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Review on Agricultural Input Use and Policy in Ethiopia

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Abstract: Ethiopian policymakers have made a series of policies and investments to boost agricultural production and productivity, especially staple food crops that have helped reduce poverty in the country. The goal of this process is to increase the availability of seeds, fertilizers, improved land use practices and input subsidy options to farmers. Although some evidence suggests that this process has helped improve agricultural yields and output, policymakers recognize that further improvements are needed. This article examines lessons learned from Ethiopia's previous experience in providing smallholder farmers with access to seeds, fertilizers, land use practices, and input subsidy options, identifies the challenges faced and the country's ongoing efforts to strengthen input systems and markets, and proposes policy solutions for the future.

Keywords: Seed, Input system, Land use, Markets, Sub-Saharan Africa, Ethiopia.

Review Paper

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1. INTRODUCTION

Over the past two decades, decision-makers in Ethiopia have pursued a range of policies and investments to boost agricultural production and productivity, particularly concerning the staple food crops that are critical to reducing poverty. The objective of the present process has been to increase the availability of improved seeds, chemical fertilizers, and other modern agricultural inputs and services for small-scale, resource-poor farmers, particularly those cultivating food staple crops [1].

Agricultural policy plays a key role in the process of agricultural economic growth. Among them, technological change is considered the main driver of productivity growth [2, 3]. Various studies have explored Ethiopia's agricultural policies and their impact on agricultural production and food security [4-8].

Ethiopia faces one of the most important global agricultural development challenges. It is one of the poorest countries in the world and the agricultural sector accounts for about 47% of gross domestic product (GDP) and three-quarters of employment; 90% of poor people live in rural areas. Therefore, the Ethiopian government always emphasizes agricultural productivity growth and food security in its long-term development strategies [1].

Since Ethiopia's early 1990s, agricultural growth has been at the center of Ethiopia's development strategy. Agriculture is the most widely used term for the support of global development in crops and livestock in many ways. Food and other products provide food to the population [9]. The main source of agricultural production is input. There are different types of agricultural inputs and among them, seed, fertilizer and soil are the most important.

2. LITERATURE REVIEW

2.1 Seed System, Multiplication and Network analysis

Seeds are an important factor in improving crop production and productivity. Increased seed quality increases crop yield potential by significant folds, making it one of the most economical and effective inputs for agricultural development [10]. Seeds have played a crucial role in agricultural development since the first crop was domesticated by the prehistoric man 4,000years ago. The breeding of wild species to plant crops probably began with the collection, storage and use of seeds for not only food but also for plantation as an important step in the assessment of established agriculture. Plant domestication was not a sudden revolution but a gradual transition from hunting and gathering to sit-down agriculture. During this process, conscious and unconscious selection occurred, which significantly changed many of our crop plants, from their

wild ancestors to highly adapted and diverse populations of local land races [11].

2.1.1 Seed system in Ethiopia

It represents complex organizational, institutional and individual activities associated with seed development/politics, multiplication, processing, storage, distribution and marketing in the country. Farmers, especially small-scale farmers, participate in a variety of seed systems that guarantee the quantity and quality of seeds needed and sell their products. In Ethiopia, seed systems can be divided into two broad categories: formal and informal, also called local seed systems or farmers' seed systems.

Formal Seed system

It is called a formal system because it is primarily supported by the Government and is also affected by several public institutions. The main actors in the formal system are the National Agricultural Research System (NARS), the Ministry of Agriculture (MoA), the Ethiopian Seed Enterprise (ESE) and private seed companies, especially special crops such as pioneers. ESE's seeds are mainly concentrated on two cereal crops (wheat and maize), and the annual supply of certified seeds by the company does not exceed 20,000 tones [12].

Informal Seed System

It is also known as the local system, sometimes as "farm system", because it operates under non-legal regulations and is characterized by the exchange of seeds from farmer to farmer. Traditional semi-structural operations at the community level, wide exchange mechanisms, and general processing of small quantities of seeds often required by farmers distinguish informal systems from formal systems [13, 12].

The informal seed system for small amounts of seeds is semi-structured, operated at the individual or community level, and can depend on indigenous knowledge about plant and seed selection, source, storage, management, and local dissemination mechanisms. The informal sector is flexible, adaptable to changes in local conditions, less dependent on external factors and less influenced [14].

In 1967, the Chilalo Agricultural Development Unit (CADU) was launched and improved seeds were distributed to farmers. In1978, Ethiopian Seed Company (ESE) was established under the current Department of State Agriculture, Coffee and Tea Development as a government branch. The company's main objective is to produce and supply improved seed to state and small-scale farmers [15].

In some countries, informal systems are very important for seed security. The bulk of seed supplies are provided through informal systems, which means that they are important for the security of seed supplies. About 60 to 70 per cent of Ethiopian small-scale farmers save seed on farms and exchange it between farmers, while the remaining20 to 30 per cent are loaned or purchased locally. The informal seed system (self-saved seed or exchange of seed between farmers) accounts for 90 per cent of the seeds used by small farmers [16].

Ethiopian Current Situation in Seed Systems

The seed system in Ethiopia has faced a number of challenges. The key challenges identified of the overall seed system in the country are:

- Lack of appropriate linkages between different stakeholders involved in the seed system;
- Insufficient supply of seeds good quality seeds at affordable prices;
- Focus on a small number of crops (maize and wheat) in the formal system and other profitable crops (such as beans and oilseeds) remains orphaned;
- Low level private sector participation in the formal system;
- Ineffective promotion, seed distribution and marketing mechanisms;
- The system of seed dissemination and seed quality assurance is weak.

According to a report by the Central Statistics Agency (CSA, 2005-2009), cereal production during this period increased by more than 4% per year. At the same time, planted area and output also increased at a rate of 2.5% and 2%/year, respectively. Among cereals, the largest increases across the board were recorded in teff, wheat and sorghum, respectively.

Seed Demand and Supply in Ethiopia

According to different sources and actual situations, the input supply and demand system is influenced by individual, situational, economic, institutional and organizational factors. Since the establishment of the Ethiopian Seed Enterprise as the first official and public seed sector, the company has remained the sole producer and supplier of improved seeds for more than three decades. The company also plays a leading role in developing an organized domestic seed production and supply system. The large gap between supply and demand has existed since the company's history. Driven by rapid growth in agricultural development over the past seven years, demand for improved seeds continues to grow rapidly in the country. The average annual demand for cereals, legumes and oilseeds is estimated at more than 400,000 tons [17]. The conceptual framework diagram of input supply and demand is presented in the figure below.

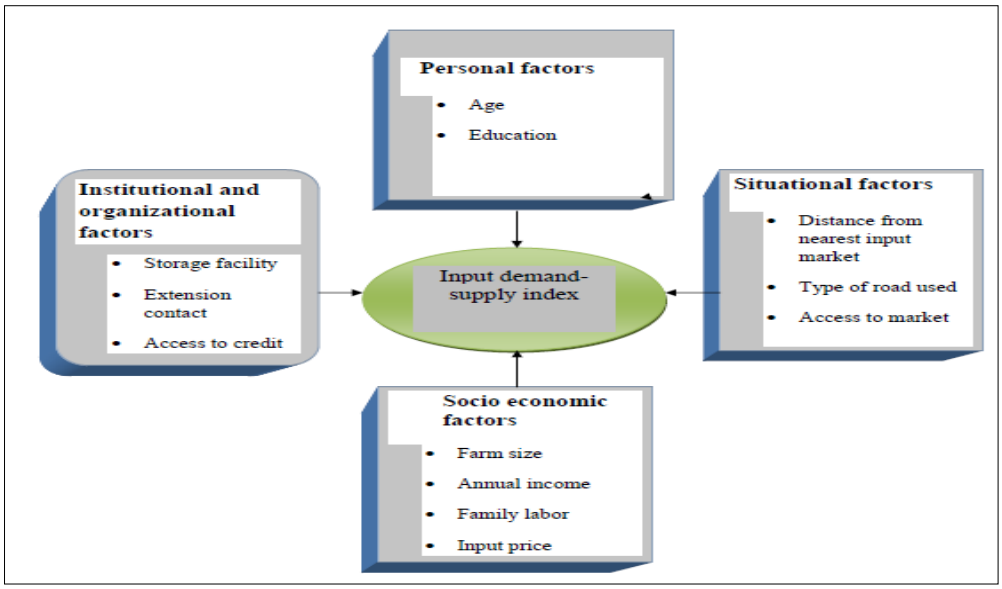

Fig. 1: Conceptual framework of the input demand-supply index

2.1.2 Seed Multiplication

Official estimates from the Central Statistics Authority (CSA) show that although the total quantity of improved seeds supplied across the country has increased since 1996-97, the use of improved seeds by farmers has increased. The average population accounted for only 4.7% of the cultivated area in 2007-08. Most farmers still rely mainly on farmer exchanges or stored seeds [16].

In recent years, the establishment of a number of private and public seed companies by regional authorities has increased the number of actors involved in the seed sector. The Ethiopian government proactively organized and brought together these stakeholders and combined their efforts to increase the supply of improved seeds in the country. Due to changes in breeding strategies, the production and supply of improved seeds, especially hybrid corn and wheat, have improved significantly over the past three years [17]. Identifying farmers' seed needs, followed by demand-oriented seed breeding and supply, is one of the strategies implemented. Furthermore, increasing the number of people involved in the seed business is another important initiative of the government for the seed system. Among others, the establishment of regional public seed companies and the provision of special support to the private seed sector are good examples. However, the majority of stakeholders are often involved in the production of potentially profitable crop seeds and some useful varieties required by farmers remain neglected. To avoid this limitation and fill the seed supply gap, the government has also launched a program called “crush breeding” in the past three years [17].

2.1.3 Seed Multiplication and Network analysis

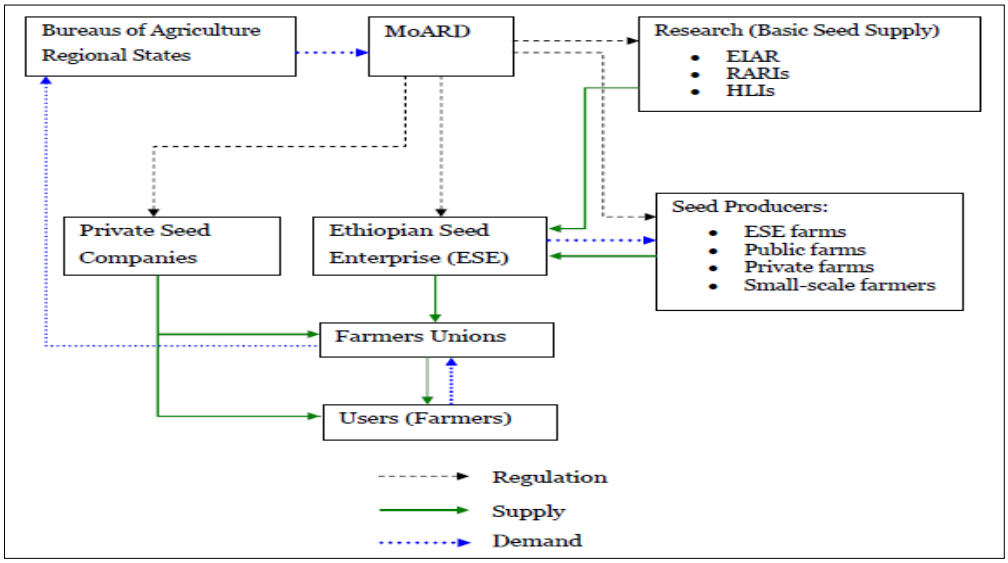

Fig. 2: Organization of the seed system in Ethiopia

Key Players in the Seed System in Ethiopia

The seed system consists of several actors; Actors include non-market actors, such as public administrations, research institutes, agricultural extension services and NGOs; to market participants, including domestic and foreign private companies, cooperative unions, and professional associations; and the farmers themselves [18].

Demand for Organic Fertilizers

According to a report by the Central Statistics Agency, fertilizer was applied to 4,734,474 hectares of land, accounting for 39.38% of the total planted area in the 2010 crop year. Farmers' demand and use of inputs Small production has increased significantly. As a result, the amount of fertilizer (DAP and urea) supplied to the regional states increased from 375,717 tons in 2006 to 595,261 tons in 2010. According to a report by the Central Statistical Office [19], fertilizer was spread on 4,734 tons. .474 hectares of land, accounting for 39.38% of the total cultivated area in the 2010 agricultural campaign. Input demand and use by small farmers has increased significantly. As a result, the amount of fertilizer (DAP and urea) supplied to regional states increased from 375,717 tons in 2006 to 595,261 tons in 2010.

Including the remaining 231,303 tons from the previous season, an additional 595,261 tons of fertilizer were imported in crop year 2010 and a total of 826,564 tons were distributed in crop year 2010.

Chemical fertilizers, a more clearly private good than seeds, also have a number of characteristics that complicate the early stages of market development [20, 2]. On the demand side, the costs of creating a fertilizer market are high when final consumers are widely dispersed geographically or when small land holdings and limited financial resources prevent them from purchasing only small quantities of fertilizer [21, 22]. Furthermore, in rain fed areas, fertilizer consumption is highly seasonal (with a marketing period of two to three months) and annual fluctuations in rainfall contribute to variability. High fluctuations between years in fertilizer demand, leading to corresponding consequences. Risk for dealers from high inventory from year to year. On the supply side, significant economies of scale in international trading and shipping mean that fertilizer importers require high levels of liquidity to supply the supply chain.

The growth in fertilizer use is notable. Over the two decades following the introduction of fertilizers under the Freedom from Famine program in the late 1960s, fertilizer use fell from 3,500 tons in the early 1970s to only about 34,000 tons in 1985. Contrast Fertilizer use, in turn, increased from 140,000 tons in the early 1970s to about 650,000 tons in 2012. The increase in fertilizer use was driven by market liberalization programs in the years 1990. Since then, the fertilizer push has entailed a number of policy changes, from liberalization, with the participation of both the public and private sectors, to the independent control of government authority over imports with exclusive marketing through agricultural cooperatives in 2008 [23].

Fertilizer Uptake/ Fertilizer Use Pattern

Chemical fertilizers are mainly used in grain production in Ethiopia. According to statistics from the Ministry of Agriculture and Rural Development (MoARD), cereals account for 90% of the country's total chemical fertilizer use; and from 2005/2006 to 2010/2011, just two regions, Oromia and Amhara, accounted for 70% of total usage, with Oromia alone accounting for about 40%. The shares of the other two major grain-producing regions – the Southern Nations, Nationalities and Peoples' Regions (SNNPR) and Tigray – are 10 and 3 percent, respectively. The adoption and use of chemical fertilizers in Ethiopia (mainly diammonium phosphate [DAP] and urea) can be assessed in several ways: in terms of total fertilizer imports, the proportion of farmers using fertilizers, and Improved fertilizer packages for seeds, ratio of arable land under fertilizer. Apply and estimate fertilizer use per hectare at the household level. Data on fertilizer use shows that a significant proportion of smallholders use fertilizer. The cultivation of teff, wheat and corn accounts for the majority of fertilizer use [1].

However, data on application rates are somewhat variable and often confusing regarding the intensity of fertilizer use in Ethiopia. Fertilizer use intensity, measured in kilograms per hectare of perennial and arable land, is currently estimated to be 17 kg of nutrients per hectare (about 29 kg per hectare of commercial produce). Similar to usage rates elsewhere in the region, but this rate is significantly lower than on small farms in the highlands of neighboring Kenya (where fertilizer is applied to 70% of the maize area with an average dose for all fields of 45 kg /ha) [24].

There is also evidence that fertilizer use is increasing over time. Data from the 2004 and 2009 survey rounds of the Ethiopia Rural Household Survey [1], show that between 2004 and 2009, the proportion of farmers who used fertilizer at least once in the previous 5 years increased from 54.4 to 67.5%.

Main Features of Agricultural Policy

Agricultural policy in developed and developing countries has been used to increase agricultural productivity and output, social welfare, and income redistribution [25]. Countries use agricultural policies to achieve self-sufficiency, transfer income between economic actors and ensure food supply and low prices for consumers. Developed industrial countries apply agricultural policies to raise agricultural product prices above market prices, transferring income from consumers to farmers, while: Developing countries apply

agricultural policies to reduce Agricultural product prices are lower than market prices, providing cheap food to consumers. Developing countries use indirect and direct measures to tax agriculture, which negatively impacts the welfare of rural households.

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The agricultural policy framework is well established and stable in most of the countries covered in this report, and changes in policy occur very slowly. A number of countries have recently renewed their agricultural policy frameworks for the coming years, and these adjustments have generally not involved drastic changes to existing policies but rather minor adjustments in overall policies. These include Canada (2013-18), European Union (2014-20), Japan (2015-20), Kazakhstan (2013-20), South Korea (2013-17), Mexico (2013-18) and Russian Federation (2013-20), Switzerland (2014-17) and United States (2014-18).

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1. Several countries, including China, Colombia, Iceland, Indonesia, Israel, Japan, Kazakhstan, Korea, Norway, the Russian Federation, Switzerland, and Turkey, focus on utilizing border measures and domestic market policies to support market prices.
2. Indonesia and Mexico have increasingly emphasized reducing costs of purchased inputs and capital, with subsidies provided for farm-purchased variable inputs like energy and fertilizers. Similarly, Brazil and Colombia rely on concessional credit schemes to promote agricultural investment, while the Russian Federation and Kazakhstan also integrate this approach into their policy framework.
3. Countries such as the United States and Canada prioritize implementing policies that mitigate the potential risks to revenue and income. The United States has recently reinforced this aspect in its policy framework, while Canada has long-standing experience in this regard.
4. Recent adjustments in policy within the European Union and Switzerland have placed a greater emphasis on providing direct financial assistance to farmers. This includes measures to enhance the environmental sustainability of agricultural practices.
5. Several countries, such as Australia, Chile, New Zealand, and South Africa, prioritize creating a favorable business environment for agriculture by emphasizing policies that offer general services with a public benefit aspect.

These broad classifications are not mutually exclusive, as the majority of nations incorporate various elements within their policy framework. To illustrate, Canada places a strong emphasis on managing potential risks to agricultural revenue and income, while also implementing supply management systems that result in substantial levels of price support for certain commodities. Similarly, Switzerland operates an intricate system of providing direct payments to farmers, while also utilizing import measures to sustain domestic prices. Norway, on the other hand, provides support for market prices across a range of commodities and also employs several different forms of direct payments. More recently, China, Japan, Korea, and the Russian Federation have begun to introduce direct payments, which serve as a complement rather than a substitute for existing market price support initiatives.

Limited numbers of countries have established schemes that are founded upon well-defined criteria dictating the timing and extent of governmental assistance.

In numerous emerging economies, the agricultural sector exhibits a distinct duality, which often necessitates the implementation of a dual-policy approach. This approach involves the adoption of one set of policies that specifically target the competitive commercial segment, while another set caters to the struggling small-scale segment. Countries such as Brazil, Chile, and South Africa explicitly distinguish between these segments and commonly provide support to small farmers through various measures aimed at reducing capital costs, minimizing expenses related to inputs, and facilitating enhanced integration into the market.

Several countries are actively engaged in the enhancement of agricultural innovation systems to enhance long-term productivity and sustainability. These efforts primarily focus on areas beyond the scope of

narrowly defined agricultural policies that typically encompass the funding of extension services and farm advisory programs. Instead, they are integrated into national innovation strategies. Noteworthy countries that have made commendable policy efforts in this direction include Australia, Canada, the European Union, and Brazil. Given that agriculture contributes significantly, both directly and indirectly, to approximately one-quarter of global greenhouse gas emissions, addressing climate change mitigation has become an increasingly important agenda item in agricultural policy discussions. However, it is worth noting that specific policy initiatives in this area remain relatively limited, with only a few exceptions. New Zealand stands out as an exception, as its agricultural sector have begun reporting to the country's emission trading scheme. Similarly, Norway and Japan are implementing measures by connecting their support payments to promote climate-friendly farming practices. In Australia, agriculture is also included in emissions trading, and funding is allocated for projects focused on mitigating emissions through the Emissions Reduction Fund.

The Agricultural Policy of the Ethiopian Government

Agriculture forms the basis of the national economy and plays a pivotal role in the socio-economic progress of the nation. In 1991, the government implemented a strategy for industrialization led by agricultural development, which focuses on integrating research with development through targeted and effective technology transfer to farmers. The objective of this agricultural development strategy is to stimulate growth, alleviate poverty, achieve self-sufficiency in food production, and safeguard the environment by promoting the safe use of enhanced technologies. The agricultural package program is primarily driven by the demonstration of improved varieties and the provision of necessary resources like better seeds, fertilizers, pesticides, and improved access to credit facilities [30].

In addition, the Agricultural Development Led Industrialization (ADLI) emphasizes that agriculture plays a crucial role in stimulating greater output, employment, and income for the population, as well as serving as a catalyst for the advancement of other sectors in the economy. The government recognizes the importance of intensifying smallholder agriculture, similar to the concept of a 'green revolution', in implementing this strategy [31].

Fertilizer Use Policy

Since the early days, the government has maintained control over the fertilizer markets in Ethiopia through its input marketing agency, which was initially known as Agricultural Input Supplies Corporation and later renamed as Agricultural Input Supplies Enterprise in 1992. This agency operated its own marketing network across the country, including marketing centers and service cooperatives that distributed fertilizers to farmers. In 1992, the transitional government implemented a new marketing system in an effort to end the government's monopoly and promote market liberalization. However, the entry of private companies into the market was initially slow, with only one company (Ethiopian Amalgamated Limited) actively participating in fertilizer marketing until 1996. Eventually, three other companies entered the market and attempted to establish their own marketing networks. Around this time, a new type of companies emerged, which were owned by regional governments and started to thrive. The Amhara regional government owned Ambassel Trading, a private company, which was the first to venture into this field. Initially, from its establishment until 1995, Ambassel primarily acted as an intermediary for AISE. However, in 1996, it expanded its operations to include importing and became the exclusive distributor and wholesaler of AISE products in the Amhara region [32].

Distribution Networks for Fertilizers

After the introduction of liberalization, numerous wholesalers and retailers promptly became agents for various importers. For instance, in 1996, importers registered a total of 2309 wholesalers and retailers. However, this figure significantly dropped to 430 by 1998, as stated in quarterly reports by the National Federation of Importers' Associations (NFIA) from 1996 to 1999. Besides, field observations and regional reports indicate that the number of wholesalers and retailers continued to dwindle in 1999. The reason for this decline can be attributed to the following factors:

- The government used to set a fixed retail margin on the selling price of fertilizer before deregulation. This margin attracted many wholesalers and retailers to enter the fertilizer business. However, with complete deregulation, they now have to compete in the market in order to make a profit. As a result, many private wholesalers and retailers have decided to withdraw from the business due to doubts about its profitability.
- Importers engaging in retailing have also reduced the number of private wholesalers and retailers, leaving little space for small-scale wholesalers and retailers.
- Additionally, private wholesalers and retailers have been discouraged by a lack of working capital, as most of them are unable to provide collateral to banks in order to obtain credit.

Practices and Regulations Concerning Land Utilization

In Ethiopia, land is considered a common asset. Unlike many other African nations, Ethiopia has maintained its fundamental land policy without major alterations for more than thirty years, with the exception of occasional land redistributions in order to cater to the expanding population. For a large portion of the Ethiopian population, access to land is a critical matter as their livelihoods and income heavily rely on agricultural activities. Consequently, matters related to

land tenure remain of great significance in both political and economic spheres, as they have been at various points throughout Ethiopia's history.

The Land Issue in Ethiopia

Currently in Ethiopia, rural land is a matter of both economic and political/social significance. According to the United Nations Economic Commission for Africa's economic report on Africa, land tenure and governance are identified as the most urgent areas requiring institutional reforms in Ethiopia. The report also highlights that the land policy implemented has not produced the expected outcomes and has been heavily criticized for its lack of inclusivity. Instead of being developed through consultations with all stakeholders, including farmers, civil society, and businesses, the policy was formulated through a centralized and top-down approach. Recent studies on the causes of long-term agricultural stagnation in Ethiopia have expanded the perspective on Ethiopian agriculture. Some argue that rural residents have increasingly experienced similar levels of poverty. According to authors [35], the land tenure system has had a diminishing effect on economic and social disparities within rural communities due to its policy of fair land distribution and the restriction on long-term migration.

Policies for Subsidizing Inputs

Agricultural input subsidies have played a significant role in Ethiopia's agricultural policy. In recent years, there has been an increasing demand from African governments and NGOs to utilize subsidies as a means to tackle agricultural stagnation across the continent. As a result, organizations like the World Bank and the UK Department for International Development have transitioned from a doubtful position to a more favorable standpoint, expressing support for this approach [35].

During the initial ten years of the 21st century, Sub-Saharan Africa transitioned from being viewed as a "hopeless Africa" to a more optimistic and promising continent, as stated by the Economist. Economic progress in the period from 2000 to 2010 demonstrated a remarkable turnaround compared to the struggles experienced in previous decades. However, it is important to note that the growth rates within Africa varied significantly between regions and countries, with West and East African coastal nations exhibiting faster growth rates compared to other areas [36].

There are, however, issues approximately the great financial boom in Africa. The United Nations Economic Commission for Africa (UNECA) and African Union (2012) word that Africa has witnessed a jobless boom in part due to the fact maximum of the boom has happened in capital-extensive extractive sectors with constrained ahead and backward linkages to the nearby economies. This is related to excessive degrees of unemployment and underemployment, especially in some adolescents, with maximum of the adolescents trapped in much less efficient casual sectors. At the same time, now no longer tons structural transformation in African economies has taken place, implying that a huge share of African human beings nonetheless depend upon agriculture as a supply of livelihood. These observations underlie issues approximately developing inequity inside African economies, and persevering with excessive degrees of poverty especially rural poverty [37].

3. CONCLUSION

Intensification and commercialization of agriculture is wanted in Ethiopia given its precarious meals scenario and acute land scarcity. Ethiopia has an admirable file of helping agriculture; the ongoing state-led rules to reinforce agricultural manufacturing and productiveness have now outlived their usefulness. This paper provides the shape and evolution of Ethiopian agricultural enter use and rules especially, seed system, which include its key players, the regulatory framework, and latest marketplace trends. The aforementioned seed systems (the formal and informal) had been running for numerous a long times with inside the country and gambling the lion’s percentage in presenting seeds for the whole crop manufacturing.

In nations like Ethiopia in which the formal seed deliver is inefficient, the casual device is extraordinarily crucial for the seed safety of the nation. The majority of Ethiopian smallholder farmers are in large part established in this device particularly via farm-stored seed exchange. The device affords less expensive and quite simply to be had with inside the farmers‟ village on the proper time of seed is needed. As a result, the bulk of Ethiopian farmers display a bent to depend upon the casual device.

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