 2015   |
|---|--------|--------|--------|--------|--------|
| PHCR at NPL (% of population)               | 45.5   | 44.2   | 38.7   | 29.6   | 23.5   |
| Poverty gap at US\$3.2 a day(2011 ppp)%     | 51.8   | 44.8   | 30.8   | 29.1   | 26.8   |
| PHCR at US\$1.9 a day(2011 ppp)( % of pop.) | 72.5   | 63.4   | 39.2   | 35.2   | 32.6   |
| PHCR at US\$3.2 a day(2011 ppp)(% of pop)   | 90.1   | 91     | 80.2   | 74.5   | 70.5   |
| PHCR at US\$5.5 a day(2011 ppp)(% of ppp)   | 96.7   | 97.8   | 95.9   | 93.5   | 90.7   |
| GDP per capita US\$                         | 134.34 | 119.68 | 136.46 | 341.55 | 640.54 |
|   | 3      | 4      | 6      | 4      | 2      |
| *GIN Index (World Bank estimate)            | 44.6   | 30     | 29.8   | 33.2   | 35     |

Source: World bank

\*The data from 1995 might not be true if the income of the people is increased, but it can be true if the upper income people dropped to the lower income level, in both case it is not acceptable because the country's overall economy and the income status of the people before and between 1995 to 1999 did not show any significant change that decreased the gap. but the data was for the World Bank to be believed closer to real information.

### 3.2. Trends of agriculture policy and its implementation in Ethiopia

Agricultural sector is the soul of majority of Ethiopian people. Agriculture is key to providing national food security, engine to the development of the economy and means of reducing national poverty. Agriculture policy and its implementation is fundamental to achieve sustainable development and food security, to improving the living standard of farmers and reduction of poverty (Cochrane,2012 and Chipeta et al,2015) . Ethiopian governments ruled the country in



different periods and developed their own agricultural policy, thereby in the 1960s, mid 1970s and 1991 till now were three distinct regimes.

### **3.2.1 The Haile Selassie regime agriculture policy**

Under Haile Selassie's rule, in 1970 the total population was 28.41million and 91.41 percent of the people lived in rural area (World Bank, 2018). In this period the Ethiopian economy relied mainly on agriculture, particularly coffee production was given more attention . During this era, it had something resembled feudal system and land ownership was inequitable and most of the farmers were forced to till the fields of the landowners. The emperor regime developed three five-year plans from 1957-1973 for the development of the economy. The first five-years development plan gave emphasis on raised foreign exchange earnings by improving mainly coffee production (Welteji,2018). Coffee is growing and produce predominantly in southern part of Ethiopia, three fourth of the agrarian area is produce diversified crops, the first five years plan ignored the majority of crops production sector and the goal was rarely achieved.

The second five years development plan gives more priorities for commercial/marketable products and very little attention for cereal crops that majority of smallholder's production (Shikur, 2020). In this period agriculture was expected to grow by 2.4 percent, but it was grown by 1.9 percent. It was clear that there was no land reform policy, appropriate policy measures, strong organizational programs that facilitate the success of the plan (UK Essay,2018). In this time there was lack of professionals that set up relevant agricultural policy, no strong institution to support the performance of the policy and very poor agricultural inputs supply, moreover the internal and external political instability was one of the causes that gave little attention to the agricultural sector, as a result agriculture could not move forward as much as it was anticipated in the plan.

The third five years development plan focused on agricultural sector and set relatively clear agricultural development strategy. Large scale commercial farming was given more attention in the regime. The plan stressed on modernization of farmers subsistence agriculture in the country, but only selected area that believed to be more productive within a short period of time. Agricultural inputs like improved seeds and fertilizers were available for the selected farmers, as a result better agriculture output was achieved for that particular area in sometime . The

discriminative nature of the plan ignored the rest of the farmers in the country and difference among peasants were grown. However, after reevaluated the outcomes of the plan, the strategy covered majority of farmers in the country, but hard to reached agricultural inputs to all farmers. Because of internal political instability, lack of agricultural professionals, poor agricultural inputs and extremely little agricultural modernization leads agricultural development static. As a result, living standard of the farmers were very poor and many of farmers were not realized their own food security. Despite the fact that has abundant fertile arable land Poor agricultural policy and implementation exposed millions of people in need of food aid every year.

### **3.2.2 The Derg regime agriculture policy**

After the overthrow of absolute monarchy, the military junta (Derg) took power from 1974. Land issue was the burning question and engine to overthrow the previous regime. The Derg regime had taken different land reforms in order to answer question raised by the people. The measure has abolished land tenure system in the country by supported different proclamation. The government totally ignored the policy of the monarchy period and setup their own agricultural development strategy. The agricultural development strategy(ADS) of the regime was named as socialist transformation of agriculture. The ADS was implemented by the formation of state farms and producer's cooperatives, the government was set different proclamation and decrees to implement the strategy. The economic source of the agricultural sector was grouped as small peasant farms given least attention and producer's cooperatives and state farms which was the overwhelming priority of the government .

The government ADS was not accepted by many of the peasants, as a result the agriculture policy was discriminatory and ignored smallholders' farmers which accounted the majority of Ethiopian farmers and stands in favored of the producer's cooperation and state farm. The government policy was in favored of producer's cooperation related modern inputs, extension services, credit opportunity, tax and others but it was forgotten the smallholder's farmers. The government forced the peasants to sell the portion of their own agricultural outputs to the agricultural marketing corporation at a lower price, the peasant might not have sufficient product to sale for the corporation, it must be buying and sale to the corporation based on the predetermined Quota, if the peasant could not meet the required obligation, it was crime and put

in prison. This was the mechanism that the government pressed the peasants to join the producer's cooperation and implemented the agricultural policy.

From the conception of agricultural producer cooperation (APC) in 1979 the government devoted great effort in order to transform individually owned means of production into common ownership based, thereby all possible support was given for APC, however the government ignored to support the individual farms, moreover increased burden on the peasants by unfair tax levied, high fertilizer price and others. Indeed, by overcome the challenges of the government, the agriculture yields of the individual farms was similar to APC annual yield. The result indicated that the APC could not move forward, and it was in the eve of collapse. On the process the members of the APC farmers released the cooperation and became individual farmers. The strategy was established by the interest of the government, many of the farmers joined to the cooperation forcefully without their willingness, for 11 years the agricultural sector did not show any development, finally the strategic plan collapsed and forced to issue other agriculture policy named as mixed economic policy reform in 1990. Policy implementation is effective and able to achieve the intended goal, when the country is politically stable, strong citizenship feeling, strong feeling on one nation one people, motivation to grow with together, but these factors are greatly lack in Ethiopia for many decades, that is why the country failed to achieve economic development. The derg regime from conception 1974 to end of power 1991 despite poor agricultural policy, the internal and external political unrest was very serious and economic development strategy was forgotten and food insecurity was grown.

### **3.2.3 EPRDF regime and agriculture policy**

In 1991 the absolute dictatorship Derg regime was overthrown, and the Ethiopian People's Revolution democratic Front (EPRDF) took power. During this time, the government introduced different economic strategies. Agriculture is the dominant sector for the development of overall economy, increasing food security and reducing poverty. The government aimed to attain fast and broad-based economic development, in 1993 Ethiopia's development strategy introduced named as Agriculture Development Led Industrialization (ADLI). Its main objective has been, to achieve rapid growth in agricultural production, raise income for rural households, attain national food self-sufficiency and produce surpluses which could be marketed to the urban or industrial sectors, moreover it supports smallholder farms to improve their performance and productivity.

The ADLI strategy extended to improve agricultural extension services, promote better utilization of land and water resources, and develop rural infrastructures (MoARD,2010 p.4;Prabhakar and Alemu ,2013 p.238 and EATA, 2017, P.12-16).

Ethiopia's sustainable economic development ensured based on agricultural development. Industrial development policy was planned in 2002. ALDI strategy Primary focus was promoted the value of the policy in terms of economic formation through the implementation of agricultural and rural centered economic and industrial development. "If the ADLI strategy can be successfully practiced, it would be gradually transformed into industrial-led development strategy"(EATA,2017, P. 13). According to World Bank data the economic growth rate of Ethiopia in 1988,1990,1992, 1996 was 0.5 percent,2.7 percent, -8.67 percent, and 12.43 percent respectively, similarly (ENB, 2004/5) annual report data showed that the economy growth in 1999/00 and 2000/01 was 5.4 and 7.4 respectively, in the same years agricultural sector growth rate was 2.2 and 10.6 percent respectively and contributed to GDP growth 1.0 and 4.8 percent respectively.

The government of Ethiopia provided successive national plans to achieve sustainable economic growth. Sustainable Development and Poverty Reduction Program(SDPRP) was introduced and fully implemented between 2002-2004.The aim of SDPRP was to enhance the productive capacity of smallholder farmers; Promote crop diversification; Shift to a market-based system; Increase the coverage of rural water supply; and Support household food security. Moreover, the aim includes different extension packages, expanding the coverage of micro-financing institutions( MoFED,2002, P.5-16). The plan was identified growth in agricultural surplus as the basis of economic development in other sectors, emphasized capacity building and education as key factors of growth, Prioritized water resource management and irrigation and sought to strengthen private sector engagement in industry (MoFED,2006, P. 6-7). According to NBE annual report the economic growth rate of Ethiopia in 2001/2 and 2002/3 was -0.3 and -3.3 percent respectively and agriculture growth rate was -2.1 and -11.6 percent respectively (NBE, 2004/5).It is a clear indication that the economy is dependent on agricultural sector.

Followed the SDPRP the government plan was the Plan for Accelerated and Sustained Development to End Poverty (PASDEP), this was implemented from 2005-2010. The fundamental objective of the strategy was eradication of poverty and ensured food security.

PASDEP was emphasized on commercialization of agriculture and promotion of more rapid non-farm private sector growth, geographical differentiation that was focused on productivity in areas with reliable rainfall, for food security needs, adequately strengthened human resources capacity and their effective utilization, integrating development activities with other sectors and establishment of effective agricultural marketing systems (MoARD, 2010 p.5, and EATA, 2017, p.15). The PASDEP implementation was successful and achieved a high growth rate for consecutive years. According to World Bank data in 2005 and 2010 Ethiopia have grown by 11.82 and 12.55 percent respectively. NBE, 2009/10 annual report indicated that the country grown by 12.6 percent in 2005 and 10.4 percent in 2010, similarly agriculture sector grew by 13.5 percent in 2005 and 7.6 percent in 2010. It was known that the growth of the economy was depending on the growth of agricultural sector.

The economic development achieved from the previous years (PASDEP) was encouraged the government and to scaling up economic growth, the new Growth and Transformation Plan (GTP) was introduced for five-year period (2010–2015). The aim of the GTP was to bring sustainable rapid and broad-based growth and minimize poverty to a lower level. The GTP emphasized agriculture as the core of economic development, thereby the strategies focused on to improve productivity of smallholder as well as large farmers by distributing significant agricultural inputs through the scaling up strategy, to conserve natural resources and improve irrigations and to shift from subsistence agriculture to production of high value agriculture products (NPC, 2016 p. 24). There was also continued emphasis on the aim of agricultural sector to improve crop and livestock production, ensure food security, strengthen markets, improve agricultural services, and drive investment, strengthening agricultural research and facilitating stronger market linkages (EATA, 2017). The GTP was implemented successfully and encouraging achievements have been registered the real GDP growth rate averaged 10.1 percent and agricultural sector annual average value-added growth rate accounted 6.6 percent (NPC, 2016). In this period, it brought economic growth and shown positive poverty reduction from 30 percent in 2011 to 24 percent in 2016 (World Bank, 2020 and NPC, 2016).

Based on the first five years (2010-2015) Growth and Transformation plan (GTP I), the second five years (2016-2020) GTP was introduced. The achievements and challenges of GTP I were the base for the formation of GTP II. In this period agriculture remained the main engine of rapid

and inclusive economic growth and development. The GTP II has similar aim like the previous strategies, agriculture is the main sources of growth for the industrial sector and emphasis given not only promoting the productivity and quality of main food crops production, but also a special attention was given for high value crops, industrial inputs and export commodities(NPC,2016 p.78). In this period irrigation-based agriculture, horticulture, fruits and vegetables, livestock and fisheries development were inattention. “During GTP II period, agriculture and particularly smallholder agriculture was remained the single most important source of economic growth” (NPC,2016 p.82).FAO supporting the government strategic plan (GTP II) emphasized on crop diversification and intensification, introduction of new varieties of crops, improved crop husbandry practices and appropriate farm mechanization, development of the national seed sector, building the capacity of the extension system and beneficiaries, value chain development and commercialization and development of agricultural sector(FAO,2017 P.3). In this period the economic growth rate of the county in 2016 and 2018 was 8.0 percent and 7.7 respectively and agriculture growth 2.3 and 3.5 respectively(NBE,2018/9).

Governments of Ethiopia introduced varieties of development policies, strategies, and programs for more than 60 years, but the country’s economic development could not move forward. Ethiopia remains one of the poorest countries in the world (World Factbook, 2020), WHY? The agricultural sector is at “the center of a number of strategies designed and implemented by the Government of Ethiopia with the goals of accelerating growth, reducing poverty, enhancing sustainability and inclusiveness, and eliminating the country’s dependence on overseas development aid”(ETAT,2011 P. 4). It is known that agriculture is the soul of majority of Ethiopia’s population, despite tremendous natural resources, the county couldn’t be self-sufficient in food production and millions of people are needs food help every year, WHY? Agriculture is the backbone of Ethiopian economy and livelihood of majority of people, but food insecurity and malnutrition are yet serious challenges for the country( FAO, 2017). What is the Mystery behind Ethiopia’s long walk under chronic poverty? Quality and effective economic policy could not bring any economic development without peace, democracy, and equality in the country. The study conducted in Cameroon showed that, government and behavior of the population shares 48 and 24 percent respectively for the failure of agricultural policy(Nguiakam,2011,p.6160).

### **3.3 Challenges of agricultural sector in Ethiopia**

#### **3.3.1 Series of Political Instability in the country**

The nature of Country's all structural set up has determined by the status of the governments. Most developed country's governments are democrat but developing countries like African governments are dictatorial. Democracy is the major factor for the economic development of a country. The existence of Peace, stability and trust between the people and the government can be the way to alleviate conflicts inside the country, can promote working and growth together, avoid inequality and strength unification. The political situation in Africa especially sub-Sahara African is a chronic disease that caused the region in the tail of world development. Despite the fact that Africa has unexploited abundant natural resources, the region couldn't grow as expected rather prolonged political instability caused food insecurity, growing poverty and very poor living standards of the people in the region. "The African political instability and other related problems is basically a consequence of its leadership problem"( Ongayo, 2008, p.4). Political instability is a serious problem for the economic performance and policy implementation in a country(Aisen &Veiga ,2011,P.3).

In Ethiopia political instability practices is the existing reality in more than decades. Historically Ethiopia ruled by different governments in different periods and faced internal and external conflicts. This is one of the causes that discouraging the growth of the country. During monarchy regime, the country was destabilized by internal and external political factors, the European colonizer was destabilized the country repeatedly, as a result economic performance and growth at this time was not the question of the people. After the victory of Ethiopian over European colony, land issue was one of the major factors for political instability. The student protest against the regime was based on the question of "Land to the Tiller" which means redistribution of land from wealthy landlords to working class tenants ( Ruyter,2011 & Crummey, 2020)). In this period the movement reached to all parts of the country and the government was incapable to manage the interest of the population. Due to this reason, political instability grew up and government was struggled to turn the questions of the people and focused on how to stay on power. All economic performance especially agricultural sector has lost attention, people lost trust on the government and became uncooperative and finally the regime overthrown and replaced by the most dictator regime Derg.

The communist Derg regime was ruled the country up to 1991, in this period the government nationalize all means of production, including land, farms, and industry. The smallholding subsistence farmers who accounted the major parts of Ethiopian agriculture faced with uncertainties on their land rights, producing surplus foods lied at risk and one sixth of the population was at risk of starvation (Crummey, 2020). As a result, most of the people turned their face and has lost trust to the government. The internal and external factors challenged the government and became absolute dictatorship and started to kill thousands of people those who are opposed to the regime, the government became restless, the rebel groups became strong and fight the government army, moreover the neighboring country Somalia tried to invade Ethiopia and fight against. The maximum budget of the country was spent for the defense sector. In this period national military service was an obligatory as a result, many people forced to join the military forces. The political instability grew time to time, the agricultural sector which accounted higher share to GDP lost attention by the government. Food insecurity became high, millions of people in need of food aid. The government failed to defend the internal conflict and the economy of the country grew down. The impact of the political turmoil of Ethiopia highly affected the value of exports for most commodities in 1978, example the value of: pulses in 1974 was 101.9 million Birr, but in 1978 it was 17.3 million. Oilseeds in 1974 was 95.9million Birr, but in 1978 it was 12.2million Birr; live animals in 1974 was 13.3million Birr but in 1978 it was 1.0 million; others in 1974 was 60.8 million but in 1978 it was 8.1 million(Watkins, et al,\* ). According to macro trends data adapted from World Bank, the Ethiopia's GDP growth rate in 1982 was 0.92 percent, in 1984 and 1985 it was -2.85 and -11.14 percent. The political instability affected each sector badly and the people stands against the regime, as a result the government overthrown in 1991 and replaced by Ethiopian People's Revolutionary Democratic Front (EPRDF).

EPRDF was a coalition of ethnic-based four political parties ruling the country up to 2018, Ethiopia's population is highly diverse with numerous ethnic groups speaking more than eighty different languages .The government created and implementing new ethnic based constitution which is serving till now. In theory the constitution grants the right of secession to every ethnic groups in the country. Ethiopia is a federation of nine ethno-linguistically divided regional states (Lie and Mesfin,2018 p.9 and Abbink,2006 P.392-393). Each region has their own constitution, flag, executive government, legislature, judiciary, police, and militia and working language. In



each region there existing one dominant ethnic group that has fundamental rights in the region and others are minority ethnic groups with limited right in the territory. The ethnic based federalism affecting the life of millions of Ethiopians. Ethnic conflict is cause of economic downfall and lose of human life and massive displacement, especially in Africa Central African Republic, Nigeria, South Sudan, Congo and Rwanda are few examples (Blagojevic,2009). Land disputes and resource utilization is one of the fundamental causes for prolonged ethnic conflict. In Ethiopia one ethnic group is residing in all parts of the country for more than a decade, example ethnic “Amhara” has one regional state and in the region there are many other ethnic groups are living and lead their life, on the other hand millions of Amhara people are living in the other regional states for centuries, for example in “Oromia” region there are more than 10 million Amhara people are residing for a long period of time, however this people couldn’t exercise their own fundamental rights in Oromia, the people are seen like migrants and the land and other resources are only for Oromo people, such a trend is existing in all regional states for distinct ethnic groups. Land issue is the main reason for the conflict, as a result mostly agrarian societies are highly affected by the ethnic federal system.

In the period of EPRDF regime, the political instability started from 1991, data obtained from different sources, the violent conflict between the major population ethnic Oromo and Amharic speaker and others resulted death of hundreds of people, displacement of hundreds of thousands and destruction of property in between 1991-2005( Abbink,2006, p. 408-411). The ethnic conflict is growing up and millions of Ethiopians people life are unsecured and cause for displacement . In 2017 the ethnic conflict between two regions Oromia and Somalia displaced 1,205,000 people and other new displacement between three regions Oromia, Somalia and SNNPR were 1,391,000 people(EHR, 2018, p 20). In 2016 many people were displaced in six regions because of conflict( EHR,2016, P. 23). Ethnic federalism cause for instability, serious ethnic conflict, and the proliferation of secessionist(Abebe,2017, p.5).The ethnic federalism engineer and driving force TPLF was clashed with the federal government at the end of 2020, as a result UN and other NGO’s confirmed that 4.5 million people out of 6 million needs food aid, the regional state authorities were killed , some of them are in prison and others are hid themselves in the jungle. It can raise question when and how to break these horrendous trends in Ethiopia? In Ethiopia, the absence of democracy is the main reason for the instability of the country. Ethiopia’s prominent scholars and politicians Pro. Berhanu Negain, Pro.Merera Gudina

and others argued that democracy is a sole option to salivate the complex problems of Ethiopia(Adugna, 2016, p 1-2). Democracy in Ethiopia is the way to respect people's fundamental rights, affirm good governance, assure stable working and living conditions and help to attain sustainable economic development (Adula 2019, p. 29).

### 3.3.2 Climate change impact in agricultural sector

Climate change is one of the serious challenges in agricultural sector. Climate variability imbalances the agricultural ecosystem and resulting in changing of agricultural climatic elements like temperature, precipitation, and rainfall(Tesfay et al,2016, p. 68). Climate change affects millions of peoples in Africa, Asia and Latin America with frequent drought, floods and storms, the regions accounting up to 90 percent of all climate-related disasters(UNWFP,2021). Climate change has a negative effect on agricultural productivity(Nwaiwu et al, 2014, p.24). "Small farms, which account for about 90% of the world's 570 million farms, are particularly vulnerable to changes in seasonal climate"( Cartier,2021, P.1). UN, FAO, and WB had similar opinion for Climate Change is an increasing threat to African continent, in the Survey conducted by Selormey and Logan that 30 out of 34 African countries, confirmed that climate conditions for agricultural production had worsened over the past decade(Selormey and Logan,2019). Most Sub-Saharan African farmers are relying on rain fed agriculture, thereby climate change effect is very high in agriculture productivity.

Drought has a long history in Ethiopia. It is one of the challenges for Ethiopia's development and food insecurity. Ethiopia has been hit repeatedly by climate-induced recurrent droughts, as a result in 1888-92 the great famine has been occurred and one-third of Ethiopia's people died (USAID,1987,P.2). In the recent decades in 1984, 1985 and 1986 famine has been hit Ethiopia and 6.5,10.8 and 6.8 million people respectively were under severe starvation and death(USAID,1987, P.1). Climate change impact persisting and affecting the life of agrarian society and others, due to on the ongoing drought people requiring emergency food assistance between August and December 2017 were 8.5 million of which 3.3 million reside in the Somali region and more than 1.5 million livestock perished estimated economic loss of USD 350 million. In the same year in the summer season crop production on 250,000 hectares maize was affected by flash floods(FAO,2017,p.3-5). The table below described the continued impact of

drought on the life of people, the maximum drought affected people registered in 2002/03 and the least in 1986/87.

Table 11. Drought impact in the country

| Years   | Drought affected population( million) | Population affected (%) | Years   | Drought affected population( million) | Population affected (%) |
|---------|---------------------------------------|-------------------------|---------|---------------------------------------|-------------------------|
| 1980/81 | 2.82                                  | 7.7                     | 1991/92 | 7.85                                  | 15.6                    |
| 1981/82 | 3.70                                  | 9.8                     | 1992/93 | 4.97                                  | 9.6                     |
| 1982/83 | 3.30                                  | 8.5                     | 1993/94 | 6.70                                  | 12.6                    |
| 183/84  | 4.21                                  | 10.5                    | 1994/95 | 3.99                                  | 7.3                     |
| 1984/85 | 6.99                                  | 17.0                    | 1995/96 | 2.78                                  | 4.9                     |
| 1985/86 | 6.14                                  | 14.5                    | 1996/97 | 3.36                                  | 5.8                     |
| 1986/87 | 2.53                                  | 5.8                     | 1997/98 | 4.10                                  | 6.8                     |
| 1987/88 | 4.16                                  | 9.3                     | 1998/99 | 7.19                                  | 11.7                    |
| 1988/89 | 5.35                                  | 11.6                    | 1999/00 | 10.56                                 | 16.6                    |
| 1989/90 | 3.21                                  | 6.8                     | 2000/01 | 6.24                                  | 9.6                     |
| 1990/91 | 7.22                                  | 14.8                    | 2002/03 | 14.3                                  | 22.00                   |

Source: Demeke & Ferede(2004)

According to the MoANR, 2016 annual report, climate change is one of the serious challenges in Ethiopia's prospect to produce sufficient food and reduce poverty. In fiscal year 2015/2016 due to drought reason around 15million people were exposed to hunger. Ethiopia has different ecological systems , some of the regions are highly vulnerable to climate change and soil degradation, deforestation and loss of biodiversity are very challenged and agricultural productivity is insufficient, thereby in these regions food insecurity and poverty remains high. Due to extreme drought, every year around 3million people are facing crop production shortfall

and 7.6million are supported by productive safety net program (Teshome and Zhang,2019, p.1). The ND-GAIN Index showed that Ethiopia is one of among highly vulnerable countries to climate change and it ranked 157th out of 181 countries. Climate change impact is one of the deep-rooted challenges in the development of agricultural sector and that is why Ethiopia is known in the world as hungry state and high food aid recipient, but how could it be possible to overcome this chronic situation?

Ethiopia climate change projections showed a significant increase in temperature and drought, heavy rain, and floods in the lowlands of the country. Future projections show that the mean annual temperature will increase in the range of 0.9 to 1.1°C by 2030, in the range of 1.7 to 2.1°C by 2050, and in the range of 2.7 to 3.4°C by 2080 compared to the 1961 to 1990 normal, posing a sustained threat to agriculture and the economy ( MoANR,2016). From 2011 Ethiopia has shown commitment to combat climate change by focused on implementing the Climate Resilient Green Economy (CRGE) strategy. Ethiopia has signed a number of international environmental conventions, such as the United Nations Convention on Biological Diversity (CBD), United Nations Framework Convention on Climate Change (UNFCCC), UNCCD, Kyoto Protocol to the UNFCCC and the Paris Agreement(Zegeye,2018,p.25 &MoANR, 2016,p.74). The CRGE strategy, aimed to bring sustainable economic development and become a middle-income country by 2025. Improving agricultural sector to ensure food security and farmer income and reducing emissions and protecting and reestablishing forests for their economic and ecosystem services are key pillars through which the CRGE's intends to reduce climate vulnerability(Zegeye,2018,p.25 & MANR, 2016,p.74). With the coordination of PASIDP-II and CRGE strategy goals to increase agricultural productivity and enhance climate resilience through sustainable irrigation development and improved watershed and landscape management. PASIDP-II strategy understand the significant of developing climate resilient communities for proper use of water resource in the agricultural sector in order to increase production and agriculture market(MoANR,2016,p.74). To achieve the desired aim, all the stakeholder's active participation is required, capacity building, awareness and cooperative actions can combat climate change impact and ensure food security and increase agriculture productivity. At the movement climate change impact in Ethiopia is continuing a serious threat and cause of huge economic loss and food insecurity.

### 3.3.3 Lack of agricultural inputs

Agricultural sector is a fundamental source of livelihood for most of developing countries, it helps to reduce poverty, increase incomes, and improve food security for 80% of the world's smallholder farmers(World Bank, 2020 ). FAO(2019) report indicated that global hunger increased by 10million between 2018/19, Africa's hungry population is extremely growing up. Effective utilization of modern agricultural inputs is a proven evidence that increased the agricultural productivity(FAO,2019 and Sahel,2014). Between 1961 and 2009, sufficient use of agricultural input tripled the agriculture output(Fuglie and Wang,2012). Fertilizers, improved seeds, agrochemicals, tractors, agricultural machineries and implements and tools are among the agricultural inputs(EST-WEST-SEEDS,2018 ). Fertilizer is widely used as an agricultural input in all regions of the world, according to(FAO, 2017). Using sufficient fertilizer in the agriculture can bring significant output for farmers of many regions, however utilization of fertilizer is low in developing countries, especially in Africa(Msangi and Rosegrant,2015). Singapore fertilizer consumption in 2016 was 30,237.86 kilogram per hectare of arable land ranked first and Central African Republic consumption was 0.34 kilogram per hectare of arable land and became the last of the world( World Bank et al, 2019).Regionally, fertilizer consumption kilogram per hectare of arable land World 140.6, EU 152.6, OECD 137.8, East Asia and Pacific 331.0, North America 127.2 and Sub-Saharan Africa(SSA) 16.2( World Bank, 2019).

According to many evidence's fertilizer utilization in the farm can increase yields and food security, Africa is one of the poorest regions in the world and millions are hunger because of lower productivity, but why fertilizer utilization in the farm is very low in Africa, particularly Sub Sahar Africa? Because of low incentives and high price of fertilizer demand is often low in Africa, lack of sufficient resources and poor crop product gains farmers unable to purchase fertilizer and farmers inefficient usage of fertilizer leads to low productivity as a result fertilizer utilization is low in Africa( Morris, et al,2007 p.45-48). The different types of modern agricultural machinery include tractors, combine harvester, thresher, manure spreader and fertilizer distributor, plow and cultivating machines, seeder, and planters( Zhou,2016, p.2; Sims et al, 2012 p. 815-816). In Africa utilization of agricultural machinery is rarely used, instead most of the farmers reliance on human power with traditional farming system, as a result agricultural productivity in Africa is too low. All most all SSA smallholder farmers operating

farm activities using hand tools, such onerous system is extremely time consuming, thereby to make ready a farmland to sow seeds, it needs 60 person-days per hectare and for weeding 50 person-days per hectare, however on average 30 percent of yield lost because of weed infestation(Sims et al,2006, p.5).

In Ethiopia, the loss of soil fertility and land degradation is one of the major challenges in the agricultural sector, the worst consequence is declining agricultural productivity, raising food insecurity and poverty. Agricultural input is one of the mechanisms to increase agriculture productivity and minimize food insecurity and poverty in the country. Majority of Ethiopia’s farmers are smallholders, 85 percent of households farming on less than 2 hectares and among this 40 percent less than 0.5 hectares. From this small plot of land could not produce their own annual food intake requirements(FAO,2014, P.1). The average smallholder farmers gross annual income generate from agriculture is USD 1,246(FAO,2018,P 1-2). Ethiopian farmers economic situation is terribly low to purchase sufficient agricultural inputs. The prices of fertilizers, improved seeds, tractor etc are very high, as a result most of the farmers are utilized insufficient number of agricultural inputs. For example, in 2019 USA used 138.59kg, China 503.82kg, South Africa,58.51kg, Brazil 186.09kg, Kenya 38.18kg and Ethiopia 14.43kg fertilizer per hectare(indexmundi,2019). Cereal crops are the major production in Ethiopia; however, it has lower yield compared to the world, in 2018 cereal crops yield in US 8.69 tons per hectare, China 6.08, Brazil 4.81,SA 4.93,Ethiopia 2.39 and Kenya 1.81 tons per hectare(Ritchie et al, 2019).

Table 12. Estimates of Agricultural Production and Cultivated Areas of Major Grain Crops for Private Peasant Holdings-Meher( summer) season

Area in thousands of Hectares and Production in thousands of quintals. 1quintal= 100kg

| Agriculture production | 2016/17         |                  | 2017/18         |                  | 2018/19         |                  | 2019/20         |                  |
|------------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|-----------------|------------------|
|                        | Cultivated area | Total production | Cultivated area | Total production | Cultivated area | Total production | Cultivated area | Total production |
| Cereals                | 10,219          | 253,847          | 10,232          | 267,789          | 10,358          | 277,638          | 10,478          | 296,726          |

|          |        |         |        |         |        |         |        |         |
|----------|--------|---------|--------|---------|--------|---------|--------|---------|
| Pulses   | 1,550  | 28,146  | 1,598  | 29,785  | 1,620  | 30,113  | 1,563  | 30,051  |
| Oilseeds | 805    | 8,392   | 846    | 8,550   | 747    | 7,850   | 820    | 8,421   |
| Total    | 12,486 | 266,829 | 12,574 | 290,386 | 12,676 | 306,124 | 12,727 | 335,198 |

Source: compiled from ECSA survey data and NBE annual report

The total grain production in 2019/20 reached 315.6 million quintals (31,560,200 tons) of which, cereal production accounted for 88 percent, pulses 9.5 percent and oil seeds 2.5 percent. The cereal production yield per hectare in 2016/2017 and 2019/20 is 2.48 and 2.83 tons respectively. In 2019/20 the cultivated land and production increased by 1.15 and 6.87 percent, respectively. Similarly pulses and oilseeds yield per hectare in 2019/20 is 1.92 and 1.02 tons respectively. In general, because of low utilization of agricultural inputs crop production volume per hectare is low. Majority of grain crop production is used for household consumption, as a result the possibility to maximize agricultural imputes utilization is hard. The following table show the distribution of grain crop production.

Table 13. Grain Crop production in thousands of quintals and percent of utilization all holdings

| Years   | Agriculture production | Total production | Household Consumption | Seeds | Sales | Others |
|---------|------------------------|------------------|-----------------------|-------|-------|--------|
| 2016/17 | Cereals                | 253,847          | 65.53                 | 12.14 | 17.78 | 4.55   |
|         | Pulses                 | 28,146           | 56.74                 | 13.59 | 27.05 | 2.62   |
|         | Oilseeds               | 8,392            | 34.3                  | 10.9  | 52.33 | 2.47   |
| 2017/18 | Cereals                | 267,789          | 67.72                 | 11.5  | 17.08 | 3.7    |
|         | Pulses                 | 29,785           | 59.33                 | 12.92 | 25.42 | 2.33   |
|         | Oilseeds               | 8,550            | 38.91                 | 10.71 | 48.33 | 2.05   |

|         |          |         |       |       |       |      |
|---------|----------|---------|-------|-------|-------|------|
| 2019/20 | Cereals  | 296,726 | 65.93 | 11.18 | 18.33 | 4.61 |
|         | Pulses   | 30,051  | 56.23 | 13.12 | 27.34 | 3.31 |
|         | Oilseeds | 8,421   | 31.94 | 10.99 | 54.12 | 3.15 |

Source: ECSA,NBE,2019/20 survey report

The cereal production consumption is high in Ethiopia, in 2019/2020 household consumption(HHC) is 65.93, seeds 11.18 and sale 18.33 and others 4.61 of 2.866 tons 2.182 tons used for HHC and seeds but 0.518 ton used for sale in order to purchase other food items, clothes, medication, sufficient fertilizers, chemicals, tractors and others. Can we imagine that farmers utilize sufficient agricultural inputs in this situation? In Ethiopia almost all smallholder farmers depend on traditional farming system, oxen and hand hoe is the main source of farm power for land preparation and planting. Animal power is useful for farmers from crop conception to consumption. According to Nation Master(2003) data agriculture tractors per 1000 person in 2000, USA 17,Australia 16, Botswana 3.42, and Ethiopia 0.0454. In Ethiopia there are many organizations like CIDA, USAID, FAO, Bill and Melinda foundation working with the government to improve the agricultural sector. To break this chronic challenge, mainly government commitment is the solution to increase the agricultural inputs, focus on the modernization of agricultural sector and minimize traditional farming system.

### 3.3.4 Impacts of pests, locust swarm, and weeds in agriculture development

Naturally, agriculture is highly vulnerable for different factors, as a result productivity is very low and food insecurity is high many countries in the world. The evaluation posed in six African countries in 2003/05, 8.380million people were affected by desert locust invasion(FAO,2006, p.8). To increase food security and productivity FAO with other NGO's planned and implemented sustainable desert locust control(FAO, 2006, p 14). In reality desert locusts swarm continue to be a serious threat to food security and agriculture in parts of Africa and Asia (FAO,2020). Especially in sub-Saharan Africa locust swarm impact in agriculture is one of the serious causes for shortage of food security for millions of households(Lechler,2020). In Ethiopia on the top of drought, desert locust is one of the challenges in agricultural sector, by 2020 desert locust destroyed 356,286 metric tons cereal crops, 197,163 hectares of cropland and 1.35 million hectares of pastureland, as a result 1 million people were in need of food



assistance(World Bank and CGTN Africa, 2020). By the joint assessment of Ethiopia ministry of agriculture, FAO,NDRMC, FEWS NET and other 15 assessment partners like UNDP, OCHA analyzed the impact of desert locust infectious on household livelihoods and food securities in Ethiopia by 2020. The table below shows the assessed result of desert locust impact in each region of Ethiopia,

Table 14. Estimated cereal crops lost due to desert locust (quintals) in 2020

| Region      | Total Cereal lost | Maize  | Sorghum | Wheat  | Barely | Vegetable | Total   |
|-------------|-------------------|--------|---------|--------|--------|-----------|---------|
| Afar        | 202 882           | 3 633  | 175     | 614    | 0      | 453       | 4 874   |
| Amhara      | 96 780            | 0      | 15 430  | 0      | 0      | 0         | 15 430  |
| Dire Dawa   | 31 050            | 300    | 1 150   | 0      | 0      | 0         | 1 450   |
| Oromia      | 1 228 352         | 3 813  | 32 238  | 5 000  | 0      | 0         | 41 051  |
| SNNP        | 134 420           | 1 748  | 2 410   | 0      | 0      | 0         | 4 158   |
| Somalia     | 1 026 132         | 30 000 | 41 271  | 18 805 | 0      | 0         | 90 076  |
| Tigray      | 843 241           | 1 847  | 20 956  | 11 769 | 6 005  | 0         | 40 577  |
| Grand Total | 3 562 856         | 41 341 | 113 630 | 36 188 | 6 005  | 453       | 197 615 |

Source: Ethiopia Ministry of Agriculture and partners group(2020).

the table shows that DL destroyed 1 228 352 quintals (122 853.2 metric tons) of cereal crop on 41 051 hectares of cropland in Oromia region, followed by 1 026 132 quintals (102 613.2MT) CC on 90 076 hectares of cropland in Somalia region and 843 241 quintals(84 324.1 MT) CC lost on 40 577, Sorghum 113 630 hectares were badly affected, similarly 41341 and 36 188hect, Maize and wheat respectively affected by DL. Barely and vegetable also damaged in Afar and Tigray.

The impact of desert locust on crop productivity affected many of household’s consumption behavior. The group assessment classified the households as poor, borderline, and acceptable food consumption. “Poor food consumption is extremely food insecure, borderline consumption mean eating the equivalent of cereals and vegetables on a daily basis plus oils/fats and sugar/sugar products about five and three days per week respectively and acceptable consumption were having, along with daily intake of cereals, vegetables, oil and sugar, on some

day(s) consumption of items with high concentration of proteins”(MoA ,et al, 2020 P.5). The table shows food consumption score of households in the regions of Ethiopia.

Table 15. Household Food Consumption Score

| Regions     | August 2019       |             |            | Feb 2020          |            |            |
|-------------|-------------------|-------------|------------|-------------------|------------|------------|
|             | Measurements in % |             |            | Measurements in % |            |            |
|             | Poor              | Border line | Acceptable | Poor              | Borderline | Acceptable |
| Afar        | 58                | 22          | 20         | 91                | 8          | 1          |
| Amhara      | 29                | 21          | 51         | 11                | 12         | 77         |
| Oromia      | 38                | 20          | 42         | 50                | 17         | 33         |
| SNNP        | 42                | 32          | 26         | 22                | 39         | 39         |
| Somalia     | 46                | 19          | 35         | 52                | 16         | 32         |
| Tigray      | 5                 | 21          | 74         | 3                 | 9          | 88         |
| Dire Dawa   | -                 | -           | -          | 13                | 25         | 62         |
| All regions | 37                | 24          | 39         | 41                | 17         | 42         |

Source: Ethiopia Ministry of agriculture and partners group

the table shows in Afar region household poor consumption increases from 58 percent in 2019 to 91 percent in 2020, borderline consumption decreases from 22 percent in 2019 to 8 percent in 2020 and Acceptable consumption decreases from 20 percent in 2019 to 1 percent in 2020. In table 5 above in 2020 Afar region DL destroyed 4 874hectares cropland and 202 882quintals(20 288.2 MT) CC. Amhara, Tigray and SNNP region shows household consumption improvement

in all levels from 2019 to 2020. Somalia and Oromia regions household poor consumption increased from 46 and 38 percent respectively in 2019 to 52 and 50 percent respectively in 2020. The DL damaged on cereal crops in 2020 in both regions were serious.

To control desert locust population experts have been discussed and studied for over 90 years(FAO,2006),Ministry of agriculture of the county with the cooperation of FAO, World Bank, Desert Locust Control Organization and the community are responsible to control the desert locust( World Bank, 2020). Efficient desert locust control inputs like pesticides, including biopesticides, through aerial and ground spraying is necessary to reduce their propagation and prevent their spread to new areas( World Bank & Samuel,2020).

### **3.4.Agriculture sub-sector**

In Ethiopia agricultural sector encompasses crop production, livestock, forestry, and fishery. Crops grown in different regions and ecologies of Ethiopia, grain crop is the major crop category includes cereals, pulses, and oilseeds, which is major food crops for the majority of country's population and used as a source of income at household level and part of foreign currency earnings as a national level. Moreover vegetables, fruit crops, root crops, chat, coffee, hops/gesho and sugarcane are the other categories of country's crop production. Table 7 shows grain crop total land area and production reached 12.86million and 335.19million in 2019/20, cereal crop accounted the maximum land area and volume of production in each year compared to pulses and oil seeds. In 2019/2020 total area covered by cereal crop was 10,478,218.03 and total production was 296,726,476.94quintal, yield per hectare is 28.32quintal, similarly in 2009/10 total area covered was 9,233,025.14hectare and production volume was 155,342,279.88quintal, yield per hectare is 16.82quintal, but in 2015/16 because of drought cereal crop production decreased by 2.02 percent over last year 2014/15. In 2019/20 Pulses covered 1,563,768.72 hectares and total production volume was 30,051,986.62quintals and yield per hectare is 19.22quintals and in 2009/10 pulses covered total area of 1,489,308.45hectares and total production was 18,980,472.57quintals, yield per hectare is 12.74quintals, but in 2010/11,2013/14,2014/15,2016/17 and 2019/20 pulses production decreased by-8.85,-6.48,-10.57,-6.23 and -3.5percent respectively and increased at a maximum level by 19.10 percent in 2011/12 from last year 2010/11. Similarly, oil seeds in 2019/20 total area of land covered was 820,792.09hectares and volume of production was 8,421,360.34 quintals, yields per hectare is

10.26 quintals and in 2009/10, 780,915.89 and 6,436,143.98 total area in hectares and production in quintals respectively and yield per hectare is 8.24 quintals. Cereal crop per hectare is more effective than the others and oil seeds is the lowest. Moreover, whole time period average annual growth of cereal crop production is 6.47 percent, and the farmland is grown by 1.27 percent, similarly pulses and Oilseed's production grew by 4.60 and 2.69 percent respectively and its farm area grew by 0.49 and 0.50 percent in 11 years period. Average annual growth from 2009/10-2014/15 cereal production is 8.37 percent and pulse, and oilseeds production grew by 6.48 and 3.33 percent respectively and from 2015/16-2019/20 cereal crop production grew by 5.72 percent and pulses and oilseeds production grew by 2.94 and 1.76 percent, respectively. In general, the whole years average annual growth of grains area grew by 1.12 and production grew by 6.18 percent. Cereal crop accounted the highest farm area and production volume compared to the others.

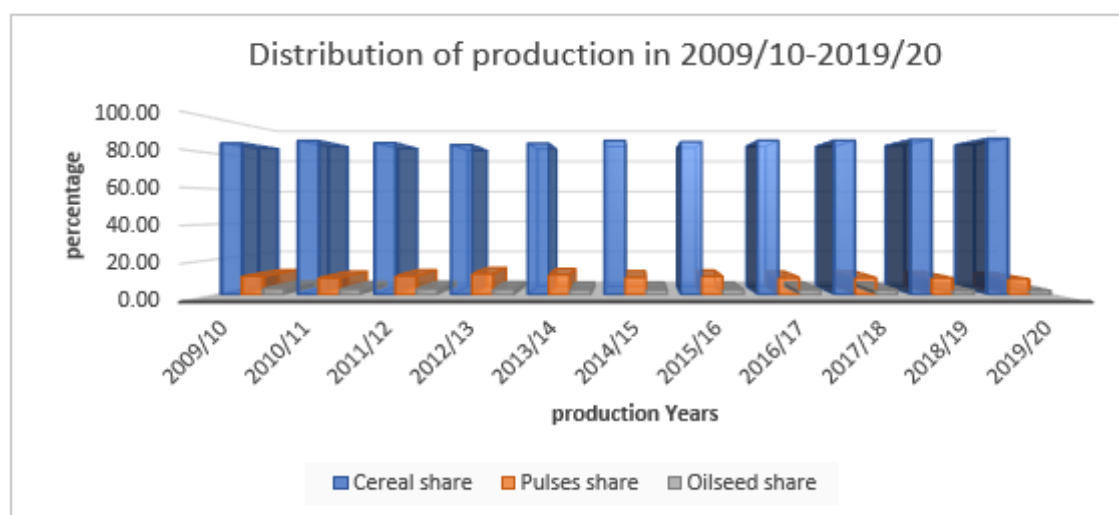
Table 16. Total Area and Production of Grain Crops for Private holdings, Meher Season

2009/10- 2019/2020

| Years   | Cereals       |        |                  |        | Pulses       |        |                  |        | Oil seeds  |        |                  |        | Grain Crops   |           |                  |        |
|---------|---------------|--------|------------------|--------|--------------|--------|------------------|--------|------------|--------|------------------|--------|---------------|-----------|------------------|--------|
|         | Total area    | %      | Total production | %      | Total area   | %      | Total production | %      | Total area | %      | Total production | %      | Total area    | %         | Total production | %      |
|         | in hectare    | Change | in Quintal       | Change | in hectare   | Change | in Quintal       | Change | in hectare | Change | in Quintal       | Change | in hectare    | Change    | in Quintal       | Change |
| 2009/10 | 9,233,025.14  |        | 155,342,279.88   |        | 1,489,308.45 |        | 18,980,472.57    |        | 780,915.89 |        | 6,436,143.98     |        | 11,503,249.48 |           | 180,758,896.43   |        |
| 2010/11 | 9,690,733.96  | 4.96   | 177,613,365.84   | 14.34  | 1,357,522.68 | -8.85  | 19,531,935.01    | 2.91   | 774,529.55 | -0.82  | 6,339,987.49     | -1.49  | 11,822,786.19 | 2.777795  | 203,485,288.34   | 12.57  |
| 2011/12 | 9,588,923.71  | -1.05  | 188,099,616.95   | 5.90   | 1,616,809.37 | 19.10  | 23,162,012.43    | 18.59  | 880,870.81 | 13.73  | 7,308,800.29     | 15.28  | 12,086,603.89 | 2.231434  | 218,570,429.67   | 7.41   |
| 2012/13 | 9,601,035.26  | 0.13   | 196,511,515.46   | 4.47   | 1,863,445.42 | 15.25  | 27,510,311.88    | 18.77  | 818,449.30 | -7.09  | 7,266,644.43     | -0.58  | 12,282,929.98 | 1.624328  | 231,288,471.77   | 5.82   |
| 2013/14 | 9,848,745.96  | 2.58   | 215,835,225.61   | 9.83   | 1,742,602.19 | -6.48  | 28,588,805.90    | 3.92   | 816,125.31 | -0.28  | 7,112,592.38     | -2.12  | 12,407,473.46 | 1.013956  | 251,536,623.90   | 8.75   |
| 2014/15 | 10,144,252.30 | 3.00   | 236,076,624.39   | 9.38   | 1,558,442.04 | -10.57 | 26,718,430.40    | -6.54  | 855,750.22 | 4.86   | 7,600,993.24     | 6.87   | 12,558,444.55 | 1.216775  | 270,396,048.03   | 7.50   |
| 2015/16 | 9,974,316.28  | -1.68  | 231,287,970.83   | -2.03  | 1,652,844.19 | 6.06   | 27,692,743.11    | 3.65   | 859,110.39 | 0.39   | 7,848,093.10     | 3.25   | 12,486,270.87 | -0.574702 | 266,828,807.04   | -1.32  |
| 2016/17 | 10,219,443.46 | 2.46   | 253,847,239.63   | 9.75   | 1,549,911.86 | -6.23  | 28,146,331.73    | 1.64   | 804,752.00 | -6.33  | 8,392,021.85     | 6.93   | 12,574,107.33 | 0.703464  | 290,385,593.21   | 8.83   |
| 2017/18 | 10,232,582.23 | 0.13   | 267,789,764.02   | 5.49   | 1,598,806.51 | 3.15   | 29,785,880.89    | 5.83   | 846,493.53 | 5.19   | 8,550,738.16     | 1.89   | 12,677,882.27 | 0.825307  | 306,126,383.06   | 5.42   |
| 2018/19 | 10,358,890.13 | 1.23   | 277,638,380.98   | 3.68   | 1,620,497.30 | 1.36   | 30,113,480.57    | 1.10   | 747,803.78 | -11.66 | 7,850,196.94     | -8.19  | 12,727,191.21 | 0.388937  | 315,602,058.49   | 3.10   |
| 2019/20 | 10,478,218.03 | 1.15   | 296,726,476.94   | 6.88   | 1,563,768.72 | -3.50  | 30,051,986.62    | -0.20  | 820,792.09 | 9.76   | 8,421,360.34     | 7.28   | 12,862,778.84 | 1.065338  | 335,199,823.90   | 6.21   |

Source: compiled from CSAE survey data

Figure 3 . Grain crop distribution by production

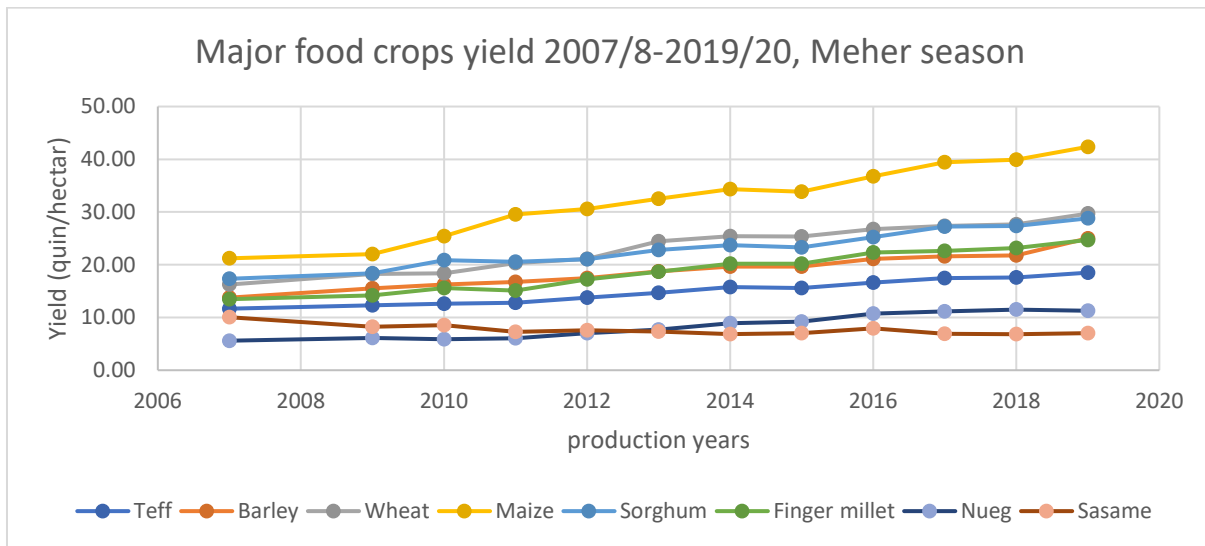


### 3.4.1 Trends of major food (Grain) crop production yield

Table 4 show that in 2019/20 estimated cropped area and volume of production have increased by about 1.07 percent and 6.21 percent respectively over last year 2018/19. The production yield per hectare for the selected crops increased for the last 11 years except sesame, in 2019/20 nueg and maize production per hectare grew by 6.38 and 6.29 percent respectively, but sesame grew by -3.29 percent; over the last seven years (2013/14-2019/20) average annual growth of nueg,

barley and Finger millet production yield per hectare is 6.35, 4.83 and 4.67 percent respectively, but sesame grew by -0.81. In 2019/20 Finger millet and barley production per hectare grew by 5.52 and 5.43 percent respectively. Sesame production is one of the export items, but its growth is going negatively.

Figure 4. Major food crops yield



### 3.4.2 Distribution of area and production under major crops

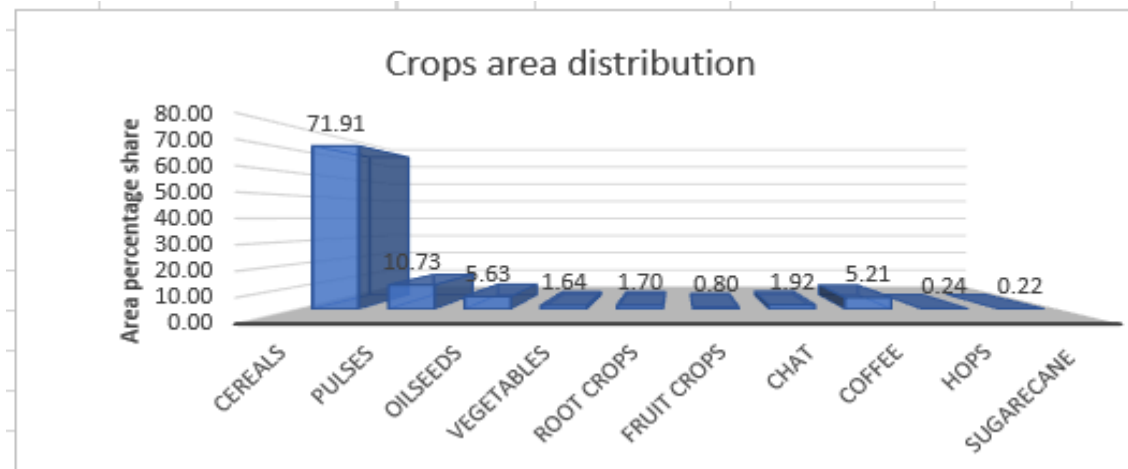
Table 8 show that major crops cereals and pulses accounted the maximum number of holders and area in hectare and production volume in 2018/19-2019/20. In 2019/20 Hops, Chat, Coffee, and Vegetables grew by 16.97,4.70,2.48 and 1.43 percent respectively, however Sugarcane, Oilseeds, Cereals and Fruit crops grew negatively by -13.65, -6.78, -6.43 and -1.10 percent, respectively. Sugarcane and Root crop production Yield per hectare is 467.4, 187.40 and 465.05 ,195.88 quintal in 2018/19 and 2019/20 respectively. Coffee is the lowest production yield per hectare in 2018/19 and 2019/20. In 2019/20 most of crop production decreases ranging from -13.68 to -1.10 percent and total area of land decreased ranging from -13.23 to -1.14 percent, for example Sugarcane and Oilseeds cultivated area decreased by -13.23 and -8.89 percent respectively, similarly root crops and Cereal crop production decreased by -6.77 and -1.14 percent respectively compared to 2018/19. Figure 5 indicated the percentage distribution of area under major crops in 2019/20.

Table .17 Distribution of Major crops in 2018/19-2019/2020

| Crops       | Number of holders | 2018/19         |        |                       |           | Number of holders | 2019/20        |           |            |                   |             |            |
|-------------|-------------------|-----------------|--------|-----------------------|-----------|-------------------|----------------|-----------|------------|-------------------|-------------|------------|
|             |                   | Area in Hectars | share% | Production in Quintal | Yield Q/H |                   | Area inHectars | A.share % | A.Growth % | Produ. in Quintal | P.Yield Q/H | P.growth % |
| Cereals     | 16,850,457        | 10,478,218.03   | 71.91  | 296,726,476.94        | 28.32     | 15,150,420        | 10,358,890.13  | 71.57     | -1.14%     | 277,638,380.98    | 26.80       | -6.43%     |
| Pulses      | 8,405,037         | 1,563,768.72    | 10.73  | 30,051,986.62         | 19.22     | 8,074,692         | 1,620,497.30   | 11.20     | 3.63%      | 30,113,480.57     | 18.58       | 0.20%      |
| Oilseeds    | 2,474,911.00      | 820792.09       | 5.63   | 8,421,360.34          | 10.26     | 2,824,730         | 747,803.78     | 5.17      | -8.89%     | 7,850,196.94      | 10.50       | -6.78%     |
| Vegetables  | 6,520,863         | 238564.07       | 1.64   | 8,767,390.66          | 36.75     | 6,323,879         | 241,191.40     | 1.67      | 1.10%      | 8,893,169.13      | 36.87       | 1.43%      |
| Root crops  | 5,844,287         | 248357.51       | 1.70   | 46,542,860.75         | 187.40    | 5,932,310         | 231,551.95     | 1.60      | -6.77%     | 45,357,549.36     | 195.88      | -2.55%     |
| Fruit crops | 5,462,709         | 116284.63       | 0.80   | 8,436,238.66          | 72.55     | 4,787,354         | 119,908.57     | 0.83      | 3.12%      | 8,343,562.20      | 69.58       | -1.10%     |
| Chat        | 3,579,420         | 279613.10       | 1.92   | 2,624,344.52          | 9.39      | 3,219,970         | 323,643.90     | 2.24      | 15.75%     | 2,747,770.98      | 8.49        | 4.70%      |
| Coffee      | 6,312,486.00      | 758523.29       | 5.21   | 4,825,605.71          | 6.36      | 5,148,340         | 764,863.16     | 5.28      | 0.84%      | 4,945,743.63      | 6.47        | 2.49%      |
| Hops        | 2,577,432         | 34494.85        | 0.24   | 419,345.98            | 12.16     | 2,591,305         | 38,112.41      | 0.26      | 10.49%     | 490,521.26        | 12.87       | 16.97%     |
| sugarcane   | 1,125,217         | 32068.92        | 0.22   | 14,991,344.23         | 467.47    | 998,749           | 27,826.98      | 0.19      | -13.23%    | 12,940,810.52     | 465.05      | -13.68%    |

Source: compiled from CSA survey data

Figure5. Percentage distribution of area under major crops in 2019/20



### 3.4.3 Evaluation of agricultural productivity and efficiency

Agricultural productivity and efficiency of a micro or macro region is closely influenced by physical (physiography, climate, soil, water), socioeconomic, political, institutional, and organizational factors (FAO,2017). The measurement of agricultural productivity and efficiency helps to identify the areas that are performing well or poor in comparison to the neighboring areas. By selected the major crops from the CSA survey data of 2012/13, Endeyi’s method was used to compute crop productivity index of the regions.

$$\text{Productivity Index} = \left( \frac{Y}{Y_n} \div \frac{T}{T_n} \right) * 100$$

Where:

Y-product of the selected crops in a unite area in the region,

Yn – Total production of the selected crops in the entire region,

T – Area under selected crops in unit area,

Tn– Total cropped area in the entire region,

By using the above formula the productivity index were calculated for 8 regions for the year 2012/2013 and classified the productivity as high, moderate and low productivity regions. To classify the productivity indices, the statistical method quartiles was applied. The index value which lies below in the first quartile was named as Low Productivity Regions, the index value lies between first and third quartiles is marked as Moderate Productivity Regions and index values which lies above the third quartile is named as High Productivity Regions. Table 18 was the bases of calculation for the productivity index of the regions. The result and discussion described below in table 19:

Table 18. Selected Grain crops area and production for private Peasant Holdings for Meher Season 2012/2013

| Regions   | Teff               |                          | Barley             |                          | Wheat              |                          | Maize              |                          | Sorghum            |                          | Fingure millet     |                          |
|-----------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|--------------------|--------------------------|
|           | Area<br>in hectare | production<br>in Quintal | Area<br>in hectare | production<br>in Quintal | Area<br>in hectare | production<br>in Quintal | Area<br>in hectare | production<br>in Quintal | Area<br>in hectare | production<br>in Quintal | Area<br>in hectare | production<br>in Quintal |
| Tigray    | 161,798.11         | 2,122,234.54             | 98,162.52          | 1,588,109.44             | 111,846.34         | 2,052,724.49             | 69,026.20          | 1,611,595.43             | 208,390.45         | 5,051,383.77             | 78,663.67          | 1,391,749.88             |
| Afar      | 0                  | 0                        | 0                  | 0                        | 0                  | 0                        | 3,346.35           | 188,482.63               | 0                  | 0                        | 0                  | 0                        |
| Amhara    | 1,090,139.50       | 15,281,977.33            | 388,113.19         | 5,905,028.22             | 498,192.03         | 8,885,685.80             | 434,641.83         | 12,629,728.51            | 578,276.40         | 11,227,669.52            | 226,547.40         | 4,076,438.95             |
| Oromia    | 1,256,564.80       | 17,535,596.51            | 448,545.32         | 8,977,417.59             | 872,971.81         | 20,262,900.10            | 1,115,957.40       | 35,908,457.46            | 675,657.31         | 14,898,156.74            | 92,306.89          | 1,532,059.62             |
| Somalia   | 0                  | 0                        | 0                  | 0                        | 4,150.13           | 92,781.82                | 28,808.44          | 920,293.39               | 31,593.75          | 980,619.38               | 0                  | 0                        |
| Ben-Gumuz | 19,389.08          | 197,194.05               | 723.21             | 7,877.64                 | 1,770.90           | 29,460.56                | 49,476.37          | 1,454,544.88             | 65,933.36          | 1,309,957.16             | 29,114.90          | 365,682.81               |
| S.N.N.P   | 202,375.61         | 2,515,409.23             | 82,040.19          | 1,314,679.86             | 138,351.34         | 3,022,336.80             | 305,204.64         | 8,718,901.74             | 131,516.72         | 2,245,193.80             | 4,873.12           | 2,245,193.80             |
| Gambela   | 0                  | 0                        | 26.92              | 0                        | 0                  | 0                        | 5,070.81           | 119,724.88               | 3,662.18           | 82,322.40                | 0                  | 0                        |
| Total     | 2,730,267.10       | 37,652,411.66            | 1,017,611.35       | 17,793,112.75            | 1,627,282.55       | 34,345,889.57            | 2,011,532.04       | 61,551,728.92            | 1,695,030.17       | 35,795,302.77            | 431,505.98         | 9,611,125.06             |

Source: CSA survey data

Table 19 show that productivity index of Teff crop is lowest in Afar, Gambela and Somalia regions, those regions were repeatedly damaged by drought and climatic change related factors, while Teff crop productivity index in Tigray, Ben.Gumz and SNNP regions were moderate and Amhara and Oromia Teff crop productivity index was high, relatively in the two regions rainfall is available and climatic condition is stable, as a result Teff production is more better than the



other regions in Ethiopia. Barley crop production in Afar, Gambela and Somalia region was the lowest as Teff crop because same reasoning, Amhara, Ben.Gumz and SNNP regions Barley crop productivity was moderate, and Tigray and Oromia region Barley crop production was high. Wheat, Maize, Sorghum and finger millet crops productivity was low in regions of Afar, Gambela; Tigray, Gmbela; Afar and Afar, Somalia, Gambela respectively, while moderate productivity in regions of Tigray, Amhara, Ben.Gumz, SNNP; Amhara, Somalia, Ben. Gumz, SNNP; Amhara, Oromia, Ben. Gumz, SNNP and Tigray, Oromia, Ben. Gumz respectively, similarly high productivity in regions of Oromia, Somalia; Afar, Oromia; Tigray, Somalia, Gambela; Amhara, SNNP respectively. In general, it is clearly seen that which crop item is more productive in each region and it is a good indication that stakeholders give emphasis to maximize productivity by using suitable crops to the regions.

Table 19. Productivity index of the regions in 2012/13

### Crops

| Regions  | Teff   | Barley | Wheat  | Maize  | Sorghum | Fingure millet |
|----------|--------|--------|--------|--------|---------|----------------|
| Tigray   | 95.11  | 92.53  | 86.96  | 76.30  | 114.78  | 79.43          |
| Afar     | 0.00   | 0.00   | 0.00   | 184.07 | 0.00    | 0.00           |
| Amhara   | 101.65 | 87.01  | 84.50  | 94.96  | 91.94   | 80.79          |
| Oromia   | 101.19 | 114.47 | 109.97 | 105.16 | 104.41  | 74.52          |
| Somalia  | 0.00   | 0.00   | 105.92 | 104.40 | 146.98  | 0.00           |
| Ben Gumz | 73.75  | 62.30  | 78.82  | 96.08  | 94.08   | 56.39          |
| S.N.N.P  | 90.13  | 91.65  | 103.50 | 93.36  | 80.84   | 2068.52        |
| Gambela  | 0.00   | 0.00   | 0.00   | 7.72   | 106.45  | 0.00           |

Source: compiled based on Table 18.

|             | Teff                  |                        |
|-------------|-----------------------|------------------------|
| Index Range | Category              | Region                 |
| 0           | low productivity      | Afar, Somalia, Gambela |
| 73.75-99.67 | Moderate productivity | Tigray, Ben.Gumz, SNNP |
| Above 99.67 | High productivity R.  | Amhara, Oromia         |

|              |                       |                                 |
|--------------|-----------------------|---------------------------------|
|              | Barley                |                                 |
| 0            | low productivity      | Afar,Somalia, Gambela           |
| 74.66-92.31  | Moderate productivity | Amhara,Ben.Gumz,SNNP            |
| Above 92.31  | High productivity R.  | Tigray,Oromia                   |
|              | Wheat                 |                                 |
| Below 19.70  | low productivity      | Afar,Gambela                    |
| 19.70-105.32 | Moderate productivity | Tigray, Amhara,Ben.Gumz,SNNP    |
| Above 105.32 | High productivity R.  | Oromia, Somalia                 |
|              | Maize                 |                                 |
| Below 80.57  | low productivity      | Tigray, Gambela                 |
| 80.57-104.97 | Moderate productivity | Amhara,Somalia,Ben.Gumz,SNNP    |
| Above 104.97 | High productivity R.  | Afar, Oromia                    |
|              | Sorghum               |                                 |
| Below 83.61  | low productivity      | Afar                            |
| 83.57-112.70 | Moderate productivity | Amhara,<br>Oromia,Ben.Gumz,SNNP |
| Above 112.70 | High productivity R.  | Tigray,Somalia,Gambela          |
|              | Finger Millet         |                                 |
| 0            | low productivity      | Afar,Somalia, Gambela           |
| 56.39-80.45  | Moderate productivity | Tigray, Oromia,Ben. Gumz        |
| Above 80.45  | Moderate productivity | Amhara,SNNP                     |

Similarly, to compute agricultural efficiency of the regions, Bhatia's measuring method was applied.

$$E_i = \frac{\sum I_{ij}}{C_{ij}}$$

Where,  $E_i$ - Agricultural efficiency

( $Y_{ij}$ )- Yield of individual crop of the individual area 'i' under the total area

$I_{ij}$ -Ratio between ( $Y_{ij}$ )

Yi- The average yield rate of the entire area ‘j’ of any crop multiplied by 100,

Cij- Area in % for individual crop in individual areal unit,

to calculate the agricultural efficiency of 8 regions, CSA survey data of 2012/13 was used. The result and discussion are shown in table 20 below. Categorization of the result was the same as productivity index.

Agricultural efficiency was low in Gambela and Ben. Gumz regions, however Tigray, Afar, Amhara, Somalia, SNNP regions agricultural efficiency was moderate and Oromia region agricultural efficiency was high. Afar region is one of the hottest regions that produced only maize, which is drought resistant crop, unlike Oromia region is one of the productive regions with suitable climatic conditions and accounted most of the crop production in the country. In terms of aggregate crop production Amhara is the second largest crop producer region and third SNNP. Part of Somalia region is hottest and unable to grow some crops like Teff, Barley and Finger millet which are popular food in the county. More effort should spend on better crop producing region in order to maximize production and increase food security. Poor agricultural efficiency region should replace by others suitable sectors.

Yij in(kg/hectare)

| Regions   | Teff    | Barley  | Wheat   | Maize   | Sorghum | Fing.millet |
|-----------|---------|---------|---------|---------|---------|-------------|
| Tigray    | 1311.66 | 1617.84 | 1835.31 | 2334.76 | 2424.00 | 1769.24     |
| Afar      | 0.00    | 0.00    | 0.00    | 5632.48 | 0.00    | 0.00        |
| Amhara    | 1401.84 | 1521.47 | 1783.59 | 2905.78 | 1941.57 | 1799.38     |
| Oromia    | 1395.52 | 2001.45 | 2321.14 | 3217.73 | 2204.99 | 0.00        |
| Somalia   | 0.00    | 0.00    | 2235.64 | 3194.53 | 3103.84 | 1256.00     |
| Ben-Gumuz | 1017.04 | 1089.26 | 1663.59 | 2939.88 | 1986.79 | 0.00        |
| S.N.N.P   | 1242.94 | 1602.48 | 2184.54 | 2856.74 | 1707.15 | 1256.00     |
| Gambela   | 0.00    | 0.00    | 0.00    | 2361.06 | 2247.91 | 46073.03    |

Cij Result

| <u>Regions</u> | <u>Teff</u> | <u>Barley</u> | <u>Wheat</u> | <u>Maize</u> | <u>Sorghum</u> | <u>F.Millet</u> |
|----------------|-------------|---------------|--------------|--------------|----------------|-----------------|
| <u>Tigray</u>  | 22.23       | 13.49         | 15.37        | 9.48         | 28.63          | 10.81           |

|                  |       |       |       |        |       |       |
|------------------|-------|-------|-------|--------|-------|-------|
| <u>Afar</u>      | 0.00  | 0.00  | 0.00  | 100.00 | 0.00  | 0.00  |
| <u>Amhara</u>    | 33.90 | 12.07 | 15.49 | 13.52  | 17.98 | 7.04  |
| <u>Oromia</u>    | 28.16 | 10.05 | 11.17 | 25.01  | 15.14 | 2.07  |
| <u>Somalia</u>   | 0.00  | 0.00  | 6.43  | 44.63  | 48.94 | 0.00  |
| <u>Ben-Gumuz</u> | 11.65 | 0.43  | 1.06  | 29.73  | 39.62 | 17.50 |
| <u>S.N.N.P</u>   | 23.41 | 9.49  | 16.01 | 35.31  | 15.22 | 0.56  |
| <u>Gambela</u>   | 0.00  | 0.31  | 0.00  | 57.89  | 41.81 | 0.00  |

Table 20. Agricultural Efficiency

| Regions   | Agricultural efficiency |   |  |         |          |              |                                     |
|-----------|-------------------------|---|--|---------|----------|--------------|-------------------------------------|
| Tigray    | 123.09                  | Degree of<br>Agricultural<br>Efficiency | Range of<br>Agricultural<br>Efficiency | Regions |          |              |                                     |
| Afar      | 177.1                   |   |  |         |          |              |                                     |
| Amhara    | 128.99                  |   |  |         |          |              |                                     |
| Oromia    | 143.06                  |   |  |         | Low      | below 96.55  | Ben. Gumz, Gambela                  |
| Somalia   | 132.21                  |   |  |         | Moderate | 96.55-140.35 | Tigray, Afar, Amhara, Somalia, SNNP |
| Ben-Gumuz | 87.7                    |   |  |         | High     | above 140.35 | Oromia                              |
| S.N.N.P   | 124.33                  |   |  |         |          |              |                                     |
| Gambela   | 9.11                    |   |  |         |          |              |                                     |

#### 3.4.4 Export of Agricultural products

In Ethiopia there are different varieties of crops are growing , such as grains, vegetables, root crops, coffee, inset, chat, cotton etc. Most of the crops are used for domestic consumption, raw materials for domestic agro-industries and for exports. Agricultural products accounted majority of country's foreign exchange earnings. Coffee, oilseeds, and pulses are among the top export crop products. Table 21 shows Ethiopia's major export items including agricultural and nonagricultural products, agricultural products export share accounted 73.4 percent and 91.9 percent in 2012/13 and 2018/19 respectively. Agricultural product exports share increased from 2012/13 to 2015/16, on average it grew by 3.43 percent, while nonagricultural product export shares decreased in the same years and on average it grew negatively by -11.86 percent. Whole time overall average agricultural products export share grew by 1.85 percent. Coffee is the major

and longstanding export agricultural product, in 2018/19 coffee export value dropped to -8.90 percent, but in 2019/20 turned to 12.01 percent. Coffee export share decreased from 30.4 percent in 2016/17 to 28.6 percent in 2019/20. The average share of coffee between (2016/17-2019/20) grew by -1.95 percent and the whole years average share of coffee grew by 2.55 percent. Similarly, oilseeds export shares decreased from 2013/14 to 2016/17 and on average it grew by -16.42 percent between the same years and the whole years average oilseeds share grew by -2.99 percent. Pulses crop export share increased from 2014/15 to 2016/17 and on average its share grew by 12.06 percent between the same years and the whole years average export share of oilseeds grew by 0.69 percent. The rest agricultural products export share has similar pattern like explained above.

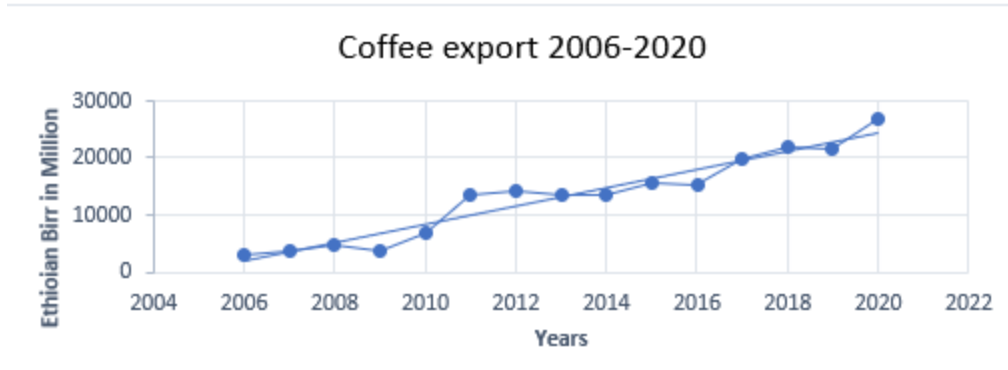
Table 21. Value of Major export Items of Ethiopia

Million USD

| Items                           | (million USD) |         |         |         |         |         |         |         |
|---------------------------------|---------------|---------|---------|---------|---------|---------|---------|---------|
|                                 | 2012/13       | 2013/14 | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
| Coffee                          | 746.6         | 714.4   | 780.5   | 722.7   | 883.2   | 839     | 764.1   | 855.9   |
| Oilseeds                        | 443.5         | 651.9   | 510.1   | 477.2   | 351     | 423.5   | 387.8   | 345     |
| Leather and leather products    | 121.1         | 129.8   | 131.6   | 115.3   | 114     | 132.4   | 117.4   | 72      |
| Pulses                          | 233.3         | 250.7   | 219.9   | 232.4   | 279.9   | 269.5   | 272.3   | 234.8   |
| Meat and Meat products          | 74.3          | 74.6    | 92.8    | 96.4    | 98.7    | 101.7   | 88.6    | 67.4    |
| Textile and Textile products    |               |         |         |         |         | 103.8   | 152.9   | 168.9   |
| Fruits and vegetables           | 43.9          | 45.9    | 47.6    | 53.7    | 56.1    | 61.4    | 60.9    | 58.8    |
| Live Animals                    | 166.4         | 186.68  | 148.51  | 147.8   | 67.6    | 61.1    | 45.8    | 54.1    |
| Chat                            | 271.27        | 297.35  | 272.42  | 262.5   | 273     | 263.2   | 303.6   | 324.4   |
| Gold                            | 578.8         | 456.2   | 318.7   | 290.7   | 208.8   | 100.2   | 27.9    | 196.5   |
| Flower                          | 186.7         | 199.7   | 203.1   | 225.3   | 218.5   | 228.6   | 256.6   | 422.3   |
| Electricity                     | 34.6          | 45.3    | 42.8    | 31.5    | 73.4    | 80.5    | 55.7    | 66.4    |
| Others                          | 215.4         | 247.4   | 251.4   | 212.3   | 283.2   | 171.2   | 132.9   | 121.1   |
| Total                           | 3115.87       | 3299.93 | 3019.43 | 2867.8  | 2907.4  | 2836.1  | 2666.5  | 2987.6  |
| Total non agriculture exports   | 828.8         | 748.9   | 612.9   | 534.5   | 565.4   | 351.9   | 216.5   | 384     |
| Total agriculture export        | 2287.07       | 2551.03 | 2406.53 | 2333.3  | 2342    | 2484.2  | 2450    | 2603.6  |
| Agricultural share of export    | 73.4%         | 77.3%   | 79.7%   | 81.4%   | 80.6%   | 87.6%   | 91.9%   | 87.1%   |
| Non agriculture share of export | 26.6%         | 22.7%   | 20.3%   | 18.6%   | 19.4%   | 12.4%   | 8.1%    | 12.9%   |
| Coffee shares                   | 24.0%         | 21.6%   | 25.8%   | 25.2%   | 30.4%   | 29.6%   | 28.7%   | 28.6%   |
| Oilseeds shares                 | 14.2%         | 19.8%   | 16.9%   | 16.6%   | 12.1%   | 14.9%   | 14.5%   | 11.5%   |
| pulses shares                   | 7.5%          | 7.6%    | 7.3%    | 8.1%    | 9.6%    | 9.5%    | 10.2%   | 7.9%    |

Source: Compiled from National Bank data of Ethiopia

Figure 6. coffee export growth trend



### 3.4.5 Livestock in Ethiopia

Ethiopia is one of the top countries that has the largest livestock population and the highest draught animal population in Africa. Livestock sector has multiple functions in the country's economy by providing food, raw material for the industry, for breeding purposes, transportation, draught, and others. Categorically, camel, Horses, Mule and Asses mostly used for transportation, draught, and others, however, Camel has extra use for meat and milk. Similarly, Cattle, sheep and goat have a common characteristic used for meat and breeding and particular characteristics of Cattle and goat used for milk and sheep used for wool and cattle used for draught, moreover poultry and Beehives used for food. Most of livestock are growing in all parts of the country, table 13 show that total livestock population reached 231.82 million in 2019/20 and the whole period average annual growth is 4.41 percent. cattle and poultry have the top position in livestock production in the country and its share accounted 56.59 and 49.31 percent of the total livestock in the period 2018/19 and 2019/20 respectively, cattle population alone accounted 28.19 percent of the total livestock of the country in 2019/20. Cattle population volume reached 65.35million in 2019/20 and increased by volume between 2003/4-2010/11 and on average it grew by 4.82 percent in the same period. The cattle increased by 10.61 percent in 2007/8 over the last year 2006/7 and decreased by -2.35 in 2011/12 compared to previous year 2010/11, but it increased from 2012/13- 2019/20 by the range of 1.52 to 6.25 percent and on average it grew by 2.83 percent in the period (2011/12-2019/20), over the whole period of time cattle population grew by 3.37 percent.

Sheep population volume was 39.89million in 2019/20 and its share of the total livestock population is 17.21 percent. From 2015/16-2019/20 sheep population increased continuously, and it grew by 8.07 percent between the same years. In 2019/20 number of sheep increased by

20.82 percent over the previous year 2018/19, similarly its volume increased from 2003/4-2007/8 and on annual average it grew by 11.37 percent, however, sheep volume dropped over the years in 2008/9,2010/11,2011/12 and 2015/16 ranging from -5.05 to 1.50,moreover the whole period annual growth of sheep population is 5.49 percent. Goat population share accounted 18.23 and 21.78 percent in 2018/19 and 2019/20 respectively, goat population increased continuously in the period between 2003/4 to 2009/10 ranging from 0.35 to 17.84 percent, annual average growth of the goat between the same period is 7.70 percent, at a maximum level it increased by 29.61 percent in 2019/20 over the last period 2018/19 and annual growth over the whole period is 8.09 percent. Similarly, in 2019/20 Horses, Asses, Mules and Camels share of the total livestock is 0.91, 0.15, 4.31 and 3.32 respectively and overall annual growth in 17 years is 2.36,-14.72,21.48 and 17.46 percent respectively. In 2019/20 Poultry and Beehives share accounted 21.12 and 3.00 percent respectively. Annual average growth of the whole years is 1.98 and 3.11 percent respectively. In general cattle, Sheep and Goat are the most significant livestock type in the agricultural sector and it accounted more than 60 percent of the total livestock population.

Table 22. Number of livestock by type

| Years   | All livestock |         |            |         |            |         |           |         |           |         |           |         |           |         |            |         |           |         |
|---------|---------------|---------|------------|---------|------------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|---------|------------|---------|-----------|---------|
|         | Cattle        | %Change | Sheep      | %Change | Goats      | %Change | Horses    | %Change | Asses     | %Change | Mules     | %Change | Camels    | %Change | Poultry    | %Change | Beehives  | %Change |
| 2003/4  | 38,102,682    |         | 16,575,493 |         | 13,834,703 |         | 1,447,274 |         | 3,769,871 |         | 321,339   |         | 471,145   |         | 35,656,385 |         | 4,228,612 |         |
| 2004/5  | 38,749,310    | 1.70    | 18,074,721 | 9.04    | 14,858,646 | 7.40    | 1,517,585 | 4.86    | 3,930,227 | 4.25    | 317,671   | -1.14   | 458,576   | -2.67   | 30,868,525 | -13.43  | 4,546,244 | 7.51    |
| 2005/6  | 40,281,110    | 3.95    | 20,721,562 | 14.64   | 16,248,899 | 9.36    | 1,569,318 | 3.41    | 4,280,542 | 8.91    | 340,572   | 7.21    | 436,622   | -4.79   | 32,032,199 | 3.77    | 4,012,515 | -11.74  |
| 2006/7  | 43,007,315    | 6.77    | 23,617,496 | 13.98   | 18,423,395 | 13.38   | 1,655,284 | 5.48    | 4,486,171 | 4.80    | 325,659   | -4.38   | 615,197   | 40.90   | 33,957,837 | 6.01    | 4,870,679 | 21.39   |
| 2007/8  | 47,570,675    | 10.61   | 26,117,272 | 10.58   | 21,709,428 | 17.84   | 1,775,794 | 7.28    | 5,572,931 | 24.22   | 376,682   | 15.67   | 1,009,040 | 64.02   | 39,563,902 | 16.51   | 4,688,278 | -3.74   |
| 2008/9  | 49,297,898    | 3.63    | 25,017,218 | -4.21   | 21,884,222 | 0.81    | 1,787,211 | 0.64    | 5,421,895 | -2.71   | 373,519   | -0.84   | 759,696   | -24.71  | 38,127,504 | -3.63   | 5,149,244 | 9.83    |
| 2009/10 | 50,884,005    | 3.22    | 25,979,919 | 3.85    | 21,960,706 | 0.35    | 1,995,306 | 11.64   | 5,715,129 | 5.41    | 365,584   | -2.12   | 807,581   | 6.30    | 42,053,263 | 10.30   | 4,598,226 | -10.70  |
| 2010/11 | 53,382,194    | 4.91    | 25,509,004 | -1.81   | 22,786,946 | 3.76    | 2,028,233 | 1.65    | 6,209,665 | 8.65    | 385,374   | 5.41    | 1,102,119 | 36.47   | 49,286,932 | 17.20   | 5,130,322 | 11.57   |
| 2011/12 | 52,129,017    | -2.35   | 24,221,384 | -5.05   | 22,613,105 | -0.76   | 1,961,949 | -3.27   | 6,438,435 | 3.68    | 368,781   | -4.31   | 979,318   | -11.14  | 44,893,009 | -8.91   | 4,993,815 | -2.66   |
| 2012/13 | 53,990,061    | 3.57    | 25,489,204 | 5.23    | 24,060,792 | 6.40    | 1,907,047 | -2.80   | 350,026   | -94.56  | 6,748,357 | 1729.91 | 915,518   | -6.51   | 50,377,142 | 12.22   | 5,207,300 | 4.27    |
| 2013/14 | 55,027,280    | 1.92    | 27,347,933 | 7.29    | 28,163,332 | 17.05   | 1,963,010 | 2.93    | 356,087   | 1.73    | 6,953,077 | 3.03    | 1,098,312 | 19.97   | 51,350,738 | 1.93    | 5,124,228 | -1.60   |
| 2014/15 | 56,706,389    | 3.05    | 29,332,382 | 7.26    | 29,112,963 | 3.37    | 2,033,115 | 3.57    | 400,329   | 12.42   | 7,428,037 | 6.83    | 1,164,106 | 5.99    | 56,866,719 | 10.74   | 5,885,263 | 14.85   |
| 2015/16 | 57,829,953    | 1.98    | 28,892,380 | -1.50   | 29,704,958 | 2.03    | 2,082,203 | 2.41    | 405,950   | 1.40    | 7,881,394 | 6.10    | 1,228,023 | 5.49    | 60,505,327 | 6.40    | 5,916,100 | 0.52    |
| 2016/17 | 59,486,667    | 2.86    | 30,697,942 | 6.25    | 30,200,226 | 1.67    | 2,158,176 | 3.65    | 409,877   | 0.97    | 8,439,220 | 7.08    | 1,209,321 | -1.52   | 59,495,026 | -1.67   | 6,189,329 | 4.62    |
| 2017/18 | 60,392,019    | 1.52    | 31,302,257 | 1.97    | 32,738,385 | 8.40    | 2,007,829 | -6.97   | 461,665   | 12.64   | 8,845,589 | 4.82    | 1,418,457 | 17.29   | 56,056,778 | -5.78   | 6,523,969 | 5.41    |
| 2018/19 | 61,510,258    | 1.85    | 33,020,392 | 5.49    | 38,963,879 | 19.02   | 1,930,808 | -3.84   | 370,552   | -19.74  | 9,655,441 | 9.16    | 1,760,870 | 24.14   | 59,420,266 | 6.00    | 7,075,188 | 8.45    |
| 2019/20 | 65,354,090    | 6.25    | 39,894,394 | 20.82   | 50,501,672 | 29.61   | 2,111,134 | 9.34    | 357,603   | -3.49   | 9,987,762 | 3.44    | 7,702,493 | 337.43  | 48,955,675 | -17.61  | 6,958,004 | -1.66   |

Source: compiled from CSA survey data

Livestock population is unevenly distributed in the regions of Ethiopia, Table 22 shows that Horse is not growing in 60 percent of the regions, similarly Asses and Mules are not growing in 40 percent of the region. Cattle, Sheep, Goat and Poultry livestock are growing in all regions of the country, the concentration of total livestock population is high in regions of Oromia and Amhara, it accounted 67.64 million and 55.90 million respectively, moreover, these two regions are performed high crop production and land area annually, the least livestock population is located in Gambela, Harari and Dire Dawa and total number of livestock has 783,398,301,060 and 562,594 respectively. In 2019/20 the share of cattle population in Oromia and Amhara accounted 38.30 and 24.97 percent respectively and both accounted 63.27 percent of the total livestock population. Three regions Amhara, Oromia and SNNP share of cattle population accounted 82.25 percent and the rest seven regions share is 17.75 percent. Amhara region accounted maximum share of sheep which is 26.03 percent and Oromia and Somalia share 23.21 and 23.03 percent respectively, similarly Somalia accounted the maximum share of Goat which is 33.67 percent and share of goat in Afar region is 16.89 percent. Oromia accounted the



maximum share of Horse, Asses that is 62.76 and 36.45 percent and 51.64 percent share mule situated in Amhara region and 79.6 percent of Camel share located in Somalia region. Similarly, poultry share is high in Amhara and Oromia and Beehives share is high in Oromia. In general Oromia region accounted the maximum share of total livestock population 29.2 percent and Amhara region share accounted 24.1, whereas Ben.Gumuz, Gambela, Harari and Dire Dawa share of total livestock population is the lowest and accounted 1.0, 0.3, 0.1 and 0.2 percent respectively.

Table 23. Livestock distribution in the region

All livestock in 209/20

|            | Cattle     | share % | Sheep      | share% | Goats      | share% | Horses    | share% | Asses     | share% | Mules   | share% | Camels    | share% | Poultry    | share% | Beehives  | share%      |
|------------|------------|---------|------------|--------|------------|--------|-----------|--------|-----------|--------|---------|--------|-----------|--------|------------|--------|-----------|-------------|
| Ethiopia   | 65,354,090 |         | 39,894,394 |        | 50,501,672 |        | 2,111,134 |        | 9,987,762 |        | 357,603 |        | 7,702,493 |        | 48,955,675 |        | 6,958,004 | 231,822,827 |
| Tigray     | 4,908,964  | 7.51    | 2,097,619  | 5.26   | 4,838,969  | 9.58   | 2,558     | 0.12   | 901,002   | 9.02   | 8,078   | 2.26   | 46,436    | 0.6    | 6,317,518  | 12.90  | 343,243   | 4.93        |
| Afar       | 1,952,394  | 2.99    | 4,040,176  | 10.13  | 8,531,082  | 16.89  | 0         | 0.00   | 317,065   | 3.17   | 0       | 0.00   | 1,162,311 | 15.1   | 92,941     | 0.19   | 35,216    | 0.51        |
| Amhara     | 16,318,446 | 24.97   | 10,386,223 | 26.03  | 6,883,316  | 13.63  | 461,620   | 21.87  | 3,435,729 | 34.40  | 184,657 | 51.64  | 49,467    | 0.6    | 16,827,119 | 34.37  | 1,353,537 | 19.45       |
| Oromia     | 25,031,068 | 38.30   | 9,260,493  | 23.21  | 7,526,644  | 14.90  | 1,324,903 | 62.76  | 3,640,642 | 36.45  | 108,356 | 30.30  | 294,331   | 3.8    | 16,668,657 | 34.05  | 3,782,186 | 54.36       |
| Somalia    | 3,646,940  | 5.58    | 9,188,394  | 23.03  | 17,001,673 | 33.67  | 0         | 0.00   | 772,584   | 7.74   | 529     | 0.15   | 6,132,355 | 79.6   | 354,264    | 0.72   | 0         | 0.00        |
| Ben.-Gumuz | 626,537    | 0.96    | 72,284     | 0.18   | 404,015    | 0.80   | 0         | 0.00   | 62,584    | 0.63   | 2,705   | 0.76   | 0         | 0.0    | 884,660    | 1.81   | 153,781   | 2.21        |
| SNNP       | 12,404,963 | 18.98   | 4,735,604  | 11.87  | 4,819,573  | 9.54   | 318,654   | 15.09  | 818,595   | 8.20   | 52,679  | 14.73  | 0         | 0.0    | 7,347,205  | 15.01  | 1,155,017 | 16.60       |
| Gambela    | 327,801    | 0.50    | 43,903     | 0.11   | 134,206    | 0.27   | 0         | 0.00   | 0         | 0.00   | 0       | 0.00   | 0         | 0.0    | 229,151    | 0.47   | 48,337    | 0.69        |
| Harari     | 69,615     | 0.11    | 4,236      | 0.01   | 103,567    | 0.21   | 0         | 0.00   | 14,649    | 0.15   | 0       | 0.00   | 0         | 0.0    | 104,585    | 0.21   | 4,408     | 0.06        |
| Dire Dawa  | 67,364     | 0.10    | 65,462     | 0.16   | 258,629    | 0.51   | 0         | 0.00   | 24,702    | 0.25   | 0       | 0.00   | 16,862    | 0.2    | 129,575    | 0.26   | 0         | 0.00        |

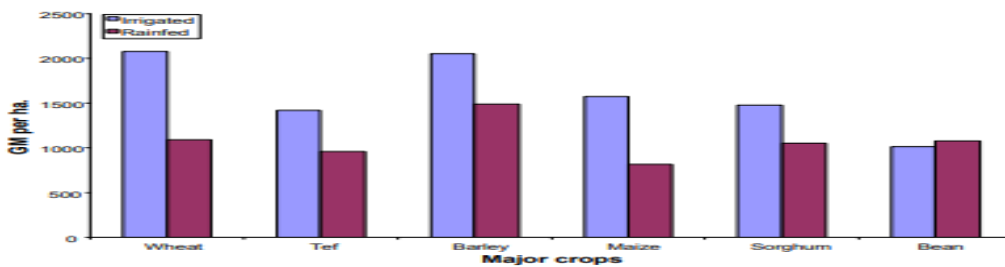
Source: compiled from CSA survey data

### 3.4.6 Irrigation practices in Ethiopia

Many literatures showed that irrigation in Ethiopia was started during ancient times by smallholder farmers, however modern irrigation started during 1950's (Haile and Kassa, 2015 p. 265). The total potential irrigable land in Ethiopia is estimated to be 5.3 million hectares (Awulachew et al,2010). According to CSA data 2019/20, at present 211,047 hectares of land covered under irrigation agriculture, the estimated utilization of irrigation farm accounted 3.98 percent that is food crops (96.02 percent ) in Ethiopia come from rainfed agriculture. It is obvious that improving the irrigation sector can increase agricultural productivity and helps to attain food security and sustainable development, moreover it reduced reliance on rainfall(Awulachew et al,2010). Ethiopia has abundant water resources; it has 12 river basins with annual surface runoff volume estimated 125 million m<sup>3</sup> and ground water potential

estimated 2.5 to 13.5 billion m<sup>3</sup> per year, and the irrigation potential by the river basins estimated 3.73 million hectare and 1.6 million hectares by ground water and rainwater (Awulachew et al,2010). However, utilization of water resources for irrigation in Ethiopia is poorly performed, evidence showed that irrigation crop production is more efficient than rainfed crop production, the study conducted by Tilahu et al (2011), proved that the major crops Wheat, Tef, Barley, Maize, Sorghum production in irrigated agriculture is higher than rainfed agriculture. Relatively rainfed agriculture vulnerability to climate change is more serious than irrigation agriculture.

Figure 7. Major crop production output by rainfed and irrigation



Source: Tilahun et al (2011)

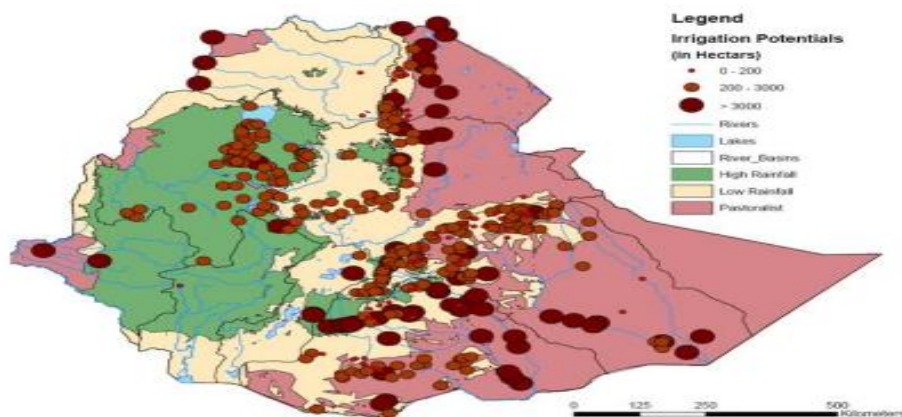
Ethiopia is divided into 32 major agro- ecological zone and this can further be grouped into three primary zones based on rainfall and evapotranspiration(Awulachew et al,2010), it can be described as follow

| Zone                     | Land % | Population % | permanent crop output % |
|--------------------------|--------|--------------|-------------------------|
| High rainfall covered    | 24     | 43           | 51                      |
| Moisture deficit covered | 32     | 47           | 39                      |
| Pastoralist covered      | 44     | 10           | 10                      |

In the high rainfall zone, it accounted smaller land coverage, relatively high population and major crop output, rainfall tends to exceed 800 mm/year, experienced mixed crop-livestock systems, but crop is dominate, in this zone, irrigation would be supplementary to produce a second crop and increase productivity. In moisture deficit zone, land coverage relatively higher

than the former but low productivity and overpopulation. Rainfall is generally lower than 600 mm/year, production is typically mixed crop and livestock with crop dominating, irrigation could secure food production, improve livelihoods, and increase food resilience. Similarly, the pastoralist zone accounted the maximum land coverage, but population and productivity seen very low. Except in the west part of the country, rainfall is lower than 600 mm/year, Pastoralist, livestock-based and non-sedentary lifestyles prevail, the areas are constrained by vulnerability and low livestock productivity. Irrigation would create livelihood options and increase food resilience; the figure below shows the distribution of the three zones in Ethiopia and its irrigation potentials in hectares.

Figure 8. Categories of three zones

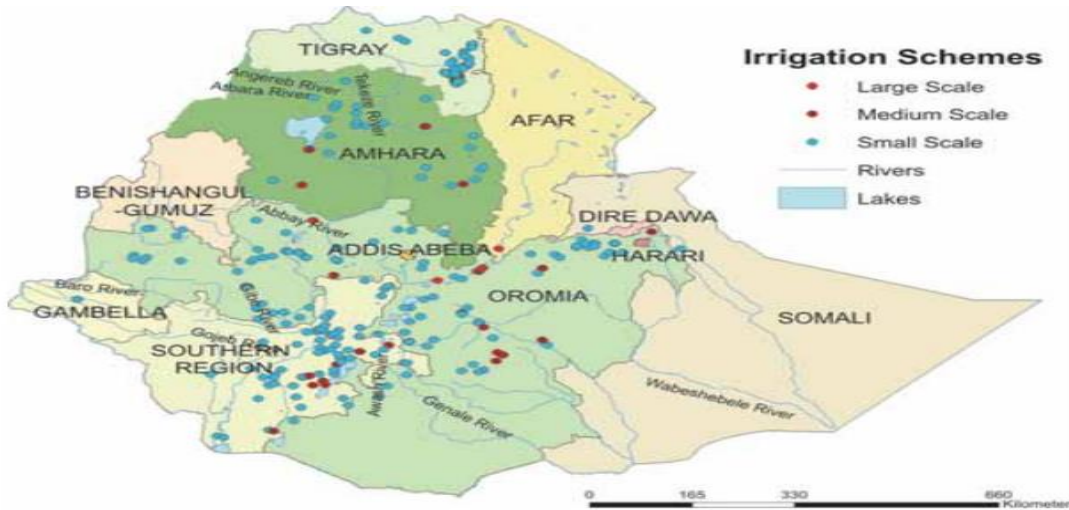


Source: IWIM

Irrigation development in Ethiopia is classified based on the size of the command area such as Small-scale irrigation systems <200 hectare( ha) which is traditional method, Examples hand-

dug wells, shallow wells, flooding (spate), individual household-based river diversions and other traditional methods, it accounted 46 percent. Medium-scale irrigation systems (200-3,000 ha) which is publicly sponsored and Large-scale irrigation > 300 ha which is typically commercially or publicly sponsored (IWIM, 2010). The figure shows the distribution of irrigation scheme in the country.

Figure 8. irrigation schemes distributed in the regional states of Ethiopia



Source. Girma et al (2007)

### 3.4.6.1 Nation and regional Irrigation practices

It is believed that irrigation is one of the ways to increase agricultural productivity and accelerate overall economic development of Ethiopia. According to World Bank data, in 2018 Ethiopia's agricultural land estimated 37.90 million hectares of this 5.3-million-hectare land available for irrigation. According to CSA survey data in 1995/6 total land covered by irrigation was 84,640 hectares, but in 201/620 it reached to 211,047 hectares. Table 15 show that the practices and share of Irrigation agriculture in national and regional wise, the total number of Holder in 2008/9 was 1.1 million and in 2019/20 it reached 1.3 million, similarly irrigated land in 2008/9 was 164,370 hectare and in 2019/20 raised to 211,047 hectares, that is, it increased by 46,677 hectare. Share of regional irrigation agriculture performance ranges from 0 to 48.71 percent. Oromia region accounted the major irrigated land area annually, whereas Gambela region has zero share of irrigated land area, similarly Ben.Gumuz, Harai, Dire dawa and Somalia share of irrigated area was low. In 2009/10 Oromia irrigated area increased by 2238 hectare over the last year

2008/9 and it has 48.71 percent of irrigated share and the lowest share 31.66 percent has been recorded in 2016/17. Amhara region has the second position in irrigated land area, in 2016/17 the maximum share of irrigated land area accounted 29.82 percent and the lowest share was 18.68 percent in 2019/20. These two regions accounted more than 60 percent of irrigated land area, moreover major percentage of total agricultural land area, crop production and population situated in the regions. In 2014/15 in SNNP region irrigated land area covered by 43,982 hectare and accounted 24.58 percent share of irrigated land. The region has third position in irrigation agriculture practices, in 2009/10 irrigated land data was missed, however the share of irrigated land area ranges from 14.68 to 24.58 percent, similarly Somalia region has accounted 13.94 percent share of irrigated land, but the previous year share was very low, 2016/17 data was missed. Tigray regions share of irrigated land area ranged from 5.64 to 12.74 percent and Afar region share of irrigated land accounted minimum 1.55 and maximum 8.18 percent. In general Irrigation practice in most of the regions has been poorly performed, however the countries maximum irrigated land area was concentrated on three regions, it accounted on average more than 80 percent. Gambela region does not have any irrigation performance, similarly agricultural activities were limited.

Table 23. National and regional Irrigation practices

Irrigation from 2008/9-2019/20

|         | Ethiopia  |         | Tigray  |        | Afar    |        | Amhara  |        | Oromia  |        | Somalia |        | Ben.Gumz |        | SNNP    |        | Gambela |        |
|---------|-----------|---------|---------|--------|---------|--------|---------|--------|---------|--------|---------|--------|----------|--------|---------|--------|---------|--------|
|         | Holder    | Hectar  | Holder  | Hectar | Holder  | Hectar | Holder  | Hectar | Holder  | Hectar | Holder  | Hectar | Holder   | Hectar | Holder  | Hectar | Holder  | Hectar |
| 2008/9  | 1,101,204 | 164,370 | 179,334 | 17,396 | 15,393  | 13,444 | 412,766 | 31,178 | 402,657 | 72,977 | 6,177   | 2,740  | 5,795    | 0      | 69,537  | 24,125 | 0       | 0      |
| 2009/10 | 1,076,103 | 154,424 | 154,232 | 14,279 | 8,313   | 3,856  | 405,746 | 30,777 | 336,955 | 75,215 | 8,849   | 2,930  | 6,928    | 698    | 75,037  | 0      | 107     | 0      |
| 2010/11 | 1,039,859 | 182,146 | 120,261 | 23,202 | 23,822  | 2,819  | 411,465 | 46,094 | 330,847 | 67,155 | 9,069   | 3,601  | 11,394   | 484    | 114,754 | 33,415 | 164     | 0      |
| 2011/12 | 1,143,077 | 165,604 | 135,493 | 13,541 | 19,173  | 5,060  | 487,832 | 41,228 | 359,946 | 70,190 | 4,556   | 2,146  | 10,025   | 384    | 113,101 | 28,171 | 350     | 0      |
| 2012/13 | 1163072   | 151645  | 139579  | 12820  | 17552   | 4377   | 509557  | 34241  | 371793  | 67244  | 12830   | 4230   | 12537    | 757    | 84813   | 24886  | 0       | 0      |
| 2014/15 | 1,208,548 | 178,904 | 136,102 | 10,891 | 15,639  | 5,150  | 539,922 | 42,295 | 342,621 | 67,484 | 12,500  | 4,590  | 10,564   | 1,280  | 135,570 | 43,982 | 269     | 0      |
| 2016/17 | 2,104,545 | 195,374 | 180,853 | 11,569 | 184,953 | 8,995  | 780,365 | 58,251 | 719,530 | 61,861 | 0       | 0      | 9,001    | 929    | 198,670 | 44,695 | 1,118   | 0      |
| 2019/20 | 1,304,493 | 211,047 | 151,835 | 11,895 | 5,871   | 5,208  | 540,329 | 39,434 | 398,391 | 83,148 | 83,148  | 29,412 | 6,438    | 351    | 150,339 | 38,150 | 0       | 0      |

### Regional share of irrigation in %

|         | Tigray | Afar | Amhara | Oromia | Somalia | Ben.Gum | SNNP  | Gambela | Harari | Diredawa |
|---------|--------|------|--------|--------|---------|---------|-------|---------|--------|----------|
| 2008/9  | 10.58  | 8.18 | 18.97  | 44.40  | 1.67    | 0.00    | 14.68 | 0       | 0.52   | 0.83     |
| 2009/10 | 9.25   | 2.50 | 19.93  | 48.71  | 1.90    | 0.45    | 0.00  | 0       | 0.75   | 2.35     |
| 2010/11 | 12.74  | 1.55 | 25.31  | 36.87  | 1.98    | 0.27    | 18.35 | 0       | 0.46   | 2.50     |
| 2011/12 |        | 3.06 | 24.90  | 42.38  | 1.30    | 0.23    | 17.01 | 0       | 2.02   | 0.92     |
| 2012/13 | 8.45   | 2.89 | 22.58  | 44.34  | 2.79    | 0.50    | 16.41 | 0       | 1.11   | 0.91     |
| 2014/15 | 6.09   | 2.88 | 23.64  | 37.72  | 2.57    | 0.72    | 24.58 | 0       | 0.88   | 0.92     |
| 2016/17 | 5.92   | 4.60 | 29.82  | 31.66  | 0.00    | 0.48    | 22.88 | 0       | 1.56   | 0.66     |
| 2019/20 | 5.64   | 2.47 | 18.68  | 39.40  | 13.94   | 0.17    | 18.08 | 0       | 1.15   | 0.47     |

Source: CSAE survey data

#### **3.4.6.2 Challenges of irrigation in Ethiopia**

Ethiopia has enormous untapped irrigation potential, however recent data show that only 3.89 percent of irrigation land area has been cultivated. Population increasing, food insecurity and poverty persisting in the country. The discussion above described that the country has huge agricultural land area and water resources, but definitely the lowest percentage of the resources has been performed, for this there are many challenges in agricultural sector, it has been discussed above that the continuous political instability of the country, poor agricultural policy and implementation and lack of agricultural inputs are the main challenges for unsuccessful achievement in the sector. Many researchers identified the challenges of irrigation agriculture in Ethiopia (Haile, 2015; Meja,2020; FAO,2015; Kassie, 2019; Awulachew, 2010). Poor Scheme management, socio-institutional Problem, market problem, insufficient technical Skill and financial shortage were among the challenges of irrigation development in the country, moreover inadequate community involvement and consultation in scheme planning, inadequate awareness of irrigation resulted resistance to the adoption of new technologies/crops by traditional cereal farmers, combined with Ethiopian farmers' extreme risk aversion and poor agricultural extension and irrigation water management-related service delivery, particularly for small-scale farmers were the other challenges. Unstable government could not achieve the expected outcome, unless gain trust by the people of the country.

## Chapter Four

### **4. CONCLUSIONS AND RECOMMENDATION**

Ethiopian decades of political instability are one of the deep-rooted causes for food insecurity, extreme poverty, and poor economic development. The existing ethnic based federal system is the engine for country's instability, in order to bring peace and stability in the country, all-inclusive national dialogue and reconciliation is an urgent action, government is more responsible to reform the administration system and strengthening national identity. Country's Poor agricultural policy and implementation could not improve food security and economic development, it is better to review the country's agricultural policies with referencing developed countries agricultural policy and implementation methodology. Majority of country's smallholder farmers operating on one or less than one hectare with traditional farming system and low utilization of agricultural inputs. To improve productivity and ensure food security government should subsidize the sector in different forms, for example one tractor and combine harvester for every group of 100 farmers including different packages like fertilizer, improved seeds, this is a good stimulation for the traditional farmers. Drought is the other challenges in agricultural productivity of Ethiopia, to overcome periodic drought, cloudseeding technology and drought resistance crop application is one of the solutions to increase productivity and ensure food security.

The crop and livestock sub sector were analyzed based on the central statistics agency of Ethiopia annual survey data, in this case it was evaluated that the productivity and efficiency of major crops in different regions by applied different measurement, Oromia and Amhara regions showed better agricultural productivity and efficiency result, more than 80 percent of cattle existed in three regions (Amhara, Oromia and SNNP). In most of the regions like Gambela, Somalia, Afar, Bensangul Gumuz, Hrari and Diredawa crop and livestock distribution were low, to increase productivity in these regions' government effort should be very significant to change the working attitudes of the people by providing some farm equipment, fertilizer and improved seeds and other technologies, moreover government by itself can be the part of the farming activity, this will encourage/stimulate the society to participate in the agricultural sector. Instead

to import billions dollar agricultural products per annum, it is good to subsidize farmers to increase productivity and ensure food security.

The study showed that Ethiopia has tremendous water resources, but more than 95 percent of country's agricultural activities relied on rainfed, as a result every year low agricultural output registered, and low agricultural land area cultivated. The study proved that agriculture output is better in irrigation system than rainfed, Ethiopia has 12 big river basin and different lakes and small rivers and estimated 5.3 million hectare of irrigation land area, however Ethiopia has utilized only 4 to 5 percent of irrigation land area, most of the irrigation agriculture was practiced in Amhara, Oromia and SNNP regions, it accounted on average more than 80 percent. The rest of the region accounted estimated 20 percent, in these regions it has abundant water resources and irrigation land, but irrigation agriculture performance was too low, country's majority of poor people are living in these regions. Government should change the working habits of the society primarily start state farm operation parallelly inside the regions and show the positive outcomes to the society, repeated promotion for irrigation farm is very important, moreover agricultural input subsidies and other benefit can stimulate majority of the society to engage in the sector.

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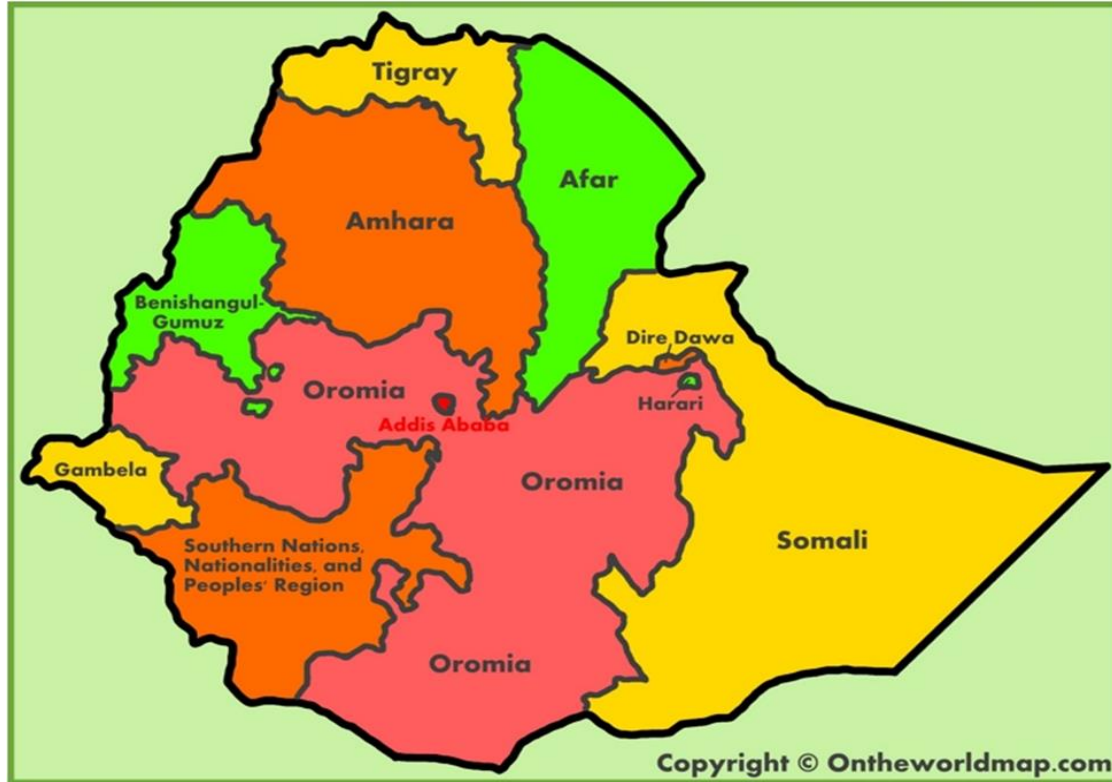
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## Appendices

Map of Ethiopia with regional state



### Populati

| Region      | Area (Sq. Kilometers) | Area Share % | Population 2017 | Population share % |
|-------------|-----------------------|--------------|-----------------|--------------------|
| Addis Ababa | 527                   | 0.05         | 3434000         | 3.64               |
| Tigray      | 84722                 | 7.97         | 5247005         | 5.57               |
| Afar        | 72053                 | 6.77         | 1812002         | 1.92               |
| Amhara      | 154709                | 14.55        | 21134988        | 22.43              |
| Oromia      | 284538                | 26.75        | 35467001        | 37.64              |
| Somalia     | 279252                | 26.25        | 5748998         | 6.10               |
| Ben.-Gumuz  | 50699                 | 4.77         | 1066001         | 1.13               |
| SNNP        | 105476                | 9.92         | 19170007        | 20.34              |
| Gambela     | 29783                 | 2.80         | 435999          | 0.46               |
| Harari      | 334                   | 0.03         | 246000          | 0.26               |
| Dire Dawa   | 1559                  | 0.15         | 466000          | 0.49               |
| Total       | 1063652               |              | 94228001        | 100                |