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## The status, challenges, and prospects of agricultural production and productivity in Ethiopia: A review

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### Abstract

Ethiopia is heavily dependent on its agricultural sector, which has suffered from recurrent droughts. Rapid population growth, change of arable land to urban expansion, climate change, unemployment, waterlogging in wetland areas, salinity in arid and semi-arid, acidity in high rainfall areas, and depletion of natural resources are causing food shortages. Productivity performance in the agriculture sector is critical to improvement in overall economic well-being. Therefore, this article focused to reviewing the country's current production and productivity of agricultural challenges and opportunities. In addition to that, the status of the agricultural production of the country were reviewed. The seminar mainly concentrated on land degradation and deforestation, land fragmentation, the shortage of farmland, climate change, unevenly distributed construction and urbanization, lack of integration among stakeholders, political instabilities, and its prospects. Ethiopia has great opportunities, such as commercial farming investments in cereals, cotton, fruit, vegetables, and ornamental plants. The country has also many opportunities in the areas of livestock production. However, Ethiopia's current fruit, vegetable, and livestock production for export are very limited.

**Keywords:** Agriculture, challenges, prospects, production, productivity, Ethiopia

### Introduction

Agricultural activity is dominated by smallholder farmers who produce more than 95% of the country's agricultural output (Gebeyanesh *et al.*, 2021) <sup>[15]</sup>. Agriculture, which accounts for 41.4% of Ethiopia's GDP and 80% of total employment, is the country's economic backbone. Productivity performance in the agriculture sector is critical to improvement in overall economic well-being. The current Ethiopian agriculture is best characterized by traditional farming methods and low production and productivity (Gebissa, 2021) <sup>[16]</sup>. Providing Ethiopians with food security will be very difficult in the upcoming decades. This is a result of the population's rapid growth, change of arable land to urban expansion, climate change, depletion of natural resources, inflation of basic needs, unemployment, political unrest, and civil turmoil (Tadesse and Alemayehu, 2019; USAID, 2018) <sup>[37, 43]</sup>.

In Ethiopia, both the price and demand for food have rushed more recently than before. The variation in food prices occurs during a short time, during a season, and over several years. The wholesale price unit of maize grain in the Ethiopian capital city of Addis Ababa alone increased from 1,469 to 5,013 in Ethiopian Birr (ETB) per ton from 2005 to 2012, and the price has tripled in the past five years. The average food price increased from 7.4 to 15.8 percent between 2014 and 2019 (<http://knoema.com/atlas>). Ethiopia's government has been forced to purchase food at a very high cost due to a lack of food self-sufficiency and the inefficiency of economic growth. High-input and resource-intensive farming practices in Ethiopia are responsible for the loss of vital microorganisms, extensive deforestation and soil nutrient depletion have a negative impact on agricultural outputs (FAO, 2017) <sup>[13]</sup>.

Ethiopians have primarily engaged in mixed agriculture. Due to religion and cultural preferences, they have primarily relied on cultivating the land and herding mammals and birds for a long period throughout history (Getachew, 2020) <sup>[17]</sup>. However, the agricultural sector has shown remarkable resilience over many centuries though it is now progressively failing (Plecher, 2009) <sup>[32]</sup>. The country is known for the regular food shortage that occurred due to droughts, sudden outbreaks of natural disasters, pests, lack of rainfall, and shortage of technological advancement in the past periods. Therefore, enhancing the application of

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extension services in agronomic techniques, afforestation, protection of livestock and crop plants, access to financial support, and time-based markets can enhance the community's standard of living (UNCTAD, 2017) <sup>[42]</sup>. Moreover, the farmers' use of conventional farming methods and equipment combined with the rapidly growing population forced them to expand farmland into the sensitive ecological system, endangering their own way of life by causing environmental desertification.

Ethiopia's agriculture heavily relies on oxen plow and rain-fed by neglecting other alternative technologies since the time of the Neolithic era (Getachew, 2020) <sup>[17]</sup>. However, the government attempted to displace the private sector's leadership by ignoring mechanization possibilities and rural finance and credit facilities. The problems related to basic infrastructures like roads, hydroelectric generation plants, irrigation tools, and other farm equipment availability in the country and the limitation of foreign currencies for importation limited the attraction of the agricultural sector to private investors (Ibid). In addition, political instability, economic, and social crisis in the Middle East countries have their own negative impacts on agricultural production (Abdullah and Zecca, 2017) <sup>[11]</sup>.

As stated by Getachew (2020) <sup>[17]</sup>, the practice of mechanized agriculture in Ethiopia is estimated at 0.7% for land preparation while it is less than 0.8% for crops thresher machines. These still indicated very little transformation in the utilization of technologies in production. However, traditional agriculture is inefficient to feed these populations unless further modifications are implemented in the policy of the country.

Generally, Ethiopian agriculture productions are challenged by complex production constraints of abiotic and biotic factors. In short, unemployment, waterlogging in wetland areas, salinity in arid and semi-arid areas, and acidity in high rainfall areas, pests, and erratic rainfall distribution are common problems. The effects of the aforementioned issues differ across the country and from location to location. For instance, According to Merga and Ahmed (2019) <sup>[29]</sup> waterlogging is a major issue in the Vertisols of the highlands whereas salinity is in lowland areas of the country. Moreover, the authors mentioned that in locations with high rainfall, the technical input such as synthetic organic fertilizers has irregularly made the soil more acidic. Therefore, this seminar identified the challenges and prospects of Ethiopian agriculture. Specifically, the seminar aims to review the status, challenges, and prospects of agricultural production and productivity in Ethiopia.

## Review of Literature

### Status of Agricultural Production System in Ethiopia

Ethiopia is mostly a pastoral and agricultural country. Ethiopian life is so dominated by agriculture that little can be accomplished until it is aggressively targeted. Ethiopia is a country of peasants with subsistence farming. Despite recent government efforts, there is tremendous physical potential for dramatically enhanced agriculture, but there are still significant growth barriers. Ethiopia's two main agricultural systems are pastoralism in the lowlands and mixed agriculture in the highlands, which integrates the production of both crops and livestock. Multiple subsystems are included in mixed agriculture (Seife, 2022) <sup>[34]</sup>.

Approximately 50% of Ethiopia's GDP and more than 80% of its exports are derived from the country's agricultural sector, which is its economic backbone (Stellmacher, and Kelboro, 2019) <sup>[36]</sup>. The majority of Ethiopia's agriculture is smallholder farming and it produces about 95% (Gebeyanesh *et al.*, 2021) <sup>[15]</sup> of the country's major crops including cereals, pulses, oilseeds,

vegetables, root crops, fruits, and cash crops (Aweke, 2017) <sup>[6]</sup>. These farms do, however, experience a number of obstacles that reduce crop productivity. Major obstacles include inadequate policies and guidelines, severe land degradation, low income, and poor financial support, as well as poor soil fertility, high reliance on rainfall, low availability, and poor quality of seeds and fertilizers (Gezie, 2019) <sup>[18]</sup>.

According to Van Loon *et al.* (2018) <sup>[45]</sup>, crop yields in smallholder farms are much lower (less than 50%) than those attained in experimental farms and research stations. They are also significantly lower (less than 10%) than their potential yields. With an average yield of 2.6 t ha<sup>-1</sup> compared to the 7.8 t ha<sup>-1</sup> potential yield found in on-farm trials, the difference is particularly striking for maize. Food security is impacted by the low crop yields because a significant amount of grain must be imported (Temesgen *et al.*, 2017) <sup>[38]</sup>. For instance, in the past, due to insufficient domestic production, 30 to 50 percent of the wheat consumed domestically was imported.

Ethiopia has a large livestock resource with about 60 million heads of cattle and about 61 million sheep and goats (Yonas *et al.*, 2019) <sup>[49]</sup>. The animals belong to various production systems ranging from pastoral to mixed crop-livestock systems with different levels of intensification (Wondwosen *et al.*, 2020; Yonas *et al.*, 2019) <sup>[49]</sup>. About 75% of livestock is intense in the highlands of Ethiopia. The animals are essential in mixed smallholder farming systems because they help farmers diversify their sources of income, provide manure as a source of fertilizer, increase the amount of animal traction available, and protect crops from harsh weather patterns (Yonas *et al.*, 2021; Wuletaw and Kindu, 2018) <sup>[48, 47]</sup>.

However, animal husbandry competes with crop farming for scarce resources due to a lack of grazing land and high feed costs (Yonas *et al.*, 2021; Mengistu, 2018) <sup>[48, 28]</sup>. Overgrazing exposes agricultural fields to erosion and structural degradation, and high livestock populations may lower the quality of the soils (Giday *et al.*, 2018) <sup>[19]</sup>. It is crucial to comprehend the tradeoffs between the number of animals, the size of the farmland, and sustainable land productivity (Yonas *et al.*, 2021) <sup>[48]</sup>.

## Challenges of Agricultural Production and Productivity in Ethiopia

### Land degradation and deforestation

In Ethiopia, land degradation already affects around 40% of the country's agricultural land, which lowers agricultural productivity (Adugna *et al.*, 2021) <sup>[3]</sup>. For the past three decades, Ethiopia's heavily populated highlands in particular have seen declines in soil fertility (Giday *et al.*, 2018) <sup>[19]</sup>. The eroded soil resulted in infertile soil, low moisture-holding capacity, declines the levels of arable land availability, and a low amount of yield per hectare to be produced. Previously most of the existing literature on Ethiopian agricultural development has focused on resource degradation as the root cause of constraints to sustainable production and productivity (Headey *et al.*, 2014) <sup>[20]</sup>.

Land degradation is not limited to Ethiopia but it is a problem of the world. Globally, the total degraded land area was estimated from a range of fewer than one billion hectares to over six billion hectares with the variation of its spatial distribution. It accounts for about 33% of the land area and it was highly aggravated in the Middle East countries of the world (FAO, 2017) <sup>[13]</sup> it was the highest in dryland areas of the world regions. Universally, about 3.2 billion people are affected by land degradation. Entire, it expenses more than 18-20 USD trillion USD annually (UNCCD, 2019) <sup>[41]</sup>. It also affects the

natural ecosystem, soil organic carbon, and soil health.

According to Dubovyk (2017) <sup>[10]</sup>, weak institutional and policy frameworks further may fail to enforce proper land administration and use. The excessive use of organic fertilizers, mono-cropping, deforestation, and soil erosion due to poor soil management practices such as over-cultivation of soils or overgrazing. Besides, soil and water pollution, poor waste management, climate change, and decreases in the natural ability of the land to recover economic activities are also contributing factors to soil degradation that leads to the reduction of the biological productivity of land (UNCCD, 2019) <sup>[41]</sup>. FAO (2017) <sup>[13]</sup> finds out that land degradation constraints caused a lowering of the likelihood of using reduced tillage and the value of crop yield per hectare. At the same time, the net farm income per hectare is not responsive to the rising constraints. In general, land degradation is an impediment to realizing food security in reducing hunger.

Moreover, deforestation influences agriculture through natural disturbance, including biodiversity loss, damaged habitat, drought, adverse soil erosion, degradation of wasteland, extinction of life, and displacement of populations (Alemayehu, 2019) <sup>[37]</sup>. Deforestation caused the destruction of carbon sinks and reduced agricultural productivity in a brutal circle. In addition to this, the author also suggested that it influences negatively natural resources, economy, and biodiversity, and adds to the already established poverty. It accelerates soil erosion, flooding, and drought. It reduces yield, flora, fauna, and soil productivity and affects the hydrological balances negatively.

### Land fragmentation

According to Knippenberg *et al.* (2020) <sup>[25]</sup> in Ethiopia land fragmentation resulted in food insecurity and increased the amount of time spent moving from one parcel to another lowered agricultural output, and reduced productivity. It is also difficult to implement mechanized farms, inefficient to work on it to secure the family's demand because the small farm size cultivated is yielded lower. Therefore, farm size affects agricultural sustainability in the economy, social aspects, and environmental performance of agricultural production, for instance, increasing farm size has a positive impact on farmer's net profit, economic benefits, technical and labor efficiency with mean coefficients of 0.005, 0.02, and 2.25 in China, respectively (Ren *et al.*, 2019) <sup>[33]</sup>. The authors also indicated that an increase in farm size is also associated with a decrease in fertilizer and pesticide use per hectare, showing clear benefits for environmental protection.

Fragmentation of farmland affects the smallholder communities highly to produce in a sustainable manner following an inadequate policy that was used to respond to the available endogenous technological changes and population growth (Headey *et al.*, 2014) <sup>[20]</sup>. In Ethiopia, the farmland is highly fragmented in the central northern parts than in other parts. Smallholder farmers are undercapitalized, reliant on traditional practices, and forced to live in consistently poor conditions. They were unable to tolerate the yearly chances of crop failure or animal mortality because of this. Many people are currently obliged to rely on social payments and are dependent on imported cereals (Getachew, 2020) <sup>[17]</sup>.

### Shortage and landlessness of arable farmland in the highlands

Arable land refers to land where its soil and climatic conditions are suitable for growing crops and rearing animals. It is settled

with a low population density and is not protected by any land rights régime. Nevertheless, arable land is an indispensable resource for Ethiopians to secure food self-sufficiency. In developing nations like Ethiopia, increasing production and productivity is anticipated to help feed the people in the near future. This could be accomplished by making substantial adjustments to government policies about the use of resources for sustainable development (FAO, 2017) <sup>[13]</sup>.

In Ethiopia, landlessness is a significant obstacle to rural livelihood. Inequality in distribution among the householders further complicates the situation (Mehretie *et al.*, 2017; (Getachew, 2020) <sup>[17, 26]</sup>. This influenced the levels of income, opportunities, and ownership of assets. Low yields were caused by a poor farming system, such as mono-cropping, which degraded the soil and depleted its nutrients (Merga and Ahmed, 2019) <sup>[29]</sup>. However, there is a critical lack of comprehensive research on the extent of landlessness, its effects, and coping mechanisms in the country (Fekadu, 2018) <sup>[14]</sup>.

According to official data on land ownership size in Ethiopia's Regional States, 38 % of households have access to less than 0.5 hectares of land, 23.6 % have between 0.51 and 1.0 hectares, 24% have between 1 and 2 hectares, and 14% have more than 2 hectares (Getachew, 2020) <sup>[17]</sup>. These numbers, rather than indicating landlessness or overriding it, are the sizes of landholdings. This necessitates governmental adjustments aimed at lowering the population's dependence on direct agriculture. The continued decline of farmland poses difficult obstacles for mechanized farming and securing long-term capital investment (Ibid). The coping mechanism so far is sharecropping. Sharecropping contracts could minimize the land demand by over 95% temporarily, but could not secure the family's food demand since it is limited over time. Therefore, liberalizing the land market by lifting the land contract restrictions can enhance the exchange of land among rural households (Mehretie *et al.*, 2017) <sup>[26]</sup>.

In Ethiopia, landless farmers are generally more in danger now than they were under the earlier feudal systems. This happens because the government police are ineffective on this side and the land rent becomes unavailable. As a result, it is anticipated that the Ethiopian government would create a new development strategy that will benefit all farmers in terms of exploiting arable farmland for the sustained usage of the present and future generations.

### Political disturbance

It is virtually incredible that policymakers, scholars, and practitioners of the most advanced technologies failed to anticipate the problems of food security and agricultural development before they extended in Ethiopia (Getachew, 2020) <sup>[17]</sup>. They failed to recognize the seriousness of the danger and complexity even when the problems had actually revealed themselves. Ethiopia is the country where political unrest occurred for a long period of time that affected agricultural productivity and production in the past and at present. These situations have resulted in the losses of resources, and the rising tide of hunger and poverty.

The political unrest was manifested in repeated demonstrations that led to the loss of both public and private resources, including shops, materials, other farm equipment, mechanized farm equipment, shelters, floriculture, personal homes, and tools of the researcher's institute and campaigns. This represents a true crisis of visions that could result in a complete lack of comprehension and an unwillingness to work devotedly in the wake of the unrest and harassment, which is especially



discouraging (FAO, 2019; ILRI, 2017) <sup>[11, 23]</sup>.

### Climate change

Ethiopia is a climate change-prone country. The most notable climate factor in the nation is rainfall. It fluctuates across the country's agro ecological areas (highland, midland, and lowland) from season to season and year to year (Ashenafi *et al.*, 2020) <sup>[5]</sup>. In every season, its distributions across the nation are wildly uneven (Kew *et al.*, 2017) <sup>[24]</sup>. The variation of climate change in Ethiopia is not limited to rainfall but includes temperatures, relative humidity, wind, and others. The lowlands are vulnerable to increased temperatures and prolonged droughts, while the highlands suffered from more intense and irregular rainfall. This aggravated soil erosion, low agricultural output, and food insecurity in the country (Mo FAN, 2018) <sup>[30]</sup>. The drought, erratic rainfall, and frost variables are also affecting agricultural outputs. It reduces crop yield, nutrition, groundwater, soil organic matter, soil quality, soil health, incomes (Melese, 2019; Tufa, 2019) <sup>[27, 40]</sup>, and vegetation coverage (Tenaw and Habte, 2017) <sup>[39]</sup>, and caused socio-economic problems in Ethiopia. The reduced precipitation and rise in temperature could influence agricultural practices and their results widely (Ashenafi *et al.*, 2020) <sup>[5]</sup>.

The mean minimum and maximum annual temperature change varied from less than 15°C (in the highlands) to above 25°C (in the lowlands) in Ethiopia (Kew *et al.*, 2017) <sup>[24]</sup>. They reported that in the past four decades the annual temperature increased by 0.37°C per decade. This report also indicated that much of the temperature increment happened in the dry and hotspots of the country. The rise in the average temperature exhibited a spatial and temporal variation over the country. A higher rise in temperature was noted in drier areas of the northeast and southeast parts of Ethiopia (Abebe and Arega, 2020) <sup>[2]</sup>. Based on this evidence by 2050, the Ethiopian temperature will be increased by 1.7–2.1°C than the present (Befikadu *et al.*, 2019) <sup>[8]</sup>.

As stated by Ashenafi *et al.* (2020) <sup>[5]</sup>, rainfall and temperature fluctuation have a significant impact on rural lives generally and food security specifically. Variations and swings in temperature and rainfall jeopardize, among other things, the agricultural sector's productivity and put rural communities in danger. Therefore, there is a need for increased focus on strategies for adaptation and mitigation. The negative effects of climate change are not uniform. Additionally, reducing climate change unpredictability aids in stabilizing the income of farmers during dry spells and periods of low production, which benefits the

most disadvantaged members of society.

According to Melese (2019) <sup>[27]</sup>, the most crucial strategies include the use of improved crop varieties, agroforestry, crop diversification, soil conservation, off-farm irrigation practices, and modifying the timing of planting. Smallholder farmers are required to use these methods. They increase production, productivity, and aid in the preservation of natural resources. Collaboration with agroforestry, climate-smart agriculture, and conservation agriculture could help Ethiopia's economy recover significantly from recent economic declines. It serves as a foundation for eliminating extreme poverty, reducing disparities in income, opportunities, and asset ownership across regions, including land, and enhancing resilience to protracted crises, natural disasters, and armed conflicts by encouraging inclusive and equitable development throughout the nation.

The root causes of rising greenhouse gas emissions, extensive deforestation, extinctions of plant and animal species, and land degradation (FAO, 2016) <sup>[12]</sup>, as well as violations of human rights, conflicts of interest, lack of access to food and healthcare, and destruction of social protection systems, are increasing food demands through intense competition on the planet's natural resources. In Ethiopia, households that are landless and small-scale farmers are especially at risk from climate change. Following climate change, the small-scale, and landless farmers migrate to the urban to seek other employment opportunities, especially male members of rural households, which is leading, in turn, to the feminization of farming in many parts of the world (FAO, 2017) <sup>[13]</sup>.

### Unevenly distributed constructions and urbanizations

Different government authorities and individuals for construction of the house, schools, and roads grab the fertile arable land in rural, sub-town, towns, sub-cities, and cities of Ethiopia. These are reducing the farmland and increasing displacement of the farming community. Lose of such fertile productive arable farmlands created food demand gaps in Ethiopia. A rural community settlement has another negative impact on the utilization of farmlands for mechanization. More than 80% of the population lives in rural areas where farming (i.e. crop production and animal rearing) took place (USAID, 2018) <sup>[43]</sup>. However, currently, the building of houses, industries, urban establishments, and other infrastructures are undertaken on a larger scale. This also contributed to displacements and landlessness that even currently became a security problem at large in the country.

**Table 1:** Summary of major findings of challenges of agricultural production and productivity

| Challenges                                   | Its effects on production and productivity   | References  |
|--|--|---|
| Land degradation and deforestation           | Lowers agricultural productivity<br>Declines in soil fertility<br>It accounts for about 33% of the land area and it was highly aggravated<br>Deforestation caused the destruction of carbon sinks and reduced productivity                               | Adugna <i>et al.</i> , 2021 <sup>[3]</sup> , Giday <i>et al.</i> , 2018 <sup>[19]</sup> , UNCCD, 2019 <sup>[41]</sup> , Alemayehu, 2019 <sup>[37]</sup> |
| Land fragmentation                           | land fragmentation caused food insecurity<br>lowered agricultural output, productivity   | Knippenberg <i>et al.</i> 2020 <sup>[25]</sup>  |
| Shortage and landlessness of arable farmland | Landlessness is a significant obstacle to rural livelihood, influenced the levels of income<br>38 % of households have access to less than 0.5 ha of land, 23.6 % have between 0.51 and 1.0 ha, 24% have between 1 and 2 ha, and 14% have more than 2 ha | Mehretie <i>et al.</i> , 2017 <sup>[26]</sup><br>Getachew, 2020 <sup>[17]</sup>   |
| Political disturbance                        | It affected productivity and production<br>These situations have resulted in the losses of resources, and rising hunger and poverty<br>Discouraging private investors in agriculture   | Getachew, 2020 <sup>[17]</sup><br>FAO, 2019 <sup>[11]</sup> ; ILRI, 2017 <sup>[23]</sup>  |

|  |   |   |
|--|---|---|
| Climate change                                     | The lowlands are vulnerable to increased temperatures and prolonged droughts,<br>The highlands suffered from more intense and irregular rainfall, this worse soil erosion, low output, and food insecurity in the country<br>Reduced precipitation and rise in temperature could reduce crop yield, groundwater | Mo FAN, 2018 <sup>[30]</sup><br>Melese, 2019 <sup>[27]</sup> ; Tufa, 2019 <sup>[40]</sup> ,<br>Tenaw and Habte, 2017 <sup>[39]</sup> , Ashenafi <i>et al.</i> , 2020 <sup>[5]</sup> |
| Unevenly distributed constructions & urbanizations | Reducing the farmland and increasing displacement of the farming community<br>Created food demand gaps  |   |

### Prospects of Agricultural Production and Productivity in Ethiopia

Ethiopia has great opportunities, such as commercial farming investments in wheat and soybeans, cotton, fruit, vegetables, ornamental plants, and beef; a large labor force; water resources; and proximity to the Middle East and other African countries to ship products quickly, despite the fact that agrarian activities face numerous challenges (Gebissa, 2021) <sup>[16]</sup>. Ethiopia has embarked on a ten-year economic development plan (2021-2030) where agriculture is one the top of priority sectors. The agriculture sector is projected to grow at 6.2% per annum over the next ten years. Ethiopia's development plan has laid out enhancing agricultural production as one of the major strategic pillars. The ten-year plan also calls for creating a green economy that is climate resilient. Ethiopia is aiming to increase development efforts in this regard to combat land degradation and reduce pollution, reduce Green House Gas (GHG) emissions, increase forest protection and development, increase the production of renewable electricity for both domestic and export use, and concentrate on modern and energy-saving technologies

(<http://trade.gov/country-commercial-guides/ethiopia-agricultural-sector>).

The country's unique soil types and climate enable it to grow a wide range of horticulture crops for both domestic use and export (Selamawit and Tesfaye, 2019) <sup>[35]</sup>. The country's revenue and food consumption will rise because of growing such activities. Additionally, several of Ethiopia's cash crops, including coffee, oilseeds, legumes, fruits, vegetables, honey, cut flowers, tea, and spices, have the potential to increase and present significant investment opportunities. To earn foreign currency, the majority of these crops are exported. In order to add value and increase export prices, the government plans to collaborate with the private sector in the future to build processing capacity for some of these commodities, such as fruits and vegetables.

Ethiopia is known as the water tower of East Africa. The country is endowed with ample water resources in central, western, and southwestern parts, except for dry parts of the northeastern and eastern parts which may even be supplied from the water-rich areas of the country. The amount of river-based water in Ethiopia could be 124.4 billion cubic meters and it has plenty of groundwater (Ayalew, 2018) <sup>[7]</sup>. In some parts, the utilization of water resources is hindered because of the undulating topography of the country.

According to FAO (2016) <sup>[12]</sup>, there are several factors contributing to Ethiopia's underutilization of resources in general and water resources in particular, with a lack of technology and money being just two of them. This report also stated that between 2015 and 2020, the Ethiopian government planned to develop small-scale irrigation to 1.7 million hectares. This analysis suggested that Ethiopia's irrigation system is relatively new and ineffective to produce at its full capacity. The GOE is reinforcing its focus on improving the nation's irrigation systems and water-harvesting procedures in order to combat the

prolonged drought. When you take into account the fact that around 95% of Ethiopia's food production is rain-fed, there is a significant amount of room for investment. Ethiopia is nearly entirely dependent on rainfall because there are no water harvesting technologies used there (Ayalew, 2018) <sup>[7]</sup>. It is anticipated that demand for pumps, drilling equipment, and water supply and drainage systems will increase.

Ethiopia has a diverse population and a wealth of genetic resources for animals. A significant source of foreign exchange and household consumption values is the raising of livestock and the items it produces, such as live animals, meat, leather goods, and milk (Yonas *et al.*, 2021) <sup>[48]</sup>. Additionally, developing an investment strategy that promotes the production of hybrid sheep, goats, cattle, and poultry is necessary.

The most effective way to decrease water losses and increase the efficiency of water consumption in the soil-plant system is to improve irrigation technology, such as water harvesting technology. Utilizing better drought-tolerant crop varieties will help you conserve water. To increase the soil's fertility and water-holding capacity, crop residue should be left on farmland, and organic matter should be added (Gebeyanesh *et al.*, 2021) <sup>[15]</sup>. Ethiopian agriculture must be improved by conserving water resources, using ecosystem-based practices including conservation agriculture, using environmentally safe agricultural inputs, maintaining healthy soil, and making better use of genetic resources and nutrient management.

**Table 2:** Summary of major findings of prospects of agricultural production and productivity

| Prospects                               | Its effects on production and productivity   | References                                  |
|---|--|---|
| Fruits and vegetables                   | Have the potential to increase and Present significant investment opportunities  | Selamawit and Tesfaye, 2019 <sup>[35]</sup> |
| Unique soil types and climate           | The country's revenue and food consumption will rise   | Selamawit and Tesfaye, 2019 <sup>[35]</sup> |
| Irrigation systems and water-harvesting | Improve income and livelihood options for farming through increased productivity and competitiveness   | Ayalew, 201 <sup>[7]</sup>                  |
| Abundant livestock resources            | A significant source of foreign exchange and Household consumption values is the raising of livestock and the items it produces, such as live animals, meat, leather goods, and milk | Yonas <i>et al.</i> , 2021 <sup>[48]</sup>  |

### Conclusion and Recommendations

Low production and productivity, together with traditional farming practices, best describe Ethiopian agriculture. It is heavily reliant on the agricultural sector, which has been challenged by extreme output variations and ongoing droughts. In the upcoming decades, it will be very challenging to ensure the food security of Ethiopians. This is due to a number of factors, including the population's rapid growth, the conversion

of agricultural land to urban development, climate change, the depletion of natural resources, and the inflation of necessities, unemployment, political and social unrest. Other issues with Ethiopian agriculture include pests, uneven rainfall distribution, underutilized land, waterlogging in wetland areas, salinity in arid and semi-arid areas, and acidity in high rainfall areas.

Ethiopia's agriculture has a promising upcoming because of the incredible diversity of its climate. It is the water towers of East Africa that can be utilized for irrigation agriculture and more crucially hydroelectric electricity for East African countries in an attempt to address the problem associated with global warming. The government's key aim is to raise smallholder agriculture productivity. This acknowledges that smallholder agriculture is the most significant subsector of Ethiopia's economy and that smallholder-farming communities continue to have a high prevalence of poverty. Along with the aforementioned, there is a significant opportunity to increase crop and livestock output utilizing attempted cost-effective and environmentally friendly technology.

To overcome those obstacles, governments, non-governmental organizations, and other international organizations must dedicate themselves more fully to guaranteeing the needs of the general public and motivating the population to commercialize agriculture by enhancing infrastructure, offering incentives, and exporting agricultural products. Moreover, the Ethiopian government should play a role in institutional reforms and declarations that largely focus on investment in agricultural infrastructure, promoting private agricultural sector investors, and the adoption of innovative agricultural technologies. In the future, it is suggested that the other options be categorized into micro- or macro-associations for the various jobs that will be based on market-oriented support for landless householders through the provision of credit facilities to increase their income and consumption levels to decrease food insecurity regardless of their gender, race, and academic standing. These actions will minimize the demand for agricultural products, political unrest, migration, and deterioration of the currently available arable land. So, in order to address and resolve these complex issues, a variety of stakeholders, including farmers, agricultural organizations, political authorities, development practitioners, researchers, technology innovators, investors, and entrepreneurs, should work in coordination and collaboration. Therefore, rectifications of the agricultural policies across the country that support the young generation might be important to increase production and productivity. These activities may include the provision of social services to accommodate the new generation.

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