Sector Outlook: Soybean

February, 2025

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1. General Overview Sector

1.1 Global Overview

1.1.1 Global production

Soybean (*Glycine max*) is one of the most important crops globally, widely cultivated for its high protein and oil content. It serves as a key ingredient in animal feed, human food products (such as tofu, soy milk, and soy oil), and industrial applications like biodiesel[1]. It is economically the most important bean in the world, providing vegetable protein for millions of people and ingredients for hundreds of chemical products[2]. Soybeans play a significant role in the global economy, environment, and employment, making them one of the most versatile and impactful crops worldwide. Economically, soybeans are a major commodity in international trade. The crop generates billions of dollars annually, supporting livelihoods across the agricultural supply chain, from farmers to processors and exporters. The global soybean sector is worth USD 155 billion[3]. Environmentally, soybean cultivation contributes to sustainable practices such as crop rotation and soil nitrogen fixation. On the employment front, soybean farming and processing provide millions of jobs globally, especially in rural areas of developing countries, where it serves as a critical source of income. According to the Food and Agriculture Organization[4], the soybean industry supports over 20 million jobs worldwide, highlighting its importance in global food security and rural development.

1.1.2 Main production countries/ regions

Globally, Brazil (153 million MT), USA (113.27 Million MT), Argentina (48.21 Million MT), china (20.84 Million MT), India (11.88 Million MT) and Paraguay (11 Million MT) are the top producers of soybean in 2023/2024[5]. These countries account for approximately 91% of global production.

Brazil

Brazil is the world's leading producer and exporter of soybeans and its products (soyoil and soymeal). Soybean is the principal crop produced in Brazil both in scale and in value (Table 1).

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[1] USDA. (2023). *World Agricultural Supply and Demand Estimates (WASDE)*.
[2] Britannica, 2024. Soybean. https://www.britannica.com/plant/soybean, Food and Agriculture organization of the united nation, 2024. Soybean. Accessed from https://www.fao.org/land-water/databases-and-software/crop-information/soybean/en/.
[3] Persistence Market Research, 2023. Soybean by-products market. Accessed from https://www.persistencemarketresearch.com/market-research/soybean-by-products-market.asp
[4] FAO. (2023). *The State of Agricultural Commodity Markets: Soybean Production and Trade*. Retrieved from http://www.fao.org/faostat/
[5] USDA, 2024. India: Oilseeds and Products Update. Accessed from https://fas.usda.gov/data/india-oilseeds-and-products-update-29#:~:text=Soybean%20production%20in%20marketing%20year%20(MY)%202024/2025,MY%202024/2025%20are%20projected%20at%203.7%20MMT.

Table 1. Soybean production trend in Brazil

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	34,777,936	3,390	117,912,450
2019	35,895,207	3,184	114,316,829
2020	37,191,638	3,275	121,820,949
2021	39,126,269	3,445	134,799,179
2022	40,894,968	2,951	120,701,031

The trend indicates that the area dedicated to soybean cultivation is increasing; however, yield and production levels are inconsistent, with fluctuations in both increases and decreases in soybean yield and production. Soybean production is receiving subsidies and tax exemptions in Brazil[6]. Brazil soybean production and export is increasing[7] and this is largely due to increased planted areas, increased production and strong global demand, particularly from China[8]. It is projected to increase on the coming years, with the planted area expected to rise compared to the 2022/2023. However, the growth rate is slow, and this is primarily due to delayed rainfall affecting soil preparation and planting. The production volume is estimated to reach 168.6 billion tonnes and therefore a new peak will be in 2033[9]. The main export destinations of Brazil Soybeans were China, Spain, Thailand, Iran, and Netherlands[10]. Global soybean trade continues to be driven by China, which accounts for about 60% of total soybean imports. China's domestic consumption is growing (IFPRI, 2023)[11] China prefers to import soybeans from Brazil and Argentina exclusively[12]. By 2025 and beyond china will source nearly all of its soybean from Brazil[13]. In the United States, increased biodiesel production has diverted more soybean

[6] *WWF-Brazil.* 2023. Technical note reveals that despite the intensification of soybean production in Brazil, most of the profit from the chain does not stay in the country. Accessed from https://www.wwf.org.br/?86520/Most-of-the-profit-from-soybean-production-in-Brazil-goes-abroad

[7] Karen Braun, 2024. Brazil's braking of soy expansion unlikely to prevent global stock swell. Accessed from https://www.reuters.com/markets/commodities/brazils-braking-soy-expansion-unlikely-prevent-global-stock-swell-2024-08-29/

[8] *Yuriy Ruban, 2024. Conab forecasts Brazil's 2025 maize and soyabean harvests: Grain market daily. Accessed from https://ahdb.org.uk/news/conab-forecasts-brazil-s-2025-maize-and-soyabean-harvests-grain-market-daily*

[9] Soybean production in Brazil from 2023 to 2033. Accessed from https://www.statista.com/statistics/777211/brazil-soybean-production/

[10] Abd (9)

[11] IFPRI. (2023). *China's Soybean Import Trends*. International Food Policy Research Institute. Retrieved from https://www.ifpri.org/

[12] AgResource. (2024). *Global Soybean Trade and Production Outlook*. Retrieved from https://www.agresource.com/

[13] Open market, 2024. Five Things to Watch in the Soybean Market in 2024. Retrived from https://www.cmegroup.com/openmarkets/agriculture/2024/Five-Things-to-Watch-in-the-Soybean-Market-in-2024.html on February 10 2025

production to be crushed domestically for soybean oil, reducing soybean exports[14]. As a result, Brazil's share of world soybean trade will be expanded[15]. In 2023/24, Brazil is projected to account for almost 58% of total soybean exports[16]. Spain is soybean import is also increasing due to the country's livestock sector drives demand for feed ingredients, and oilseeds production is limited. Most of the soybeans used for crushing in Spain come from Brazil [17]

USA

The United States is the largest producer of soybeans globally, significantly contributing to the world supply. In the US, soybeans are also the dominant oilseed crop, accounting for a whopping 90 percent of the country's oilseed production, while the remaining 10 percent comprises cottonseed, sunflower seed, canola, rapeseed and peanuts. As of recent years, U.S. soybean production has shown a steady increase due to advancements in agricultural technology and practices (Table. 2). The average soybean yields is increasing and will continue to rise depending on weather conditions and technological adoption.

Table 2. Trend of soybean production in USA

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	35,448,420	3,400	120,514,490
2019	30,327,060	3,188	96,667,090
2020	33,428,610	3,433	114,748,940
2021	34,929,600	3,479	121,527,780
2022	34,939,320	3,331	116,377,000

The area dedicated to soybean cultivation is expected to remain stable or increase slightly, influenced by market demand and crop rotation practices. Surging demand for biofuels and lower supply out of South America are expected to benefit the U.S. until the beginning of next year. South America is still recovering from a drought that impacted harvests last year. Although countries like Brazil and Argentina are expecting bumper harvests, supply imbalances in South America give U.S. exporters a boost. Soybean exports are projected to rise due to lower supplies

[14] ***International Food Policy Research Institute (IFPRI) & Agricultural Market Information System (AMIS). (2023). Retrieved from https://www.ifpri.org/event/emerging-trends-global-soybean-complex/#:~:text=In%20the%20United%20States%2C%20increased,58%25%20of%20total%20soybean%20exports on February 10 2025***

[16] IFPRI. (2023). *Brazil Soybean Production Trends*. International Food Policy Research Institute. Retrieved from https://www.ifpri.org/

[17] USDA. (2023). *World Agricultural Supply and Demand Estimates (WASDE)*. Retrieved from https://www.fas.usda.gov/

out of Brazil. Even with increased supply from Brazil and Argentina, U.S. soybean growers are expected to receive a premium due to strong domestic demand for the crop as a biofuel feedstock[18].

Argentina

Argentina is the world's third largest producer of soybeans, after the United States and Brazil. It is the most important agricultural commodity in Argentina, with relevance in public revenues and international reserves accumulation[19]. It is the 6th most exported product in Argentina. According to[20], the area cultivated with soybeans increased. However, between 2015/16 and 2023/24, it is down by 1.8% (Table3)

Table 3. Soybean production trend in Argentina

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	16,318,060.00	2,315.70	37,787,927.00
2019	16,575,887.00	3,334.00	55,263,891.00
2020	16,710,793.00	2,919.10	48,780,407.00
2021	16,466,714.00	2,806.70	46,217,911.00
2022	15,874,266	2,763.00	43,861,066.00

Argentina is one of the largest soybean exporters in the world, ranking alongside the United States and Brazil. The country primarily exports whole soybeans, soybean meal, and soybean oil, which are essential for animal feed and cooking oil. The main destination of Soybeans exports from Argentina are China, United States, Indonesia, Chile, and Turkey[21].

China

China is a top producer of soybeans. Despite efforts to increase domestic soybean production, China still relies significantly on imports to meet its needs, contributing to the sustained demand for imported soybeans[22]. It is the world's largest consumer of soybeans, and imports most of the soybeans it needs. China primarily imports soybeans from Brazil, which is considered their

[18] Sarah Zimmerman, 2024. Global soybean production poised for record growth. Accessed from https://www.agriculturedive.com/news/soybean-supply-record-prices-exports-biofuels/716046/

[19] Thomasz, E.O., Pérez-Franco, I. and García-García, A., 2024. Assessing the impact of climate change on soybean production in Argentina. *Climate Services*, *34*, p.100458.

[20] Ramiro Costa, 2023. Exploring the Dynamics of Argentina's Soybean Complex: Past Trends and Future Uncertainties

[21] Observatory of Economic Complexity, 2023. *Soybeans in Argentina*. Retrieved from https://oec.world/en/profile/bilateral-product/soybeans/reporter/arg on 10 February 2025

[22] Lee, T., 2016. *Editor's Pick 2016: China's demand for imported soybeans expected to remain strong*

largest supplier, accounting for around 70% of their soybean imports; with the United States and Argentina being the other major sources.

Year	Area harvested(ha)	Yield(Kg/ha)	Production(t)
2018	8,415,791	1,898	15,971,504
2019	9,303,405	1,946	18,104,776
2020	9,885,928	1,983	19,604,447
2021	8,403,376	1,952	16,404,194
2022	10,243,000	1,980	20,285,000

Source ([23]).

China's demand for soybeans has generally been increasing, driven primarily by its growing livestock sector, which relies heavily on soybean meal for animal feed. As the Chinese population's income rises, there is a shift towards higher protein diets, further boosting the demand for soybeans. Projections indicate that demand will continue to rise, although the rate of increase may vary.

India

India is one of the leading producers of soybeans in Asia. Indian soybean production primarily supports domestic consumption, including oil extraction and animal feed (table4).

Table 4. India soybean production trend

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	10,328,830	1,059	10,932,970
2019	11,131,260	1,192	13,267,520
2020	12,192,710	921	11,225,850
2021	12,918,280	976	12,610,300
2022	12,146,580	1,069	12,986,720

Source ([24])

While India produces soybeans, it imports some quantities to meet its overall demand, especially for soybean oil. India's top soybean import partners are: Togo, Nigeria, Mozambique, Tanzania, Ethiopia, Burkina Faso, Zambia and others. India's soybean demand is projected to increase in

[23] Food and Agriculture Organization of the United Nations. (2023). *FAOSTAT*. Retrieved February 10, 2025, from http://www.fao.org/faostat/en/

[24] Food and Agriculture Organization of the United Nations. (2023). *FAOSTAT*. Retrieved February 10, 2025, from http://www.fao.org/faostat/en/

the 2024/2025 marketing year, with production increase driven by favorable conditions and slightly increased planting area[25].

Paraguay

Paraguay is one of the top producers of soybeans in the world, ranking among the largest exporters (table). The country's soybean industry plays a crucial role in its economy, contributing significantly to agricultural exports and overall GDP.

Table 5. Soybean production trend in Paraguay

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	3,510,000	3,147	11,045,971
2019	3,565,000	2,390	8,520,350
2020	3,631,000	3,036	11,024,460
2021	3,640,000	2,895	10,537,080
2022	3,519,850	1,288	4,532,103

Soybeans, is the 5th largest exporter of Soybeans in the world and Soybeans is the 2nd most exported product in Paraguay. The main destination of Soybeans exports from Paraguay are: Argentina, Brazil, Russia, Uruguay, and United Arab Emirates. The fastest growing export markets for Soybeans of Paraguay is Uruguay, United Arab Emirates and Switzerland.

1.1.3 Main consumer markets globally

The world's largest importers of soybean are in 2023 China (66%), Argentina (6.27%), Mexico (2.64%), Japan (2.46%), and Thailand (2.24%). About 76% of soy production is used as low-cost, quality protein for animal feed for meat and dairy production, 20% is consumed as edible oils and human food products, and 4% is used for industrial purposes, primarily in the form of biodiesel[26].

1.1.4 Supply – Demand Balance

Supply

[25] USDA, 2024. India: Oilseeds and Products Update. Accessed from https://fas.usda.gov/data/india-oilseeds-and-products-update-29#:~:text=Soybean%20production%20in%20marketing%20year%20(MY)%202024/2025,MY%202024/2025%20are%20projected%20at%203.7%20MMT.

[26] Ritchie, H., 2021. Is our appetite for soy driving deforestation in the Amazon? Our World in Data. https://ourworldindata.org/soy

The global soybean market is experiencing significant shifts in supply and demand dynamics, driven by factors such as biofuel expansion, changing trade patterns, and increasing consumption in key markets. Global soybean production is projected to reach a record 422 million tons in 2024/25, a 6% increase from the previous year, driven by expanded planted areas and improved yields in major producing countries like Brazil, the United States, and Argentina[27]. Brazil, the world's largest soybean producer, is expected to increase production by 13% in 2024/25, with planted areas expanding by 2.8%. However, delayed rainfall and climate variability could hinder this growth (IFPRI, 2023; AgResource, 2024)[28]. In the United States, soybean production is increasingly being diverted to domestic crushing for soybean oil, driven by the growing demand for biofuels. This has reduced the availability of soybeans for export, shifting the global trade balance in favor of Brazil[29]. Argentina, another major producer, is recovering from drought conditions that impacted its 2022/23 crop. Improved weather conditions and higher yields are expected to boost production in the coming years (USDA, 2023)[30].

Top producers

Demand Side

China remains the largest importer of soybeans, accounting for approximately 60% of global imports. Its demand is driven by the need for animal feed to support its massive livestock industry and for food products like soy oil and tofu[31]. China increasingly prefers sourcing soybeans from Brazil and Argentina, with projections indicating that nearly all of its soybean imports will come from Brazil by 2025[32]. The push for biofuels, particularly in the United States and Europe, has significantly increased demand for soybean oil. This has led to higher domestic crushing rates in the U.S., reducing its exportable surplus[33]. Countries like Spain are increasing soybean imports

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[27] USDA, 2023. Spain: Spain Soybean and Products Market Outlook. Accessed https://fas.usda.gov/data/spain-spain-soybean-and-products-market-outlook#:~:text=This%20report%20presents%20an%20overview,Europe%20and%20Eurasia%2C%20Spain, Statista. (2024). *Global Soybean Production Forecast*.

[28] IFPRI. (2023). *Brazil Soybean Production Trends*. International Food Policy Research Institute. Retrieved from https://www.ifpri.org/, AgResource. (2024). *Global Soybean Trade and Production Outlook*.

[29] AgResource. (2024). *Global Soybean Trade and Production Outlook*.

[30] USDA. (2023). *World Agricultural Supply and Demand Estimates (WASDE)*.

[31] IFPRI. (2023). *China's Soybean Import Trends*. International Food Policy Research Institute. Retrieved from https://www.ifpri.org/

[32] AgResource. (2024). *Global Soybean Trade and Production Outlook*. Retrieved from https://www.agresource.com/

to meet the growing demand for animal feed in their livestock sectors. Limited domestic oilseed production in Europe makes it heavily reliant on imports, primarily from Brazil[34]. Global soybean consumption is rising steadily, driven by population growth, increasing meat consumption, and the expansion of the biofuel industry. This trend is expected to continue, particularly in developing countries[35].

The global soybean market is currently tight, with strong demand outpacing supply growth in some regions. While production is increasing, particularly in Brazil, challenges such as climate variability, delayed planting, and shifting trade patterns are creating uncertainties. Brazil is emerging as the dominant player in global soybean trade, accounting for nearly 58% of global exports in 2023/24, while the U.S. focuses more on domestic crushing for biofuel production.[36] China's insatiable demand for soybeans continues to drive global trade, with Brazil and Argentina being the primary beneficiaries of this trend.

1.1.5 Trends in the Global Market

The global soybean market is experiencing significant trends characterized by rising production, strong demand, and shifting trade dynamics. Production is projected to increase, driven by expanded planted areas and improved yields in major producers like Brazil, the U.S., and Argentina. Brazil is emerging as the dominant exporter, while the U.S. focuses more on domestic crushing for biofuels. Demand from China, which represents 60% of global soybean imports, is primarily driven by the need for animal feed and food products, with Brazil increasingly becoming the primary supplier, projected to cover nearly all of China’s imports by 2025. Additionally, the growing biofuel sector, particularly in the U.S. and Europe, is boosting the use of soybean oil for biodiesel, leading to higher domestic crushing rates and reducing the availability of soybeans for export. Emerging markets in Africa and Eastern Europe are also ramping up production to meet local and regional demand. However, challenges such as climate variability and sustainability concerns are influencing market dynamics. Overall, the soybean market is marked by rising production and demand but is navigating complexities related to trade patterns, price volatility, and environmental impacts.

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[34] USDA, 2023. *World Agricultural Supply and Demand Estimates (WASDE)*. Retrieved from https://www.fas.usda.gov/

[35] FAO. (2023). *The State of Agricultural Commodity Markets: Soybean Production and Trade*. Retrieved from http://www.fao.org/faostat/

[36] IFPRI. (2023). *Brazil Soybean Production Trends*. International Food Policy Research Institute. Retrieved from https://www.ifpri.org/, AgResource. (2024). *Global Soybean Trade and Production Outlook*.

1.2 Regional Overview

1.2.1 Regional production

African producers supply less than 1% of the world's soybeans, but production levels are rising at a rate of 6.84% per year, primarily due to an increase in planted acreage rather than yield improvements[37]. South Africa, Nigeria, and Zambia are the top soybean producers on the continent. Despite this growth, Africa remains a minor player in the global soybean market, with low production levels and slow yield growth. Domestic demand for soybeans is expected to continue exceeding local supplies, making imports essential to meet the continent's needs for soybeans, soybean meal, and soybean oil.

1.2.2 Main production countries/ regions

South Africa

South Africa is the largest producer of soybeans in Africa, contributing notably to both local and regional markets[38] (Table 6). Soybeans are a small but important and growing component of South Africa's agricultural economy. South Africa's soybean production for the 2022/23 marketing year was at a record level, reflecting an increase from the previous year attributed to favorable weather, an increased planted area, and advancements in farming technologies and practices[39]. The area dedicated to soybean cultivation has also reached record high**.** Additionally, the country's crushing capacities for soybean oil and meal have grown, meeting local demand for both human consumption and animal feed[40]. South Africa exported Soya beans to Malaysia, Mozambique, Vietnam, Thailand, and Zimbabwe[41]**.** For the 2024/25 marketing season, South Africa's soybean production and export projections indicate a robust supply, driven by local commercial deliveries and a small amount of imports. The projected total demand reflects strong domestic consumption, particularly for processing into oil and animal feed, as well as significant

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[37] Cornelius, M. and Goldsmith, P., 2019. Soybean yield in Africa. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(5), pp.15169-15172.

[38] Cornelius, M. and Goldsmith, P., 2019. Soybean yield in Africa. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(5), pp.15169-15172.

[39] USDA, 2024. Report Name: Oilseeds and Products Annual. Accessed from https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Oilseeds%20and%20Products%20Annual_Pretoria_South%20Africa%20-%20Republic%20of_SF2024-0007.pdf

[40] USDA, 2023. South Africa Soybean Area Rapidly Increases. Accessed from https://ipad.fas.usda.gov/highlights/2023/05/SouthAfrica/index.pdf

[41] WITS, **2022.** South Africa Soya beans exports by country In 2022. Accessed from https://wits.worldbank.org/trade/comtrade/en/country/ZAF/year/2022/tradeflow/Exports/partner/ALL/product/120100#:~:text=South%20Africa%20exported%20Soya%20beans,16%2C108.04K%20%2C%2025%2C370%2C500%20Kg).

export potential for soybean products. This balance between production and demand suggests that while domestic needs are being met, the country is also positioned to export a notable quantity of soybeans, contributing to the overall agricultural economy[42].

Table 6. Soybean production trend in South Africa

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	787200	1956.3	1540000
2019	730500	1602.1	1170345
2020	705000	1766.7	1245500
2021	827100	2293.6	1897000
2022	925300	1241	1148300

Nigeria

Nigeria is a producer of soybeans and has been increasing its production in recent years. The country is one of the leading soybean producers in Africa (Table7). It is important for both domestic consumption and export, serving as a key source of protein for human diets and animal feed in Nigeria. The growing demand for soybeans in Nigeria is driven by the livestock sector and food processing industries. It has expanded as a result of its nutritive and economic importance and diverse domestic usage. The rapid growth in the poultry sector has also increased demand for soybean meal in Nigeria. It is believed that soybean production will increase soil fertility and control Striga. The market for soybean in Nigeria is growing very fast with opportunities for improving the income of farmers[43]. The main destinations of Nigeria's Soya beans were Canada, Turkey, India, Sri Lanka, and Angola.

Table 7. Soybean production trend in Nigeria

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	693164	952	660000
2019	830014	963	800000
2020	1207740	1045	1262280
2021	1105950	1054	1166050
2022	1100000	963	1060000

Zambia, Benin, Ghana, Uganda, and Ethiopia are also notable soybean-producing countries in Africa.

[42] Moses Lubinga, 2024. The South African Supply And Demand Projections for Grains and Oilseeds for July 2024. Accessed from https://www.namc.co.za/wpcontent/uploads/2024/07/Final-July-2024-SASDE-Report-30-JULY-2024.pdf

[43] Omoigui, L.O., Kamara, A.Y., Kamai, N., Dugje, I.Y., Ekeleme, F., Kumar, P., Ademulegun, T. and Solomon, R., 2020. Guide to soybean production in northern Nigeria.

1.2.3 Main consumer markets regionally

In 2022, Egypt, South Africa, Algeria, Tunisia, and Nigeria emerged as the top soybean consumers in Africa, reflecting significant trends in regional demand. Egypt leads the consumption, driven by its growing livestock sector and demand for animal feed. South Africa follows closely, where soybeans are essential for both animal feed and oil production. Algeria and Tunisia have also shown increasing consumption, largely due to rising demand for soy-based products and animal feed, as these nations seek to enhance food security and reduce reliance on imports. Nigeria, with its expanding agricultural sector, is also ramping up soybean consumption to support local production of animal feed and edible oil. Overall, these countries are experiencing a shift towards greater soybean utilization, underscoring the crop's importance in meeting food and feed needs across the continent.

1.2.4 Supply – Demand Balance

The soybean supply-demand balance in Africa reflects a growing but underdeveloped market, characterized by rising domestic demand and untapped production potential. Soybean production in Africa has increased steadily, with South Africa, Nigeria, Zambia, Uganda, and Malawi as top producers[44]. Cultivation is expanding due to soybean's role in crop rotation (improving soil nitrogen) and its profitability compared to traditional crops like maize. Average agricultural yields in Africa significantly lag behind the global average due to limited access to quality seeds, fertilizers, and modern farming techniques, exacerbated by climate risks such as erratic rainfall and pests like the fall armyworm. Besides, inadequate storage, transportation, and processing facilities, contribute to substantial post-harvest losses, with around 30% of crops wasted before reaching consumers.

1.2.5 Trends in the Regional Market

The regional soybean market in Africa is experiencing increasing domestic demand, particularly driven by the growing livestock sector in countries like Nigeria and Egypt. Key producers, including South Africa, Nigeria, Zambia, Uganda, and Malawi, are expanding soybean cultivation due to its profitability and benefits in crop rotation. However, there is a pressing need for investment in storage, transportation, and processing infrastructure to mitigate significant post-harvest losses, which account for around 30% of crops. As yields lag behind global averages, a trend toward adopting modern agricultural practices

[44] FAO. (2023). *The State of Agricultural Commodity Markets: Soybean Production and Trade*. Retrieved from http://www.fao.org/faostat/

and technologies is emerging to enhance productivity. Additionally, climate risks such as erratic rainfall and pests are prompting discussions on sustainable farming practices. Regional cooperation and trade agreements are further facilitating the movement and integration of soybean products across countries, highlighting both challenges and opportunities in the market.

1.3 Country Overview

1.3.1 Domestic production

From the Ethiopian export sector oilseed industry provides a major contribution to foreign exchange returns. In the country, the major oilseed exported include Sesame; Soybean; and Niger seed. Soybean is very important crop because of its nutritional value, multi-purpose use such as improving food security, soil fertility improvement and recovery of raw material for oil industry, and wider adaptability in different cropping systems. It is produced in all regions of Ethiopia at mid altitude and in lowland areas and is largely grown by smallholder farmers; however, a number of commercial farms producing soybean on larger areas of land also exist, especially in the lowland areas. These farms are largely constrained by access to finance and working capital to access machines and in term of skills and labor for soya bean production and tend to experience lower yields.

Edible oil is largely imported as local production only satisfies 2% of domestic. Ethiopia has national processing capacity of 293 million liters of vegetable oil from a composite of raw materials, but only 7% of the capacity has been utilized so far. The Soybean in Ethiopia has the potential to be a key accelerator of agricultural development and growth. It plays a valuable role in enhancing the rural economy and social development as well as ensuring national food security, and livelihoods. It is a commodity that benefits poor farmers by providing benefits for nutrition (high protein content), income (potential for value addition) and soil fertility (through nitrogen fixing properties). Soybean is also strategically important to Ethiopia, as it is the second most exported agricultural commodity (along with other oilseeds) after coffee and plays a vital role in the country's economy. It is the second largest source for oil production after Niger seed, has a domestic market orientation, and is commonly processed into oil and oil cake[45]. Production

[45] Commercial Agriculture for Smallholders and Agribusinesses (CASA), 2023. Ethiopia Soybean Value Chain Inclusive Growth Strategy

of soybeans in Ethiopia is set to rise 3.4 percent in 2026 to nearly 179 thousand metric tons, up from 146 thousand in 2021[46].

Table 8. Soybean production trend in Ethiopia

Year	Area harvested(ha)	Yield(kg/ha)	Production(t)
2018	64720	2309	149454
2019	54543	2303	125623
2020	83797	2490	208676
2021	75939	2443	185522
2022	72000	2639	190000

As indicated in the table, while the area harvested has fluctuated, the yield improvement has played a crucial role in sustaining and enhancing soybean production in Ethiopia during these years.

In 2022, Ethiopia exported $35.6 million in Soya beans, making it the 30th largest exporter of Soya beans in the world. In that same year, Soya beans were the 13th most exported product from Ethiopia. The main destinations for Soya bean exports from Ethiopia are India ($21.6 million), United States ($2.56 million), Canada ($2.3 million), China ($1.83 million), and Vietnam ($1.67 million). The fastest-growing export markets for Ethiopian Soya beans between 2021 and 2022 were the United States ($2.29 million), Canada ($1.83 million), and Singapore ($1.11 million)[47].

1.3.2 Supply – Demand Balance

In Africa, the demand for soybeans significantly outpaces the current supply, leading to a large import reliance for soybean products like soya bean meal, primarily due to the growing demand for animal feed as a result of increasing livestock production, while the major producers like South Africa and Nigeria still struggle to meet domestic needs, despite seeing a rise in production in recent years; this gap presents an opportunity for further expansion of soybean cultivation across the continent to meet the growing demand[48].

[46] Report linker, 2021. Ethiopia Soybean Industry Outlook 2022 – 2026. Accessed from https://www.reportlinker.com/clp/country/3685/726253#:~:text=Key%20Market%20Indicators,were%20the%20top%20three%20producers.

[47] OEC, 2023. Soybean in Ethiopia. Accessed from https://oec.world/en/profile/bilateral-product/soya-beans/reporter/eth

[48] *Meyer, F., Traub, L. N., Davids, T., Chisanga, B., Kachule, R., Tostao, E., & Boulanger, P. (2018). Modelling Soybean Markets in Eastern and Southern Africa: Regional Network of*

1.3.3 Climatological circumstances

Ethiopia presents significant opportunities for soybean cultivation, driven by several factors. The country boasts abundant arable land suitable for soybean production, allowing for increased output[49]. This potential is complemented by growing domestic demand, particularly for animal feed and food products, which creates a strong local market to capitalize on. Additionally, Ethiopia has the opportunity to establish itself as a regional soybean exporter, especially to neighboring countries with high demand. The nation's reputation for organic farming can further enhance its market appeal, as organic soybeans attract health-conscious consumers both locally and internationally. The international market is increasingly favoring Ethiopian soybeans due to their GMO-free status, providing a competitive advantage with potential premiums of up to $150 per tonne[50]. Government initiatives are also supporting the production and export of soybeans, while advancements in technology positively impact cultivation practices. The rise of soybean processing facilities adds value to the crop by creating jobs and expanding market opportunities for producers. Furthermore, an abundant and affordable labor force facilitates large-scale production, reducing costs and enhancing overall productivity[51]. Together, these factors position Ethiopia favorably in the global soybean market.

1.3.4 Price Setting – Price Mechanisms

In Ethiopia, farmers have the right to set prices for their soybeans, but traders often influence these prices. Farmers typically sell their soybeans to spot market traders or village collectors through brokers. However, many farmers perceive that traders may collude to drive prices down. To counter this, negotiations between producers and traders are common, and initiatives like benefit packages for reporting illegal traders have been introduced in areas such as Northwestern Ethiopia. Several external factors also affect soybean pricing in Ethiopia. Global demand is a primary driver of export prices, while geopolitical tensions can create fluctuations in prices. Additionally, violent conflicts may pose logistical challenges that further impact the supply chain and pricing of soybeans. Overall, the interplay between farmers, traders, and these external influences shapes the soybean market in the region.

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[49] Molla, H.S., Ayele, Z.A. and Zeleke, M.A., 2024. Trends, Opportunities, and Challenges of the Ethiopian Soybean Export Market in the Past Two Decades (2004–2022). *Advances in Agriculture*, *2024*(1), p.9979892.

[50] Teshale, D., Zemedu, L., Rehima, M., Tesfaye, A., Beza, E., Dibaba, R. and Diro, S., 2021. Soybean value chain analysis in Ethiopia: a qualitative study.

[51] Molla, H.S., Ayele, Z.A. and Zeleke, M.A., 2024. Trends, Opportunities, and Challenges of the Ethiopian Soybean Export Market in the Past Two Decades (2004–2022). *Advances in Agriculture*, *2024*(1), p.9979892.

1.3.5 Main production regions

Soybean is a major crop in Ethiopia, accounting for 18% of the country's oilseed production. It's grown in various agro-ecological areas, with the majority of production coming from the Amhara(Agew Awi, West Gonder, Central Gonder and Wolkait Tegdie), Benishangul Gumuz(Pawe district) and Oromia regions (Chewaka, Bedele in Buno Bedele Zones and Jimma zones, West and East Wollega[52], Oromia and Benishangul Gumuz accounts for 91% of total production.

1.3.6 Specific climatological circumstances locally

1.3.7 Main Consumer Markets

The main destination of Soybeans exports from Ethiopia are: India, United States, Canada, China, and Vietnam. The fastest growing export markets for Soybeans of Ethiopia between 2021 and 2022 were United States, Canada and Singapore [53].

1.3.8 Share of GDP

Soybeans contribute roughly 18% to Ethiopia's total oilseed production, making it a significant crop within the country's agricultural sector. However, it is considered one of the most important crops in the country (U.S. Department of Agriculture (USDA). (2020)

1.3.9 Net-Exporter or Net-Importer as a % and in volume

In 2023, Ethiopia's exports of soybeans reached $130 million, marking a 191% increase from $44 million in 2022, which represents an $85 million rise. Soybeans accounted for 4.55% of Ethiopia's total exports, which amounted to $2.85 billion that year. The share of soybeans in total exports increased by 3.1 percentage points compared to 2022, where it was 1.44% with total exports of $3.08 billion[54].

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[52] Molla, H.S., Ayele, Z.A. and Zeleke, M.A., 2024. Trends, Opportunities, and Challenges of the Ethiopian Soybean Export Market in the Past Two Decades (2004–2022). *Advances in Agriculture*, *2024*(1), p.9979892.

[53] OEC, 2023. Soybean in Ethiopia. Accessed from https://oec.world/en/profile/bilateral-product/soya-beans/reporter/eth

[54] TrendEconomy, 2024. *Ethiopia* | *Imports and Exports* | *World* | *Soya beans (soybeans)* | *Value (US$) and Value Growth, YoY (%)* | *2012 - 2023*. Retrieved from https://trendeconomy.com/data/h2/Ethiopia/1201 Accessed 11 February 2025

1.3.10 Average yields

According to [55]Global soybean yields average is 2.71t/ha, while Ethiopia's yields is 2.44t/ha. This significant disparity indicates that Ethiopia has considerable potential for yield improvement, suggesting an opportunity for increased productivity through enhanced agricultural practices and technology.

1.3.11 Average farm size

According to[56] soybean smallholder farmers has average farm size of 0.27 hectares.

1.3.12 Country snapshot

Geography

- **Location**: Landlocked country in the Horn of Africa
- **Population**: Approximately 126.5 million, making it the second most populous nation in Africa
- **Topography**: Diverse landscape featuring high plateaus, deep gorges, and mountainous regions; the central highlands are the most densely populated area
- **Climate**: Varies significantly; temperate climate in the highlands and tropical climate in the lowlands
- **Major Rivers**: The Blue Nile (Abay River) is a key waterway originating in Ethiopia

Political System

- Government Type: Federal multi-party parliamentary republic
- Head of Government: Prime Minister Abiy Ahmed, who came to power in 2018 and has implemented significant reforms
- Political Stability: The country has experienced periods of political instability alongside reforms

Economic Overview

- Growth: One of the fastest-growing economies in the region, with a focus on infrastructure development
- Income Status Goal: Aiming to achieve lower-middle-income status by 2025

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[55] Food and Agriculture Organization of the United Nations (FAO), 2023. *FAOSTAT*. Retrieved from Available at: https://www.fao.org/faostat/en/#data/QCL Accessed 11 February 2025.

[56] Mussema, R., Diro, S., Erko, B., Teshale, D., Dibaba, R., Tesfaye, A. & Zemedu, L., 2021. Soybean value chain analysis in Ethiopia: A qualitative study

- Major Industries: Agriculture (notably coffee, livestock, and cereals), textiles, and construction
- Trade Partners: Key trading partners include China, the United States, and neighboring African countries

In 2021/2022 regarding soya bean,

- Total area under production: 75939 ha
- Area that was under production with fertilizer: 17675 ha
- Types of fertilizers used: Urea, NPS, natural,
- Types of Seed: indigenous and improved seed
- The crop is produced both by irrigation and rain fed[57]

1.4 Crop Calendar

In Ethiopia, the primary soybean production season is during the "Meher" rainy season, which typically starts around September and lasts until February, with most planting occurring between June and July depending on local rainfall patterns and soil moisture availability.

1.5 Competitive Advantage

Ethiopia boasts several competitive advantages for soybean production, including vast arable land and a diverse climate that supports large-scale cultivation. The growing domestic demand for soybeans as a protein source, coupled with export potential to neighboring markets, enhances its market position[58]. Additionally, Ethiopia's reputation for organic and non-GMO products can attract premium prices internationally[59]. Government support for agricultural development, investment in processing facilities, and an abundant, affordable labor force further contribute to the economic viability of soybean farming in the country.

[57] CSA (Central Statistical Agency), 2022. The Federal Democratic Republic of Ethiopia Central Statistical Agency. Agricultural Sample Survey, Volume I, Report on Area and Production of Major Crops (Private Peasant Holdings, 2021/2022 Meher Season)

[58] Molla, H.S., Ayele, Z.A. and Zeleke, M.A., 2024. Trends, Opportunities, and Challenges of the Ethiopian Soybean Export Market in the Past Two Decades (2004–2022). *Advances in Agriculture*, *2024*(1), p.9979892.

[59] Syntesa Partners & Associates, 2018. *Value chain analysis: Ethiopia pulses and oilseeds*. Commissioned by The Centre for the Promotion of Imports from developing countries (CBI). Shayashone Trading.

2. Value Chain Analysis

A value chain analysis of soybean involves examining the various stages and activities involved in producing, processing, and marketing soybeans. The first levels of activities are handled by value chain operators, which are the owners of the product at some stage in the chain. Operators include producers, collectors, processors, wholesalers, retailers, and consumers. The second level of chain actors and supporters of the soybean value chain consists of service providers, which assist the operators in performing their tasks. Support functions include input supply, financial services, quality assurance, extension, and research, which are the focus of this report.

Input suppliers: Different input suppliers are different business units that work in supplying inputs to farmers. Smallholder farmers obtain different types of inputs from agro-input dealers, agrochemical suppliers, seed suppliers (farmers and cooperatives), regional bureau of agriculture, research centers, and NGOs. Large-scale soybean producers have access to directly buy inputs from large scale-input suppliers. There is still a very big gap between the seed demand and seed supply, resulting in limited access of farmers for improved seeds; consequently, low area coverage of the crop with improved varieties. The main sources of fertilizer and rhizobium were found to be cooperatives/unions and MoANRM/NGOs, respectively. With regard to finance, the small holder farmers get credit from primary cooperatives, and micro-finance institutions[60].

Generation and transfer of improved technologies are critical prerequisites for agricultural development particularly for an agrarian based economy like Ethiopia. Despite the release of several technologies, particularly of improved crop varieties, there has been limited use of improved seeds by the majority of farmers. Among others, unavailability of quality seeds at the right place and time coupled with poor promotion system, is one of the key factors accounting for limited use of improved seeds, which further contributing for low agricultural productivity. Poor availability and promotion of improved seeds is due to inefficiency of the seed systems of the country[61].

Producers: Soybeans are grown primarily for the market (cash crop) and used for a rotational crop while household consumption is secondary and insignificant. In Ethiopia, Soybean is produced by both smallholder farmers and few commercial farms. However, the production is

[61] Nigussie, D., Alemu, G. and Gebreyes, M., 2024. Understanding Ethiopia's maize innovation system: Application of integrated innovation system and sustainability transition perspectives. *African Journal of Science, Technology, Innovation and Development*, *16*(6), pp.719-736.

dominated by small-scale soybean producer farmers. These smallholder soybean producers are characterized by limited use of improved technologies, and best crop management practices[61].

There are many challenges facing Ethiopian soya bean farmers in Ethiopia. The major constraints identified are input supply constraints viz., rhizobium inoculants and different pesticides; lack of collateral to get credit, poor storage facilities, low price of the produce in market, and low negotiation (bargaining) power of producers[62].

Collectors: Collectors are active mainly during the harvesting season buy soybean from smallholder farmers at the village market and transport to resale the collecting wholesalers or assemblers who purchases in the surplus market. They collect soybean from the farm gate market, and sometimes, they supply to wholesalers in surplus markets[61]. In Ethiopia, soya bean collectors face challenges like limited market access, low producer prices due to lack of bargaining power, poor storage facilities, inadequate information about market trends, inconsistent supply from farmers, difficulties in accessing credit, and transportation issues, often leading to them buying at low prices from farmers due to limited options for selling their produce

Assemblers: Assemblers basing in district town and playing a great role in the soybean assembly market. They may collect soybean from farmers and collectors and transfer it to wholesalers. They have also an opportunity to directly transfer to the central market through brokers/commission agents[61]. Soybean aggregators in Ethiopia face significant challenges including: low quality and inconsistent production from farmers, poor market linkages, limited access to storage facilities, price volatility, low bargaining power with buyers, inadequate infrastructure, limited access to finance, and a lack of market information, often leading to farmers selling their produce at low prices to local traders; all of which contribute to difficulties in ensuring a consistent supply of high-quality soybeans for export markets.

Wholesalers: Wholesalers can be categories as regional and terminal markets mostly reside in big region towns (Jima, Bahir Dar, and Assosa) and Addis Ababa. They have a legal license and are engaged in large-scale soybean businesses. Regional wholesalers buy soybean from the collector/trader and stock until getting the required amount to truck and to resell to exporters and processors in the terminal/central markets, Addis Ababa, Debre Zeit, etc. [61.] Soya bean wholesalers in Ethiopia face challenges including: low crop productivity and quality, inconsistent supply due to weather fluctuations, poor market infrastructure, limited access to storage facilities, high price volatility, lack of market information, competition from international markets, difficulties

[62] Achamyelh, K. and Hailemariam, M., 2020. Challenges and opportunities of soybean marketing in Chewaka District, Ethiopia. *Asian Journal of Economics, Business and Accounting*, *17*(1), pp.13-22.

in accessing credit, and inadequate transportation networks which often lead to farmers selling their produce at low prices to local traders due to limited options.

Brokers/commission agents: Brokers actively engaged in soybean marketing in regional and Addis Ababa markets. Commission agents who engaged in soybean markets divide themselves into small groups and big groups (wholesalers) in terms of the volume of they facilitate soybean transactions in Addis Ababa[61].

Retailers: Retailers purchase soybean from farmers and sell small quantities to consumers in an open market space in the district markets. Retailers sell soybean to consumers61.The major challenges faced by soybean retailers in Ethiopia include: low quality and inconsistent supply of soybeans from farmers, poor storage facilities, limited market access, low bargaining power with producers, lack of quality control mechanisms, price volatility, inadequate market information, and limited access to credit for purchasing large volumes of soybeans; all contributing to difficulties in reliably supplying high-quality soybeans to consumers and processors.

Exporters: Soybean exporters are those who trade soybean grain to other foreign countries. More than 150 exporters are engaged in soybean international marketing, because of the high local supply and global demand for soybean[61].

Exports are frequently used for market diversification, better market prices, and as a "pull" for better product quality and working conditions because of buyer requirements for social responsibility in the supply chain. However, the Ethiopian export market does not work in this manner. Exporters sell low-quality, low-value raw materials to buyers who are less concerned with social sustainability. Additionally, there are concerns that the growing export markets can undermine the local demand for soybeans as a food security crop. Production system that is low productivity but high cost, resulting in higher local prices than the global average. An acute shortage of foreign exchange (Forex) leads exporters to sell exports at a loss to access foreign exchange and import products at high margins[63].

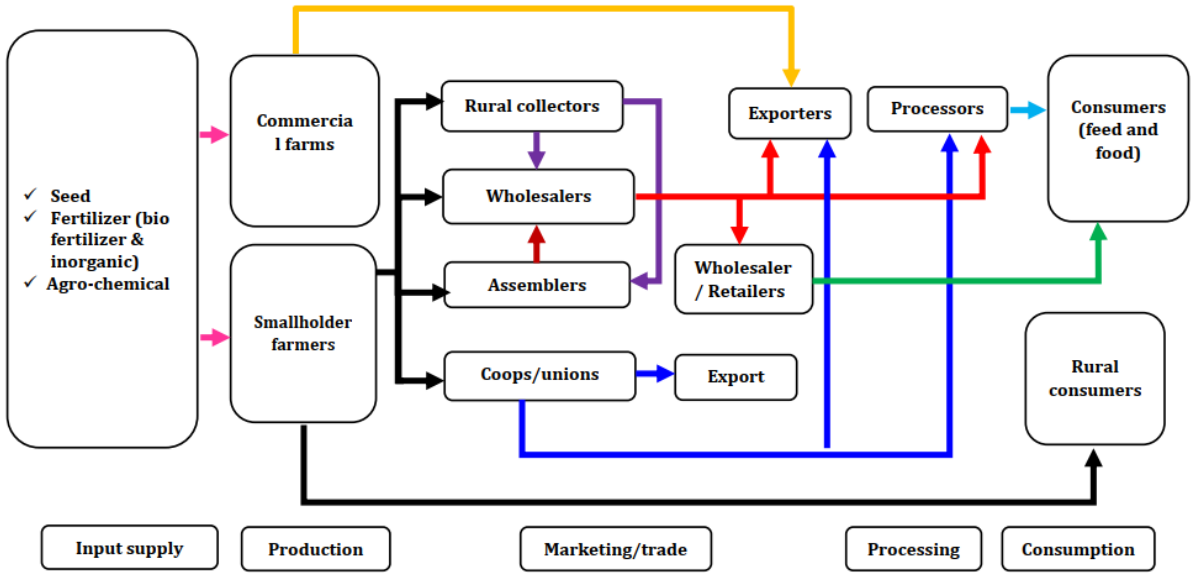
Processors: Processors are those who transform soybean grain into other final products, such, food, and feed. There are some agro-industrial processors in the country, particularly found around Addis Ababa, and Debre Zeit produces soybean food products and feed[61].

Consumers: End-users of soybean products found mostly in the central market, and buy from supermarkets. Soybean products are found in supermarkets and shops[61].

[63] CASA, 2023. Ethiopia Soybean Value Chain Inclusive Growth Strategy

2.1. General Overview Value Chain

Actors in Soybean value chain include producers, input suppliers, collectors, processors, wholesalers, retailers, and consumers[64].



Source [62]

2.2. Inputs Supply

The availability, quality, and distribution of agricultural inputs are critical for increasing soybean production in Ethiopia. These inputs include seedlings, seeds, fertilizers, and plant protection products

2.2.1. Availability of inputs

Seeds: Improved seed is among the most key input for increasing soybean production and productivity by significant folds, at the end ensuring food security and improving livelihoods in the country. Seed is a key input for improving crop production and productivity. Increasing the quality of seed can increase the yield potential of the crop by significant fold and thus, is one of the most economical and efficient input to agricultural development[65]. Formal and informal source of seed is common sources of seed in Ethiopia. The formal seed system is a system that involves the production of seeds using known sources of planting materials and undergoes inspection,

[64] *Mussema, R., Diro, S., Erko, B., Desalegn, T., Teshale, D., Wake, R.D., Abebe, A.T. and Zemedu, L., 2022. Soybean value chain analysis in Ethiopia: a qualitative study research. Research Report Number*

[65] Yirga, M., Sileshi, Y., Hailemariam, M. and Atero, B., 2020. On-farm soybean seed production through initiating and supporting seed and grain producer farmer groups in Southwest Ethiopia. *Journal of Natural Sciences Research*, 11(15), pp. 29.

validation, and certification process, and encompasses at least a breeding system that supplies initial planting material, licensed seed producers and regulatory system that certifies the produced soybean seed, and it is governed by strict regulations to maintain variety identity and purity as well as guarantee the physical, physiological, genetic and sanitary quality in Ethiopia. The major actors in the formal soybean seed system include Ethiopian Seed Enterprise (ESE), cooperative/unions, and private seed companies that are playing a great role in soybean initial technology transfer to the end-users through quality seed distribution under the regulation of Ethiopian quality seed standards. The ESE mostly produced soybean seed based on the demand of farmers; particularly, commercial farmers and a small amount for NGOs are the main buyers.

The availability of certified soybean seeds is limited, and many farmers rely on saved seeds from previous harvests, which often have lower yields66.

The informal soybean seed system under the Ethiopian context is defined as seed production and distribution along with the different actors where there is no legal certification in the process. These include retained soybean seed by farmers, farmer-to-farmer seed exchange, community-based seed multiplication and distribution, local seed business, NGO-based soybean seed multiplication and distribution, on-farm soybean seed multiplication by research centers and universities in the process of technology demonstration and pre-scaling out schemes. Therefore, currently, farmers in the study areas are believed to be depending upon the informal seeds system because of the absence of soybean seed companies that multiply, pass the steps of the certification process and transfer the initial soybean technology to the end-users.

Unavailability of quality seeds at the right place and time coupled with a poor promotion system are some of the key factors accounting for the limited use of improved soybean seeds which further contributes to low agricultural productivity in Ethiopia

Fertilizers: Fertilizer use in soybean production is relatively low due to high costs and limited availability. The government distributes subsidized fertilizers, but access remains uneven, particularly in remote areas[67].

In Ethiopia, farmers primarily acquire fertilizers for soybean production through private agro-dealers, who often buy in bulk from the Ethiopian Agricultural Businesses Corporation (EABC), a government entity responsible for the majority of fertilizer imports and distribution, which is then

[66] *World Bank. (2020). Ethiopia Economic Update: Enhancing Export Competitiveness Through Trade and Tax Reforms. Washington, D.C., USA.*

[67] *Agricultural Transformation Agency (ATA). (2017). Soybean Sector Development Strategy in Ethiopia. Addis Ababa, Ethiopia.*

further distributed to farmers through cooperatives or directly at local markets; with most farmers relying on commonly available fertilizers like Urea and DAP.

Pesticides: In Ethiopia, farmers often lack access to necessary chemicals like pesticides and herbicides to control weeds, diseases, and pests due to limited availability in the market, meaning they cannot readily purchase these products when needed, hindering their pest management practices. Pests and diseases, such as aphids and rust, are significant challenges in soybean production. However, access to effective pesticides and herbicides is limited, and many farmers lack knowledge about their proper use[68].

2.2.2. Distribution of Inputs

The distribution of agricultural inputs such as fertilizers, seeds, and plant protection products are crucial for soybean production in Ethiopia. these inputs are distributed across different channels:

Cooperatives: Farmer cooperatives and unions play a vital role in distributing inputs like seeds and fertilizers to their members, ensuring more equitable access[69].

Private Sector Involvement: Increasing private sector participation in input distribution could improve efficiency and availability, but this requires supportive policies and infrastructure development.

Challenges in Input Distribution

- Limited Access**:** Some rural areas face shortages due to logistical challenges.
- High Costs**:** Fluctuations in input prices affect affordability.
- Foreign Currency Issues: Limited availability of foreign exchange affects importation.
- Supply Chain Delays: Transportation issues can cause delays in fertilizer and seed availability.
- Low-Quality Inputs: Presence of counterfeit or substandard fertilizers and pesticides in the market.

2.2.3. Source of Inputs

Ensuring the quality of agricultural inputs such as seeds, fertilizers, and plant protection **products** is critical for maximizing soybean yield and profitability.

Certified Seeds (formal seed):

Research centers such as Bako, Assossa, and Jimma Agricultural Research Centers, along with companies like Amhara Seed Enterprise, provide improved soybean varieties that exhibit higher germination rates, exceeding 85%. These varieties are characterized

[68] *Food and Agriculture Organization (FAO). (2021). Ethiopia: Soybean Production and Market Analysis. Rome, Italy.*

by better disease resistance and enhanced yields. Notable examples include the improved soybean varieties Gizo, Afgat, and Wogayen[70].

Farmer-Saved Seeds & Informal Market Seeds:

Often, seeds are of lower quality due to contamination or inadequate storage conditions. This results in lower germination rates, typically ranging from 50% to 70%, and increases the risk of disease.

Challenges in Seed Quality

The availability of certified seeds is often limited, which poses challenges for farmers. Additionally, poor storage and transportation practices further exacerbate this issue, leading to a decline in seed quality. Adulteration and mixing with low-quality seeds are common problems that compromise the integrity of the seeds available on the market.

Fertilizers

Types of Fertilizers

For soybean production, DAP (Diammonium Phosphate) and urea are commonly used fertilizers. Additionally, blended fertilizers such as NPS, NPK, and boron-enriched formulations are recommended to enhance soil fertility and support optimal crop growth.

Challenges in Fertilizer Quality

The market is often plagued by counterfeit or adulterated fertilizers, which can significantly undermine the quality of inputs available to farmers. Poor blending practices and nutrient imbalances further exacerbate the challenges faced in soybean cultivation, negatively impacting growth. Additionally, delays in supply and improper storage conditions can lead to moisture damage, further compromising the effectiveness of fertilizers.

Plant Protection

A. Common Issues

The informal market often features expired pesticides, posing significant risks to agricultural practices. Improper handling and storage of these chemicals further diminish their effectiveness. Additionally, a lack of awareness among farmers can lead to the misuse or overuse of pesticides, compounding the potential negative impacts on crops and the environment.

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[70] Mussema, R., Diro, S., Erko, B., Desalegn, T., Teshale, D., Wake, R.D., Abebe, A.T. and Zemedu, L., 2022. Soybean value chain analysis in Ethiopia: a qualitative study research. *Research Report Number*.

2.2.4. Soybean Seeds improvement

Soybean research was started in the 1970's. Since then, 25 soybean varieties have been released in Ethiopia[71]. Research institutions like EIAR and universities are working to develop improved soybean varieties that are high-yielding, drought-tolerant, and resistant to pests and diseases[72]. New soybean variety undergo rigorous testing and registration before being released to farmers. This process ensures that only high-performing varieties are distributed[73]. The Ethiopian Agricultural Authority (EAA) is responsible for seed certification and quality control, but enforcement remains weak in some regions[74].

2.2.5. Fertilizer Registration and Quality control

All fertilizers must be registered and meet national quality standards before being sold in Ethiopia. This ensures that farmers have access to effective and safe products[75]. The government conducts periodic inspections of fertilizer imports and local products to ensure compliance with quality standards. However, enforcement can be inconsistent[76]. Ethiopia imports most of its fertilizers, which are then distributed through a network of government agencies, cooperatives, and private dealers. Delays in importation and distribution often lead to shortages during critical planting periods[77].

2.3. Producers

Producers are the backbone of the soybean value chain, and their productivity and practices significantly influence the overall output and quality of soybeans.

The producers are segmented as below

Smallholder Farmers: Comprise the majority of soybean producers in Ethiopia. Typically farm on less than 2 hectares of land. Face challenges such as limited access to inputs, credit, and modern farming technologies[78].

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[71] Arega, A. and Dabessa, A., 2020. The Release and Registration of Gute (Late Set) Soybean Varieties. *Ethiopian Journal of Crop Science*, *8*(2).
[72] Agricultural Transformation Agency (ATA). (2017). Soybean Sector Development Strategy in Ethiopia. Addis Ababa, Ethiopia
[73] Food and Agriculture Organization (FAO). (2021). Ethiopia: Soybean Production and Market Analysis. Rome, Italy.
[74] World Bank. (2020). Ethiopia Economic Update: Enhancing Export Competitiveness through Trade and Tax Reforms. Washington, D.C., USA.
[75] Food and Agriculture Organization (FAO). (2021). Ethiopia: Soybean Production and Market Analysis. Rome, Italy.
[76] World Bank. (2020). Ethiopia Economic Update: Enhancing Export Competitiveness Through Trade and Tax Reforms. Washington, D.C., USA.
[77] Agricultural Transformation Agency (ATA). (2017). Soybean Sector Development Strategy in Ethiopia. Addis Ababa, Ethiopia.
[78] Zerssa, G., Feyssa, D., Kim, D.G. and Eichler-Löbermann, B., 2021. Challenges of smallholder farming in Ethiopia and opportunities by adopting climate-smart agriculture. Agriculture, 11(3), p.192.

Medium scale Farmers: Medium-scale farmers who cultivate between 2 and 10 hectares. Have better access to resources and markets compared to smallholder farmers. Often adopt improved farming practices and technologies. However, they also face several challenges. These include fluctuating market prices that can impact profitability, limited access to credit and financing options, and increasing competition from larger agribusinesses. Additionally, they may struggle with issues related to land tenure security, regulatory hurdles, and the need for ongoing training to effectively implement new technologies and practices.

Large-Scale Farmers: Operate on more than 10 hectares of land. Have access to advanced technologies, machinery, and capital. Play a significant role in commercial soybean production and export.

2.3.1. Farming systems

Rain-fed Farming: smallholder farmers in Ethiopia who primarily rely on rainfall to cultivate soybean crops, meaning they do not have access to irrigation systems and must depend entirely on seasonal rains for their soybean production, which is the dominant practice in the country due to limited water infrastructure; most Ethiopian soybean farmers fall under this category.

Irrigated Farming: In Ethiopia, soybean production under irrigation is gaining traction as a means to significantly increase yields, with proper irrigation management, particularly utilizing deficit irrigation techniques combined with phosphorus fertilization, can lead to considerably higher soybean grain production compared to rain-fed cultivation; however, the practice is still limited due to factors like access to water infrastructure and technical knowledge about optimal irrigation practices[79]. Limited to areas with access to irrigation infrastructure, such as the Rift Valley and Awash River Basin.

Mixed Farming: Soybeans are often grown in rotation with cereals like maize and teff to improve soil fertility.

2.3.2. Production region in a country

Jimma, Buno Bedele, and West Shoa zones from the Oromia region, Awi zone from Amhara region, and Metekel and Asosa zones from Benishangul Gumuz region[80]. There are also other Key production areas include Sidama and Wolayita zones.

[79] Tadesse, M., Asefa, A., Admasu, R. and Tilahun, E., 2024. Optimization of deficit irrigation level and phosphorus fertilizer rate for soybean production in Jimma, Southwest Ethiopia. *Agricultural Water Management*, *306*, p.109189.
[80] Mussema, R., Diro, S., Erko, B., Desalegn, T., Teshale, D., Wake, R.D., Abebe, A.T. and Zemedu, L., 2022. Soybean value chain analysis in Ethiopia: a qualitative study research. *Research Report Number*.

2.3.3. Labor

Labor issues in Ethiopia concerning soybean production present several challenges. Firstly, there is often a scarcity of skilled labor, which can hinder the adoption of advanced farming practices and technologies essential for efficient soybean cultivation. Additionally, labor costs can be high, impacting the overall profitability of soybean farming. Seasonal labor shortages during critical planting and harvesting periods can also pose significant challenges, as farmers may struggle to find enough workers to meet their needs.

Moreover, labor conditions can be poor, with workers facing low wages and inadequate working conditions, leading to a lack of motivation and productivity. This situation is further complicated by the migration of labor to urban areas in search of better opportunities, resulting in a diminishing rural workforce. Addressing these labor issues is crucial for enhancing soybean production and ensuring the sustainability of the agricultural sector in Ethiopia.

2.3.4. Aging farmers

Average Age of Farmers: Many Ethiopian farmers are above 45 years old. Younger generations are less interested in agriculture, preferring urban employment.

2.3.5. Post-harvest quality issues

Post-harvest problems associated with soybean production in Ethiopia include inadequate storage facilities that lead to spoilage and quality loss, challenges in maintaining product quality due to poor handling practices, and difficulties in accessing markets for timely sales. Limited processing capabilities hinder value addition, while poor transportation infrastructure complicates distribution. Additionally, many farmers lack knowledge of proper post-harvest techniques, making soybeans vulnerable to pest infestations and resulting in significant losses. Addressing these issues is essential for enhancing the profitability and sustainability of soybean farming in the region.

2.3.6. Machinery

In Ethiopia there is limited access to tractors and other machinery, particularly for smallholder farmers. High costs and lack of training hinder the adoption of mechanized farming. High import tariffs and logistical challenges increase the cost of machinery. Limited local manufacturing capacity for agricultural equipment.

2.4. Aggregations

Aggregators play a crucial role in connecting soybean farmers with markets, processors, and consumers. They include cooperatives, traders, and middlemen who collect, store, and distribute soybeans. Below is an analysis of the aggregation system in Ethiopia's soybean value chain, focusing on cooperatives, traders/middlemen, and the dynamics between farmers and aggregators.

2.4.1. Cooperatives

Cooperatives aggregate soybeans from smallholder farmers, providing them with better access to markets and reducing transaction costs. They often offer additional services such as input supply, credit, and training on good agricultural practices. Some unions have expanded into soybean aggregation in Ethiopia. Many smallholder soybean farmers are members of local cooperatives that aggregate and market their produce.

2.4.2. Traders/ Middlemen

Role of Traders/Middlemen:

Traders and middlemen act as intermediaries between farmers and processors or exporters. They provide liquidity to farmers by purchasing soybeans immediately after harvest, even if prices are low.

Challenges

Middlemen frequently exploit farmers by offering low prices, particularly when farmers lack access to market information or alternative buyers. Some traders provide informal loans to farmers, requiring repayment in soybeans at harvest time, often under unfavorable terms such as high-interest rates. Transactions between farmers and traders are typically informal and undocumented, which can lead to disputes and mistrust. Additionally, small-scale traders operate in rural markets, collecting soybeans from farmers, while companies or individuals aggregate soybeans from multiple sources to supply processors or exporters.

2.4.3. Key aggregators

Numbers and Size: The exact number of aggregators in Ethiopia's soybean value chain is not well-documented, but they range from small local traders to large cooperatives and private companies. Cooperatives typically aggregate soybeans from hundreds or thousands of smallholder farmers, while individual traders may work with a smaller number of farmers.

Ethiopian Grain Trade Enterprise (EGTE): A state-owned enterprise involved in the aggregation and trade of grains, including soybeans.

Private Companies: Some private agribusiness companies aggregate soybeans for processing or export, though their scale is often limited.

2.5. Processing

In Ethiopia, soybean processing primarily focuses on extracting oil for cooking purposes and producing soybean meal as animal feed, with a growing emphasis on domestic processing to meet the country's rising demand for both edible oil and high-protein livestock feed, utilizing existing oil processing plants to produce soybean oil and further develop soy-based food products like soymilk and blends for malnutrition mitigation.

2.6 Transportation

Transportation costs for soybean production are heavily influenced by fluctuating fuel prices, which directly affect freight expenses. Packaging costs for products like soybean oil also contribute to the overall price. Additionally, inadequate infrastructure leads to high transport costs and inefficiencies, as Ethiopia's road network remains insufficient, limiting farmers' access to markets. Logistical bottlenecks arise from government dominance in the transport sector, hindering efficiency. However, ongoing reforms aim to enhance private sector involvement and improve the overall transportation landscape for soybean farmers[81].

2.7 Markets (Domestic & Exports)

2.7.1 Competitive advantage

Ethiopia has several competitive advantages in soybean production compared to its neighboring countries. Its diverse agro-ecological zones, particularly in regions like Amhara, Oromia, and SNNP, provide suitable conditions for soybean cultivation[82]. Ethiopia has a large and relatively low-cost labor force, which is essential for labor-intensive agricultural activities like soybean farming[83]. The Ethiopian government has prioritized agricultural development through initiatives like the Agricultural Transformation Agency (ATA), which supports soybean farmers with improved seeds, fertilizers, and extension services[84]. The increasing demand for soybean-based products (e.g., edible

[81] Agricultural Transformation Agency (ATA). (2017). Soybean Sector Development Strategy in Ethiopia. Addis Ababa, Ethiopia.
[82]
[83] World Bank. (2020). Ethiopia Economic Update: Enhancing Export Competitiveness Through Trade and Tax Reforms. Washington, D.C., USA.
[84] Agricultural Transformation Agency (ATA). (2017). Soybean Sector Development Strategy in Ethiopia. Addis Ababa, Ethiopia.

oil, animal feed) in Ethiopia provides a ready market for local producers, reducing reliance on imports[85].

2.8 Enabling Environment

Ethiopia's current economic development plan prioritizes soybean production as a key export commodity, aiming to enhance foreign exchange earnings while addressing food insecurity and malnutrition. This focus leverages soybean's high protein and oil content as a cost-effective dietary supplement for rural communities. However, historical underinvestment in soybean as an export crop underscores the need for stronger policy implementation, including subsidies for inputs and incentives for processing industries. Soybean thrives in Ethiopia's lowland areas and maize belts, particularly in regions like Oromia and Benshangul-Gumaz, which together account for approximately 80% of national output. These regions benefit from favorable climatic and soil conditions, although climate change poses risks, such as increased rainfall variability and temperature extremes. Proactive adaptation measures, such as drought-resistant varieties and irrigation infrastructure, are essential to sustaining this agricultural advantage.

A growing domestic and international demand for soybean, driven by Ethiopia's proximity to major consuming markets, presents an opportunity for market linkages and value chain development. However, weak connections between farmers, processors, and exporters remain a barrier. Strengthening these linkages through cooperatives, contract farming, or public-private partnerships could stabilize prices, reduce post-harvest losses, and incentivize production. For instance, linking smallholders to processing factories would secure markets and enhance their incomes. Despite challenges, recent increases in soybean production are largely attributed to land expansion and the partial adoption of improved varieties. Enhanced research into climate-resilient seeds, better agronomic practices, and farmer training programs is critical to closing the productivity gap. Additionally, soybean serves as both a cash crop and a nutritional staple, effectively addressing malnutrition in maize-dependent rural areas. The residues from processing also provide valuable livestock feed and compost. Furthermore, soybean's potential to generate income for smallholders through domestic sales or exports aligns with national goals to reduce poverty and trade deficits[86].

[85] Food and Agriculture Organization (FAO). (2021). Ethiopia: Soybean Production and Market Analysis. Rome, Italy.
86 International Maize and Wheat Improvement Center (2023) Climate change risks to the soybean value chain in Ethiopia: findings, implications and adaptation options.

2.8.1 Sustainability

In Ethiopia, the sustainability of soybean production is increasingly emphasized through the adoption of eco-friendly agricultural practices, such as crop rotation and organic farming, which enhance soil health and biodiversity. Farmers are shifting towards climate-resilient soybean varieties that are drought-tolerant and disease-resistant to mitigate climate change impacts. Improved water management techniques, like drip irrigation and rainwater harvesting, are being implemented to optimize water usage amidst erratic rainfall. Additionally, integrated pest management (IPM) strategies are gaining traction, reducing reliance on chemical pesticides. Investment in agricultural research and development is fostering innovations that promote sustainable farming, while government policies increasingly prioritize eco-friendly practices and provide necessary support. The rising market demand for sustainably produced food, along with enhanced collaboration between government, NGOs, and the private sector, is encouraging farmers to embrace sustainable practices. Education and capacity-building programs are also crucial in equipping farmers with the knowledge to adopt these methods, collectively indicating a positive trend towards more sustainable soybean production in Ethiopia.

2.9 Risks & its Mitigations

Soybean production in Ethiopia is confronted with various risks throughout the value chain, which can jeopardize productivity, income, and sustainability. Key challenges include seed quality and availability, pest and disease threats, and issues related to soil fertility and water management. To mitigate these risks, strategies such as government partnerships for high-quality seed distribution, integrated pest management (IPM), and sustainable farming practices like agroforestry and rainwater harvesting are crucial. Furthermore, addressing climate-related risks, such as droughts and floods, through climate-smart agriculture and resilient seed varieties is essential for enhancing production stability.

In addition to production risks, farmers face side-selling and market access challenges. Side-selling occurs when farmers opt to sell directly to traders offering immediate cash rather than aggregators who provide stable prices. To counter this, reliable market information and attractive contract terms can encourage farmers to remain loyal to

cooperatives. Moreover, improving market access through strengthened cooperatives and better transportation infrastructure is vital in ensuring farmers can reach reliable buyers and navigate price volatility in both domestic and global markets.

The "crop journey" from planting to market reveals several friction points that impact the efficiency of the soybean value chain. Initial stages such as planting and growing are hindered by a lack of quality seeds and climate unpredictability, which can be addressed through seed banks and climate-resilient varieties. Harvesting issues include poor timing and labor shortages, necessitating training and cooperative machinery pools. Post-harvest, farmers face storage limitations and insufficient processing facilities, which can be alleviated through investments and partnerships. Lastly, high transportation costs and side-selling practices highlight the need for improved infrastructure and transparency, ensuring that farmers receive fair returns while enhancing their market presence.

3. Overall Summary Sector

The soybean sector is a cornerstone of the global agricultural economy, valued at approximately USD 155 billion. It serves as a primary protein source for human consumption and a critical ingredient in animal feed, while also being used in various industrial applications such as biofuels, plastics, and cosmetics. The market is dominated by Brazil, the USA, and Argentina, which collectively account for 91% of global production, with China as the largest importer, making up 66% of global imports. This strong demand from China significantly influences global supply chains and pricing dynamics. Emerging markets, particularly in Africa, present substantial opportunities for growth, with Ethiopia poised to become a significant player due to its vast arable land, favorable climate, and increasing domestic demand for soy products driven by health awareness and sustainable practices. However, the sector faces challenges such as limited access to modern agricultural technologies, financial resources, and significant post-harvest losses, which hinder productivity and market competitiveness. Technological advancements, including precision agriculture and sustainable farming practices, are essential for enhancing productivity and reducing environmental impact. To support growth in the soybean sector, strategic investments and supportive policies are needed. Collaboration among governments, private sector stakeholders, and

farmers is crucial to create an enabling environment that encourages innovation and investment, improves access to credit, and promotes fair trade practices.

Conclusion

The soybean industry stands at a critical juncture, with significant expansion potential driven by rising global demand and the urgent need for sustainable agricultural practices. As the world confronts challenges such as food security, climate change, and economic instability, the soybean sector can play a vital role in addressing these issues, particularly in countries like Ethiopia that possess agricultural potential and growing markets.

To fully realize the benefits of soybean production, stakeholders must collaborate to create a supportive policy environment that fosters innovation and investment. Addressing challenges like limited technology access and post-harvest losses is crucial for enhancing productivity and competitiveness. By focusing on infrastructure, technology, and training, countries can improve agricultural output and empower farmers to meet market demands.

Emphasizing sustainability in soybean production will be essential for appealing to consumers who prioritize environmentally responsible practices. By adopting sustainable methods and promoting organic production, countries can enhance their competitiveness in international markets while contributing to global climate change initiatives.

Recommendation

The Cooperative Bank of Oromia plays a crucial role in supporting farmers through financing and training, and by investing in the soybean sector, can be profitable significantly while contributing to economic growth.