

Edible vegetable oil production in eastern Africa: Current status and opportunities for improvement

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Abstract: Plant-derived oil is vital for food, feed and industrial applications. The four most produced and consumed plant-based oils globally are palm oil, soyabean oil, rapeseed and sunflower seed oil. The major producers of soyabeans are China, Argentina, USA and Brazil while rapeseed is produced mainly by China, Canada and Germany. The three major producers of sunflower are Ukraine, Russia and Argentina while palm oil is mainly produced by Indonesia and Malaysia. Africa has suitable agricultural lands and weather conditions for vegetable oil crops production for local and international oil markets. However, oil crop production and productivity in Africa are low, and the continent is a net importer of edible oil. Palm oil is the most imported edible oil to the African continent. This review aims to present an overview of edible oil crops production in eastern Africa and highlights the current status and opportunities for crop production and improvement. The East African region imports palm oil mainly from South-east Asia. To counter the high cost of importation, local production of edible oil crops is being promoted. Major oil crops that are produced in the East African region are sunflower, oil palm, sesame, rapeseed (canola), soyabean, groundnuts and coconut. Oil palm is produced in Tanzania and Uganda. In Ethiopia, the primary oilseed crops are sesame, niger seed (noug), and to a lesser extent, soyabeans. Despite efforts to spur local production of edible vegetable oils, the East African region is still a net importer of the commodity.

Keywords: Eastern Africa; Oil crops; Palm oil; Sunflower; Sesame.

Introduction

Plant-based oil is vital for food, feed and industrial applications. The major oil crops include sunflower, soyabean, rapeseed (canola), oil palm, sesame, groundnuts, and cotton (Nde and Foncha, 2020). Vegetable oil industry is among the fastest-growing agricultural sectors globally (Nde and Foncha, 2020). The demand for vegetable oil has been heightened by the need for comestible oils in domestic and international markets, and livestock feed (Ikegwu et al., 2022). After oil extraction, the seed cake/meals/press-cakes, are utilised as animal feeds. The most produced and consumed vegetable oil globally is palm oil at 79.46 million tonnes (mt) in 2023/24, followed by soybean oil (61.89 mt), rapeseed (33.21 mt) and sunflower seeds at 21.63 mt (Statista, 2025). Palm oil supplies about 40% of all traded edible vegetable oil globally (Murphy et al., 2021; Ritchie and Roser, 2020). Oil palm has the highest oil yields per hectare compared to other oil-producing crops such as sunflower, cottonseed, groundnut, soyabean, sesame, and rapeseed (Murphy et al., 2021); oil palm yields 5-7 times more oil per hectare than groundnuts or soyabeans (Verheye, 2010). Globally, the major producers of soybean oil are China, Argentina, USA and Brazil, while rapeseed oil is produced mainly by China, Canada and Germany (Ikegwu et al., 2022). The three major producers of sunflower oil are Ukraine, Russia and Argentina (Ikegwu et al., 2022). In 2022, Russia and Ukraine accounted for 51% of the world's total sunflower seed production. Russia remained the world's leading producer of sunflower in 2024, harvesting 16.55 million tonnes (mt) while Ukraine followed closely, producing 12.9 mt despite geopolitical challenges; the European Union and Argentina followed, contributing 8.78 mt and 4 mt, respectively (Statista, 2025).

Oil palm is mainly grown in the tropics; it is most suited to areas between 10° North and 10° South (Amugoli et al., 2022), while the best production levels are attained in the high rainfall areas between 7° North and South of Equator (Murphy et al., 2021). Asia is the highest producer of palm oil at 86.8% followed by Africa with 6.5%, Americas with 5.5%, and Oceania with 1.2% (Amugoli et al., 2022). The global palm oil market is dominated by Malaysia and Indonesia, accounting for more

than 86% of the total global production (van Noordwijk et al., 2021). In Africa, Nigeria is the leading palm oil producer (Amugoli et al., 2022). Oil palm yield is much lower in Africa than in Southeast Asia; the average long-term productivity of oil palm farms in Africa has remained around 4 tonnes of fresh fruit bunches (FFB) per hectare while in Asia, 15-20 tonnes FFB per hectare is expected with potential yield level of 30-40 tonnes of FFB (Duguma et al., 2021). Low yields in Africa could be due to various reasons including unfavourable climate, infrastructural limitations, poor extension and technical support services from the government agencies, and a predominantly smallholder approach to production in Africa. Small-scale producers account for between 70–90% of African oil palm growers, depending on the country while in Asia, oil palm is grown in large monocultural plantations (Duguma et al., 2021). Africa has suitable agricultural lands and weather conditions for production of edible oil crops. However, oil crop production and productivity in Africa are low, and the continent is a net importer of edible oil. This review aims to present an overview of edible oil crops production in eastern Africa and highlights the current status and opportunities to guide crop production and improvement.

Status of edible oil crop production in Africa

Edible oil crop production in Africa is significant; the key oil crops produced in Africa include sunflower, soyabean, groundnut, oil palm, and sesame. South Africa is a major producer of sunflower and soyabean oil while Tanzania is a major sunflower producer and a significant producer of groundnut and sesame. Oil palm is a significant economic crop in Central and West Africa; the major palm oil producing countries include Nigeria, Ghana, Côte d'Ivoire, and Cameroon (Ofimagazine, 2021). While palm oil is primarily produced for local consumption, some African nations, such as Cameroon and Côte d'Ivoire, are also exporters (Duguma et al., 2021). The oil palm industry is experiencing growth, driven by profitability and increasing demand for edible oils. Africa has also witnessed a significant increase in sunflower production in recent years, driven by increasing demand for edible oil, seeds, and other by-products (SME Blue Pages, 2024). The adoption of modern farming techniques, improved seed varieties, and government support programs have further propelled sunflower production, resulting in increased yields and enhanced productivity. Sunflowers are adaptable to diverse climatic conditions, making them suitable for cultivation in different regions across Africa. Their resilience to drought and relatively low input requirements makes them attractive to smallholder farmers, especially in arid and semi-arid areas (SME Blue Pages, 2024). Tanzania stands out as one of the leading sunflower producers, with over 800,000 tonnes produced annually, followed closely by South Africa and Kenya. Other notable sunflower producers include Uganda, Zimbabwe, and Ethiopia (SME Blue Pages, 2024). While Africa is a major consumer of edible vegetable oils, its production is limited leading to significant imports, particularly of palm oil. Palm oil accounts for about 65% of all edible oil imports to the African continent (Olabisi et al., 2021). The major palm oil importing countries include Nigeria, Kenya, Tanzania, Angola, and South Africa (Ofimagazine, 2021). In eastern Africa, Tanzania, Kenya, Uganda, Rwanda, Burundi, Southern Sudan and DR-Congo as well as SADC countries, edible vegetable oil imports exceed US\$ 1 billion (Reuben and Meliyo, 2022).

Oil crop production in Eastern Africa

Several oilseed crops are cultivated in the east African region such as sunflower, sesame (simsim), soyabean, rapeseed, groundnuts, olive, coconuts, linseeds (flaxseeds), and cotton seeds with sunflower, oil palm, sesame, rapeseed (canola), soyabean, ground nuts and coconut being particularly important. Sunflower has special focus and is being promoted in countries such as Kenya (Kenya News Agency [KNA], 2024), Uganda (Africa Innovations Institute [AfrII], 2023) and Tanzania (Oforo, 2024). Groundnuts, sunflower and soyabean were the most produced oil seed crops in the East African region in the last decade (Figure 1).

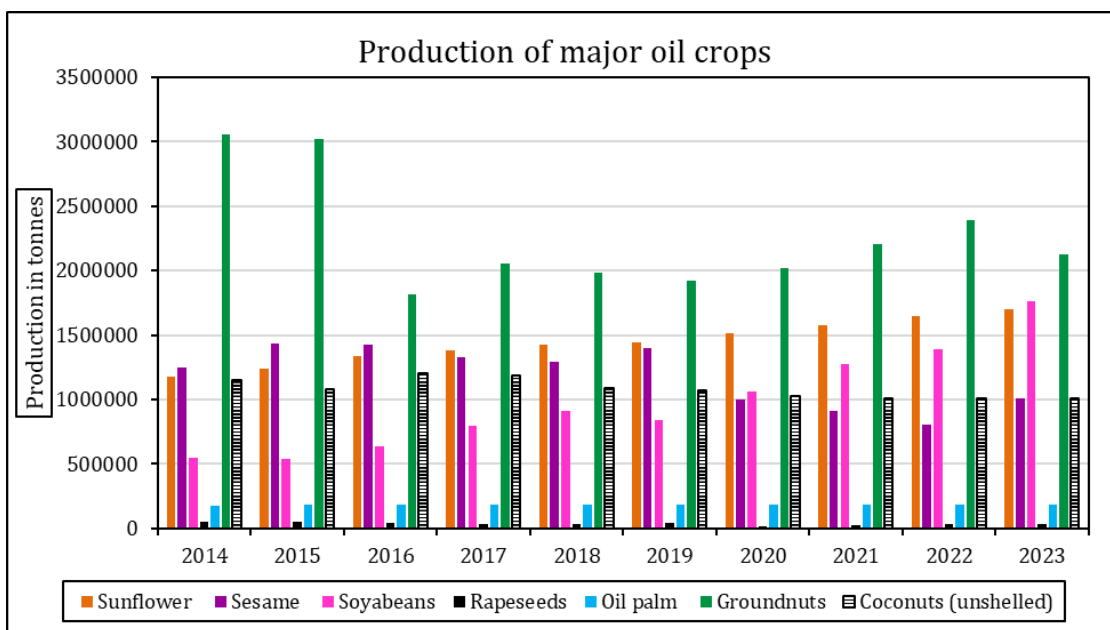


Figure 1. Production of major oil crops in Eastern Africa in the last 10 years. Source= FAOSTAT, 2024.

There has been a gradual increase in sunflower and soyabean production in the east African region (Figure 1). Edible oil crop production in eastern Africa is generally low, falling far short of demand. This necessitates importation especially of crude palm oil (CPO). Crude palm oil is the main input in edible vegetable oil production and is imported from Malaysia and Indonesia.

Edible oil crop production in Kenya

The major edible oil crops produced in Kenya include sunflower, groundnut (peanut), soyabean, sesame, rapeseed, cashew nuts and coconut (MSME, 2024). The government body responsible for developing, promoting, and regulating the oil crops sub-sector is Nuts and Oil Crops Directorate (NOCD) operating under the Agriculture and Food Authority (AFA). The NOCD's mandate includes fostering the production of oilseeds and vegetable oils, as well as regulating the sub-sector (AFA, 2025). Kenya produces only 80,000 tonnes of edible oil annually, while the national demand is over 900,000 tonnes, resulting in a 91% deficit which is filled through importation (KNA, 2024). The country spends approximately KSh160 billion annually to import edible oils mainly palm oil from South-East Asian countries (KNA, 2024); this makes edible oil the second-largest import expenditure after petroleum (Farmonaut, 2024). The main raw materials used by edible oil manufacturers in Kenya are the imported crude palm oil and semi-processed crude palm oil as palm olein (Tuei, 2023). The local manufacturers import crude palm oil (CPO) from Malaysia and Indonesia, while crude sunflower oil is imported from Ukraine and Argentina (AsokoInsight, 2025). Some local manufacturers also process coconut (copra), sunflower, soyabean, corn and rapeseed (canola) oils, though to a smaller extent (Tuei, 2023). Some of the large edible oil refiners are involved in growing vegetable oil crops and supporting small scale farmers to increase vegetable oil production in Kenya (Tuei, 2023). Manufacturing companies such as Menengai Oil and Kapa Oil contract small-scale farmers to grow oil crops; they also work with both private and public agencies to teach farmers on better farming methods. Another company, Bidco Africa have joined forces with Safaricom (a telecom company) to promote sunflower and soyabean farming in Migori County in south Western Kenya (AsokoInsight, 2025). Despite these efforts, Kenyan manufacturers still grapple with huge deficits in production of soyabeans, canola, linseed and sunflower; they have resorted to importing sunflower and soyabeans from Tanzania and Uganda to sustain the local processing demand (AFA, 2025; MSME, 2024).

Government's effort to enhance edible vegetable oil production in Kenya

To reduce the import bill, the Kenyan government has placed taxes on imports of raw materials from outside the East African Community (EAC) region and also provides preferential tariff treatment on refined edible oils manufactured from locally sourced raw materials (AsokoInsight, 2025). Furthermore, the Kenyan government has initiated a KSh.981 million Edible Oil Crops Promotion Project (2023-2028) to stimulate local production of edible oil. The project, launched in October 2023 and implemented by AFA through its Nuts and Oil Crops Directorate, aims to increase production and productivity of edible oil crops in the country (AFA, 2025; KNA, 2024). The project, whose overall objective is to promote the production of edible oil crops in various counties within the country, anticipates that at the end of the project there will be an increase in domestically produced edible oil from the current 80,000 tonnes to 240,000 tonnes. The government aims to increase the country's edible oil production from 5% to 50% over the five years of the project. This will require production of 1.5 million tonnes of soyabean, canola, and sunflower seed for use as raw materials in oil extraction. The project aims at boosting the production of edible oil crops like sunflower, soyabean, and canola through improved breeding and seed distribution (AFA, 2025; KNA, 2024). The project seeks to support availability of affordable and quality inputs, technical support on production, as well as promoting cottage level processing. The project hopes to expand the area under edible oil crops across fifteen traditional oil crop growing counties from the current 60,000 hectares to 250,000 hectares. It also hopes to promote oil crops in ten more non-traditional counties (AFA, 2025; KNA, 2024). Oil crop productivity which is currently low at an average of 0.3 – 0.5 tonnes/ha is expected to increase to 2.0 tonnes/ha as a result of interventions from this project (KNA, 2024). Through the project, the government plans to significantly boost sunflower production. Sunflower has been singled out as a key crop towards achieving edible oil self-sufficiency and import substitution because it is widely adapted to almost all ecological zones in Kenya (AFA, 2025). The focus on sunflower farming is also part of a broader strategy to diversify Kenya's agricultural sector and create new economic opportunities for farmers across the country (Farmonaut, 2024). As part of this initiative, AFA imported 500 tonnes of sunflower seeds from Zambia and distributed them to farmers across twenty counties in Kenya (Food Business Middle East and Africa [FBMEA], 2023a; KNA, 2024; Farmonaut, 2024). It is envisaged that through this project, the country will have enough edible oils and thus reduce the importation by 50% and in the long term, stop importing and be a net exporter by 2027 (KNA, 2024).

Production of edible oil crops in Tanzania

The major sources of edible vegetable oil in Tanzania include sunflower, oil palm, groundnuts, sesame, soyabeans and cotton (HAPA, 2022b). The edible oil seed crops are grown under diverse agro-ecological zones in almost all regions of Tanzania from the coast to the highlands (Reuben and Meliyo, 2022). Palm and sunflower oils constitute the largest share of the consumed and produced oils. More than 60% of edible oils consumed in Tanzania come from palm oil with sunflower oils accounting for less than 40%; sunflower oil is processed from locally grown sunflower seeds (HAPA, 2022b). More than 95% of the consumed palm oil is imported (Olabisi et al., 2021; Mgeni et al., 2018); consequently, the country imports about 60% of its edible oil needs (Mgeni et al., 2018). Some oil palm is produced in Tanzania mainly in the Kigoma, Mbeya and Pwani regions; other producing regions are Tabora, Morogoro, Tanga and Ruvuma. Kigoma region contributes more than 80% to the total oil palm produced in Tanzania (Sultan et al., 2025). A recent study showed that most farmers (98.5%) in the Kigoma region engage in oil palm production (Sultan et al., 2025). The study also showed that most oil palm farmers in

this region were males (82.4%). However, Tanzania's mean oil palm yield is 1.6 tonnes per hectare, far below the 6 to 8 tonnes per hectare reported in other countries (Sultan et al., 2025). The low productivity is attributed to the use of low-yielding oil palm varieties, poor agronomic practices, lack of modern production technologies, lack of extension services, lack of modern processing technologies, low-quality planting material and the old age of the existing oil palm trees. Most of the existing oil palm plantations (90%) in Tanzania are very old, leading to low productivity (Sultan et al., 2025). Sunflower yields are also generally low in Tanzania. For example, at Mkalama district, a leading district in sunflower production in the Singida region, the average sunflower seed yield is 350 to 600 kg per acre, which is lower than the optimum yield of 900 kg per acre (Kingu et al., 2024). Generally, an average sunflower farmer in Tanzania produces 0.6 tonnes of sunflower seeds per acre (Bank of Tanzania [BoT], 2017); this is far below potential productivity of 2.0-3.0 tonnes of sunflower seeds per acre. The potential to grow sunflower in Tanzania is huge given the increasing demand for edible oils, large tracts of suitable land, large water bodies, favourable policies and regulations, availability of power in the rural areas (Rural Electrification Programme), lower cost of producing the crop and the possibility of a wide range of products that can be produced in the sunflower value chain (BoT, 2017). However, this is negated by factors such as small-scale fragmented cultivation, low yielding varieties, poor farming practices, inadequate extension services, low-quality planting materials, limited financial resources and un-systemic interventions, among others (HAPA, 2022b; Sultan et al., 2025), resulting in low yields. Consequently, there has been an insufficient supply of raw materials to the commercial edible oil processing companies in Tanzania with many of them operating below installed capacities. Tanzania produces 290,000 tonnes of edible oil a year, which is not enough to meet its current annual demand of 650,000 tonnes; the country spends over US\$ 200 million annually for import to cover the deficit (Reuben and Meliyo, 2022).

Government interventions to enhance local production of edible oil crops in Tanzania

In a bid to improve the competitiveness of domestic sources of edible oils and reduce importation, the government of Tanzania (GoT) in line with its edible oil strategy 2016–2020, imposed a 10% tariff on imported edible oils (Mgeni et al., 2018). In the 2018/19 financial year, the GoT increased the import duty on crude and refined edible oils from 10 to 25% and from 25 to 35%, respectively (HAPA, 2022a). To further reduce dependence on imported edible oil, the GoT initiated interventions to stimulate, boost and promote local oil seed production and downstream oil processing capacity (Balchin et al., 2018; Mgeni et al., 2019). The GoT prioritized oil palm production to boost the local production of palm oil. This led to the establishment of Kihinga Research Center under Tanzania Agricultural Research Institute (TARI) in 2018; the Center was mandated to conduct and coordinate oil palm research and development in the country (Sultan et al., 2025). There have also been efforts by GoT to boost local production and processing of sunflower oil (Oforo, 2024). Among them is the immediate focus on producing about 1.4 million tonnes of sunflower seeds to enable processors to produce about 400,000 tonnes of sunflower oil (The Citizen, 2022). Due to these efforts, sunflower production has increased as much as 10 times, making the country the continental leader (FAO, 2018; Oforo, 2024); Tanzania is the leading sunflower producer in Africa having overtaken South Africa in 2023 (Oforo, 2024). There are at least 1.6 million farmers cultivating sunflower in 800,000 households in Tanzania (Oforo, 2024). Sunflower production in Tanzania is largely driven by smallholder farmers; each farmer cultivates 1.7 acres on average, with production of about 500kg per farmer (FARM AFRICA, 2022). Sunflower cultivation is traditionally carried out in 19 out of the total 30 regions of Tanzania; production is highest in Dodoma region, followed by Singida and Manyara (FARM AFRICA, 2022). Sunflower production is concentrated in the Central Corridor (Dodoma, Iringa, Singida and Tabora regions) and Southern Highlands (Katavi, Rukwa, Ruvuma, Mbeya, Njombe and Songwe region) (BoT, 2017; FARM AFRICA, 2022). Sunflower cultivation is expanding; it is now cultivated in all regions across the country, except Dar es Salaam (Oforo, 2024). In addition, there are 800 edible oil processing plants concentrated in Singida, Dodoma, and Manyara regions (Oforo, 2024). However, lack of quality sunflower seeds for planting had been a major bottleneck as the country imported most of its high-quality sunflower seeds mainly from India and South Africa. To counter this situation, the GoT through Agricultural Markets Development Trust (AMDT) has invested heavily in developing local capacity of sunflower seeds research, breeding, and commercialization in partnership with the Ministry of Agriculture through its TARI research facility in Ilonga, Morogoro, as the lead agency (The Citizen, 2022). The business model of this strategic intervention focuses on Public Private Partnerships (PPP) towards research, production and distribution of improved sunflower seeds to farmers. TARI Ilonga works with private sector seed companies, namely Biosustain in Singida, Aminata in Tanga and Highland Seed Growers of Mbeya to pilot innovative large-scale production and distribution of quality sunflower seeds. Widespread adoption of improved seed is one major driver of increased production of sunflower oil in Tanzania, high-yielding hybrid seeds that were previously imported are now produced locally and are available to farmers at an affordable price, thanks to private investment in seed multiplication (Dalberg, 2020).

Overview of edible oil production in Uganda

Oilseed crops including groundnuts, soyabeans, cottonseed, sesame (simsim) and sunflower have historically been produced as subsistence and commercial crops in northern and eastern Uganda, areas known as the traditional "oilseed belt". In the northern region, sunflower, soyabean and sesame are popular (Vorley et al., 2015). The region is a traditional sunflower growing area, it contains approximately 70 sunflower oil processors, many of them small and medium enterprises (SMEs) (Palladium, 2020). Sunflower is one of the main cash crop produced in the northern region and many farming households grow it within a mixed farming production system. Uganda's oil crop production is concentrated in several key hubs including the West Nile (Arua area), Northern (Gulu), Mid-Northern (Lira) and Eastern (Mbale) (Figure 2).

These hubs were developed through the Vegetable Oil Development Project (VODP2) and the National Oil Seeds Project (NOSP) to promote various traditional oilseed crops like sunflower, soybeans, and sesame (Mendola et al., 2020).

Sunflower and soybeans are grown as commercial crops whereas simsim and groundnut are traditionally produced for subsistence use with only excess produce being sold. In northern Uganda, soyabean market share is smaller than for sunflower largely due to the established infrastructure and processing capabilities for the latter especially in the Lira area. Lira area in mid-northern Uganda is a major hub for sunflower and soyabean production and processing. About 80% of Uganda's national sunflower production comes from five core districts around Lira i.e. Apac, Lira, Oyam, Dokolo and Soroti districts. Lira town itself is the national focal point of the oilseed milling industry, with associated seed distribution and provision of technical services (IFAD, 2010). The Lira area is also key in soyabean processing, major processors include Mukwano Industries and Mount Meru Millers Uganda (Vorley et al., 2015). In northern Uganda, sesame is also an important



Figure 2. The oilseed belt of Uganda (Vorley et al., 2015)

oilcrop; 93.7% of Uganda's sesame production is realized from this region (AfrII, 2023). About 250,000 smallholder farmers are engaged in sesame production producing about 101,000 tonnes from an area of 176,000 hectares (AfrII, 2023). Farmers in Lira produce significant volumes of sesame. In the Arua hub in north-west Uganda, sesame is the principal oilseed crop; it is traditionally grown as a food crop, but for many it has also turned into a cash crop (Vorley et al., 2015). In the Mbale hub in eastern Uganda, sunflower is the major commercial oilseed crop though oilseed production is not as widespread as in the Lira hub. Soyabeans and sesame are also grown in Mbale but mainly for food and not for oil (Vorley et al., 2015). Despite its importance, sunflower production in northern Uganda has faced several challenges including poor quality seeds for planting, poor agronomical practices and poor post-harvest handling. Consequently, the yields are low (approx. 500kgs per acre) making it difficult for processors and off-takers to obtain sufficient amounts of raw materials for processing in order to generate a steady profit. At the same time, the demand for sunflower seeds has steadily increased mainly due to the growing demand for sunflower cake from animal feed manufacturers in Kenya, and a growing market for unrefined vegetable oil in East Africa (Palladium, 2020). The Vegetable Oil Development

Project (VODP) also introduced oil palm cultivation in the wetter southern hubs of Kalangala (Bugala Island) in Kalangala district and Buvuma island in Buvuma district (IDS and IFAD, 2015). The National Oil Palm Project (NOPP) expanded oil palm production to other districts such Mayuge and Masaka (MAAIF, 2023).

In Uganda, annual edible oil demand is over 120,000 tonnes while the local production capacity is about 40,000 tonnes (NaCRRRI and NARO, 2023); the balance is offset through importation. Palm oil imports make up the majority of both the quantity and value of vegetable oil imports; palm oil is a major ingredient for most vegetable cooking oils. There have been deliberate efforts through a combination of private, public sector and NGO initiatives to boost the sector and promote local production of edible oilseed crops (Asigma Capital, 2017). Efforts to improve edible oil crop production in Uganda primarily focus on initiatives to increase yields and commercialization of oil crops like sunflower, groundnut, and oil palm; promoting sustainable production practices; enhancing access to high-quality seeds, and fostering strong linkages between smallholder farmers and the market. These efforts include introducing high-yielding, climate-resilient oilseed varieties that are adapted to changing weather conditions, providing extension services on proper agronomic practices for oil crops production, strengthening linkages between smallholder farmers, processors, and traders to ensure profitable and stable markets, promoting environmentally friendly farming methods to minimize negative impacts on the environment, and empowering young farmers to participate in oilseed production. Significant focus has been placed on growth of palm oil production in order to reduce reliance on palm oil imports; this includes expanding oil palm cultivation across suitable areas, especially on Lake Victoria islands (Asigma Capital, 2017).

Key government initiatives to enhance edible oil crop production in Uganda

The Vegetable Oil Development Project (VODP)

In order to enhance local edible oil production in Uganda and reduce the heavy reliance on imports, the Government of Uganda (GoU) with a loan from the International Fund for the Agricultural Development (IFAD) initiated the Vegetable Oil Development Project (VODP). The loan was approved in April 1997 and became effective in July 1998. Originally planned as an eight-year project, VODP extended from its original completion date of December 2005 to December 2011 due to problems in its implementation (IFAD, 2011). The project was a partnership between the government of Uganda, IFAD and a private sector partner-BIDCO (Bidco Oil Refineries Limited). The project's overall objective was to increase smallholder

incomes through domestic production of vegetable oil (IFAD, 2011). The first phase of the project (VODP1) had three sub-projects; (i) introduction of commercial oil palm production on Bugala island in Kalangala district (an island in Lake Victoria) (ii) development of traditional oil seeds in northern, eastern and mid-western districts of Uganda, and (iii) research and development (R&D) of essential oil crops piloted in several districts (Masiga, 2020). The oil palm subproject aimed at establishing a new oil palm industry from scratch with heavy dependence on a single private sector partner-BIDCO. The traditional oilseeds subproject aimed at expanding smallholder production and processing of existing oilseed crops and it worked in the northern, eastern and mid-western districts of Uganda. The main crops of focus were sunflower, soyabean, groundnuts and sesame. The essential oils subproject aimed at promoting research and development (R&D) to establish the oil content in already existing essential oil crops. Adaptive research was carried out and a range of essential oil crops like lemon grass and citronella were established with high essential oil value. The essential oils subproject was a small-scale, experimental, and research-oriented initiative piloted in a variety of geographic areas (IFAD, 2011). The first commercial oil palm plantation was established on Bugala island in Kalangala district in 2005 (Ssemmanda and Opige, 2018; Mendola et al., 2020; IDS and IFAD, 2015). This was done in an innovative public-private-producer-partnership (4P) involving an integrated processor/nucleus estate/smallholder model (Amugoli et al., 2022). The partnership was based on a tripartite agreement between the government of Uganda (represented by the VODP), Bidco (the private investor and majority shareholder in Oil Palm Uganda Limited [OPUL]) and smallholder farmers represented by the Kalangala Oil Palm Growers Trust (KOPGT). The growers' trust (KOPGT) was established by the government and acted as the commercial link between farmers and OPUL. The first 10,000 hectares of oil palm plantations were to be developed on Bugala island and consisted of a 6,500 hectares' nucleus estate plantation managed by the private investor, 3,500 hectares contract farming by the smallholders and a crude oil palm mill taking 30-60 tonnes a day (GoU, 1997). The government of Uganda agreed to provide leasehold on land free from encumbrances for all areas covered by the nucleus estate for a 99-year period (with renewal options) (IDS and IFAD, 2015). With oil palm producing four times more oil per hectare compared to other oil crops, oil palm yields of 6–12 tonnes/ha FFBS have been realized in Kalangala (Amugoli et al., 2022). The essential oils subproject experienced some unforeseen problems; consequently, the production of essential oils was very limited and was promoted only in one county of the Tororo district (IFAD, 2014). The development of traditional oil seeds sub-project realized significant achievements and contributed to enhanced oilseed production, processing and milling. The sub-project introduced high yielding varieties of groundnuts, sunflower, sesame and soyabeans that increased farmers yield in both quantity and quality. This stimulated the setup of more oil mills in the project areas (IFAD, 2014). The second phase of the project (VODP2), approved in 2010 and began in 2012, built on VODP1. The VODP2 maintained the two components relating to oilseeds and oil palm and dropped the essential oils component. VODP2 was implemented under three components; oil palm development, oil seed development and project management. Its final goal was the promotion and consolidation of the oilseed value chain, and hence increase of households' income and well-being in rural areas of Uganda (Mendola et al., 2020). The oilseed development component of VODP2 aimed at promoting and consolidating oil seed value chains in 43 districts of eastern and northern Uganda into four agro-industrial regional hubs. The four agro-industrial hubs are West Nile Hub, Gulu Hub, Lira Hub and eastern Uganda Hub (Mendola et al., 2020). The project provided extension and value chain support services targeting 136,000 smallholder households in these four hubs through 11 companies. In order to provide farmers with access to higher quality seeds, the project also funded the National Agricultural Research Organization (NARO) to produce foundation and breeder seeds of the oil crops (Asigma Capital, 2017). On the oil palm development component, activities were carried out on Bugala island in Kalangala district and Buvuma island in Buvuma district. An extra 400 hectares of oil palm was to be established on Bugala island and an additional 400 hectares on two nearby islands. Replicating the Kalangala model, VODP2 included development of 6,500 hectares for a nucleus estate and 3,500 hectares for smallholder farmers on Buvuma island, near Kampala (IDS and IFAD, 2015). Oil palm production was expanded to the districts of Buvuma and Mayuge in the Lake Victoria region. From the entire VODP project, a total of 10,924 hectares of oil palm was planted in Kalangala district, comprising 6,500 hectares of nucleus estates run by OPUL and 4,424 hectares by smallholder outgrowers (MAAIF, 2018). Despite increasing palm oil production to 37,363 tonnes in 2018, Uganda still had a deficit of 80,000 tonnes of edible oil that year (MAAIF)/ Parliament of Uganda, 2019). In 2018, VODP was transformed into the National Oil Palm Project (NOPP)(MAAIF, 2023).

The National Oil Palm Project (NOPP)

In 2018, the government of Uganda through MAAIF launched the National Oil Palm Project (NOPP) to scale up oil palm production in different parts of the country (MAAIF, 2023). The NOPP project was approved by the IFAD Executive Board in April 2018 to replace VODP. It runs from 2019 to 2029 drawing on experiences from VODP2 (MAAIF, 2023). The project was signed into effectiveness on November 29, 2018, between the GoU and IFAD. The project is implemented through a Public-Private-Producer-Partnership (4Ps) model. The lead agency is MAAIF as the public sector and BIDCO Uganda Limited as the private sector while the smallholder farmers are the producers (MAAIF, 2023). Through the project, the government of Uganda through MAAIF intends to expand oil palm production from Kalangala district to other districts. The project is being implemented in 5 hubs comprising of Buvuma hub in Buvuma district, Mayuge hub in Mayuge, Bugiri and Namayingo districts, Masaka hub in Masaka, Kalungu and Kyotera districts, Buikwe/Mukono hub in Mukono and Buikwe districts where the crop will be planted for the first time, and in Kalangala hub in Kalangala district where oil palm production has been ongoing (MAAIF, 2023). After successful commercial production of oil palm in Bugala island started, it was realized that the Bugala alone could not satisfy Uganda's demand for palm oil. Consequently, research was undertaken to assess the suitability of the off-shore districts of Masaka, Mayuge, Buvuma, and Bugiri for oil palm production. These trials were established from 2005 under the VODP. From positive research results, these districts have now been established as

commercial hubs for oil palm production and more research is being carried out in Rakai district under NOPP. The NOPP project has three (3) operational and one (1) management sub-component, namely: i) Scaling-up smallholder oil palm development; ii) Livelihoods diversification and resilience; iii) Oil Palm Sector Development Framework; and (iv) Project Management (Masiga, 2020; MAAIF, 2023). The government of Uganda through NOPP has supported expansion of oil palm production to new suitable areas and research for the identification of locally applicable technologies. Because oil palm is still new in Uganda, research is ongoing mainly at the National Agricultural Research Organization (NARO). The NARO researchers have been tasked with identifying suitable areas and varieties for commercial oil palm growing in Uganda. Adaptive trials have been undertaken in Mid North (Dokolo, Apac, Nwoya districts), North (Gulu, Amuru, Omoro districts) and West Nile (Adjumani, Moyo, Arua and Zombo districts (NaCRRI and NARO, 2023; MAAIF, 2023). However, there are challenges threatening oil palm production in Uganda; these include poor agronomic practices, physiological disorders, diseases outbreaks, pest infestations, farmer ignorance, and uncertain climatic conditions (NaCRRI and NARO, 2023). There are research information gaps on good production practices, pests and diseases management as well as limited access to oil palm planting materials (Amugoli et al., 2022). Planting materials currently in use in Uganda are purchased from West Africa and South-East Asian countries which have breeding programs and are into seed production.

The National Oil Seeds Project

The government of Uganda through MAAIF and Ministry of Local Government is also implementing a 7-year (2021-2028) National Oilseeds Project (NOSP) (NOSP, 2021). The project is funded with a loan by IFAD and the OPEC Fund for International Development (OFID), to scale up oilseed production and market access for smallholder farmers. The objective of the project is to accelerate commercialization in key oilseed value chains and thereby improve the livelihoods and resilience of the smallholders engaged in oilseed production and marketing (NOSP, 2021; IFAD, 2023). Through the project, the Ugandan government hopes to improve food security and incomes for more than 120,000 smallholder households in the northern and north-eastern regions of the country who are engaged in the production and marketing of oil seeds (groundnuts, sunflower, sesame and soyabean). NOSP is operating in six area-based hubs across 81 districts, where a hub is defined as an agroecological, social, demographic, and economic criterion. The hubs are West Nile (Arua), Northern (Gulu), Mid-Northern (Lira), Eastern (Mbale), Mid-Western (Hoima) and Karamoja (NOSP, 2021). The first four hubs (West Nile, Northern, Mid-Northern, and Eastern) were developed during implementation of the second phase of Vegetable Oil Development Project (VODP2) while the two new hubs (Mid-Western and Karamoja) were included in order to scale-up VODP2 approaches and successes (IFAD, 2023). The activities of NOSP are organized in two mutually interdependent components: (1) support to oilseed value chain development and (2) support to market linkage infrastructure serving the oilseed sector. The objective of the first component is to cluster 120,000 smallholder farmer households by accelerating the growth of competitive clusters and value chains for oilseeds and proactively developing opportunities for private sector investments in oilseeds and related by-products like animal feeds. The objective of the second component is to improve local-level public transportation infrastructure to facilitate the commercialization of the oilseed sector (NOSP, 2021). The key NOSP target groups are 120,000 subsistence smallholder farmers comprising women (60%) and men and youth (40%) who are growing oilseeds (ground nuts, sesame, soyabeans and sunflower) (OFID, 2021). NOSP seeks to commercialise the oilseeds value chains through applying a private sector-led approach targeting partnerships with oilseeds processors, input suppliers, service providers, agents, traders, transporters, financiers, scientific research institutions and nucleus farmers (IFAD, 2023).

Other interventions to enhance edible oil production in Uganda

On another front, Heifer Uganda partnered with Edukans, Heifer Netherlands, Dokolo District local government and the private sector to assist young people in the fragile northern Uganda and inspire them to consider agribusiness as an opportunity for income generation through *Learn for Agribusiness* (L4AB) project. The project aimed to enable 3,200 uneducated youth aged 18-30 years from Dokolo district to earn decent incomes by investing in and growing oilseeds, including sunflower, groundnuts and soybeans (Nalubega, 2023). The L4AB project ran from 2018 to 2021 and addressed skills development, access to finance and market to enable youth to tap into the promise of oilseed production; it also addressed systemic bottlenecks in the value chain to bring about sustainable and lasting impact. The youth farmers formed two formal producer organizations, the Dokolo Young Oilseeds Farmers' Cooperative and Kwera Youth Oilseed Farmers' Multipurpose Cooperative Society Limited, making it easier to work together and access business support and services. The L4AB project influenced government programs under the MAAIF to establish a 400-tonne capacity storage, bulking and processing facility for the Dokolo cooperative; linked the co-operatives to agriculture insurance providers to build resilience to climate change; supplied drought resilient oilseeds and provided tractors to increase production and productivity. The project also supported the cooperatives to establish market linkages and facilitate business partnerships with domestic companies that buy products from farmers such as Tropical Dynasty Limited, Ngetta Tropical Holdings, Mukwano Industries Uganda Limited, Soybean Africa Limited and TRAFORD (Nalubega, 2023).

In another development, crop scientists led by the AfrII formed an alliance to introduce sesame project dubbed Stabilizing Sesame Yields and Production in the Lango region in northern Uganda, that aimed at improving livelihoods of sesame farmers (AfrII, 2023). The project was a consortium comprising of the National Semi Arid Resources Research Institute (NaSARRI) of NARO, Uganda Oilseeds Producers and Processors Association (UOSPPA), FICA Seeds Ltd and AfrII as the lead implementer. Through this research-focused project, drought tolerant sesame varieties have been evaluated and released. The released varieties, Simsim 2 and 3 (Sesim 2 and 3) have been distributed to the farmers. In addition, innovations in gall midge and webworm control have been effected (AfrII, 2023).

Oil seed production in Ethiopia

Ethiopia is one of the centers of origin for several oil crop plants including rapeseed, niger (noug) seed, and castor beans; niger seed, linseed, Ethiopian mustard and sesame are indigenous to Ethiopia (Demissie et al., 1992). Nine oilseeds namely niger seed, Ethiopian mustard (gomenzer), linseed (flaxseed), soyabean, sunflower, castor, sesame, groundnut and cotton are produced in the country (Getinet and Fekadu, 2023). Oilseeds research in Ethiopia started at Debre Zeit Experiment Station in the late 1950's (Feleke, 1965). Later, it continued with niger seed, Ethiopian mustard and linseed at Holetta, sesame and groundnuts at Werer, and sunflower at Hawassa Research Centers, respectively (Getinet and Fekadu, 2023). Oilseed research in Ethiopia focuses on improving the production, quality, and value chain of key oilseed crops like sesame, niger seed, and sunflower. In the last 60 years, over 156 oil crop varieties with their production practices have been developed and registered (Getinet and Fekadu, 2023). Linseed, Ethiopian mustard, niger seed, and sunflower are cultivated in the highlands while sesame, groundnuts, castor and soyabeans are grown in the lowlands. Groundnut, sunflower and soybean are the choice for cultivation both in high rainfall Western lowlands and in the irrigated areas of Awash, Omo and Wabe Shebelle and Dawa Genale valleys (Getinet and Fekadu, 2023). The primary oilseed crops in Ethiopia are sesame, niger seed, and to a lesser extent, soyabeans, groundnut and linseed with sesame being a significant export commodity (Girma et al., 2022). Sesame is the most widely produced oilseed crop representing 30% of Ethiopia's oilseed production (GAIN and USDA-FAS, 2021; Figure 3).

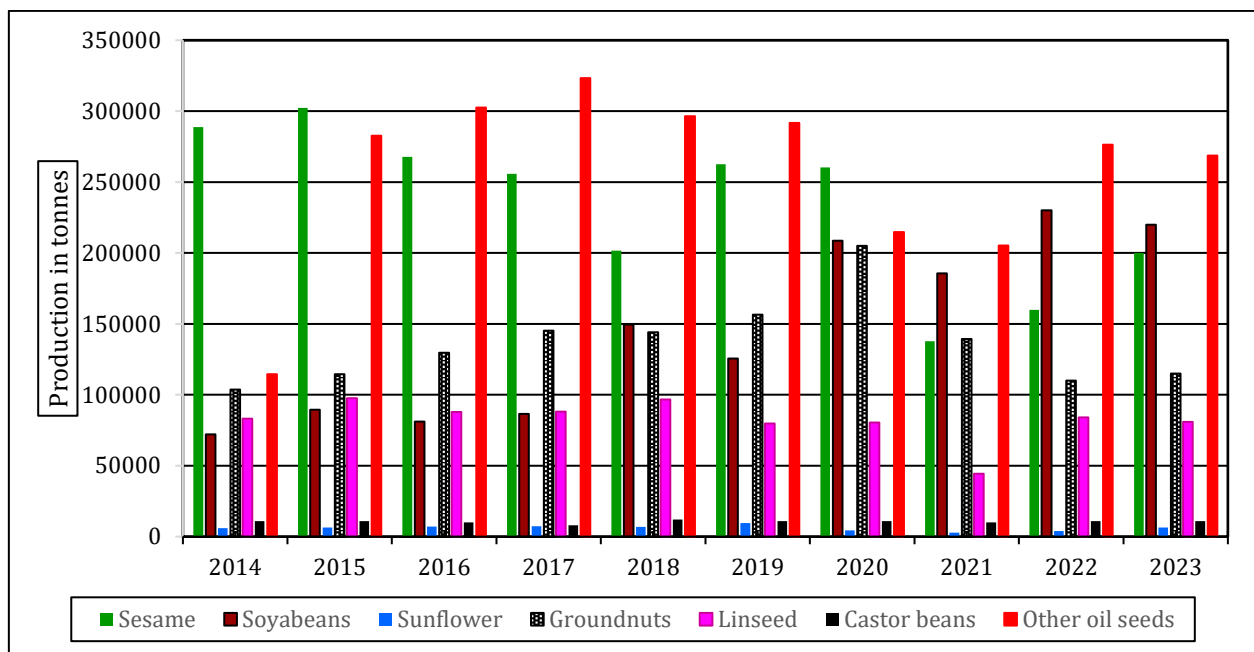


Figure 3. Edible oil crops production in Ethiopia in the last 10 years. Source: FAOSTAT, 2024.

Sesame (46% edible oil production area nationally) is generally produced as a cash crop and is almost entirely exported raw while niger seed, the second most produced oilseed (32% area), has a domestic market orientation. It is primarily processed into oil and oil cake (Hartrich and Berhanu, 2021) as well as directly consumed when mixed with other foods. Recently, niger seed was added to the list of Ethiopian Commodity Exchange (ECX) traded commodities; this move is expected to create improved market incentives for farmers to expand production (Agricultural Market News [AMN], 2023). Production of sesame is mainly concentrated in northern and northwestern Ethiopia, in the regions bordering Sudan and Eritrea (GAIN and USDA-FAS, 2021). Amhara is one of the largest oilseed producing regions in Ethiopia. In this region, sesame is the principal oilseed crop occupying about 60% of all rain-fed edible oil area and accounting for half of the total oilseed produced in the region. This translates into about 44% of all of Ethiopia's sesame production (Hartrich and Berhanu, 2021). Other sesame producing regions in Ethiopia are Tigray (31% of the national output), and Oromia (13%); Benshangul-Gumuz (9%), SNNP (2%), and Gambela (1%) of total national production (GAIN and USDA-FAS, 2021). Niger production (95%) is concentrated in the highlands of Oromia and Amhara (AMN, 2023). Ethiopia's oilseed sector plays an important role in generating foreign exchange earnings and supporting the livelihoods of market actors across the value chains (GAIN and USDA-FAS, 2021). Around 1.4 million farmers produce oilseed crops in the country. Oilseed crops are the third largest foreign exchange earners after coffee and cut flowers; the three main oil crops (sesame, niger seed, and soybeans) constitute nearly 17% of Ethiopia's agricultural exports (GAIN and USDA-FAS, 2021; Food Business Middle East and Africa [FBMEA], 2021). Oil crops account for approximately 20% of Ethiopia's total agricultural export profits, second only to coffee (Sirany and Tedele, 2022; Soliman and Demisie, 2024), with the majority of this share coming from sesame. Sesame is the largest exported oilseed; it is the second-largest agricultural export commodity after coffee (Getinet and Fekadu, 2023). Despite the great potential, there has been a decline in oilcrop production in Ethiopia (Figure 3). Sesame seed production in the 2020/2021 marketing year declined by nearly 9% from the previous year mainly due to a reduction in crop area and planting of alternative crops mostly sorghum to enhance food security (FBMEA, 2021). Some farmers planted alternative crops such as soyabeans and sunflowers in expectation of better price returns. The onset of the Tigray war in 2020 and Sudan civil war in 2023 also marked a significant downturn in sesame production especially in Tigray region and along the

Ethiopia-Sudanese border. In addition, the volatile security situation in major niger growing areas (especially in the zones of East and West Wollega) has affected niger seed trade (AMN, 2023). Furthermore, the traditional niger seed growing areas are being replaced by high yielding hybrid maize, rice and bread wheat (Getinet and Fekadu, 2023). The cultivated area under oilseeds in mid to highlands is shrinking and is being replaced by high yielding cereals such as maize, wheat and malt barley; farmers tend to earn more from cereals than inherently low yielding oilseeds (Getinet and Fekadu, 2023). Major constraints facing edible oil sector in Ethiopia include cultivation of low yielding oil crop varieties that produce poor quality oil, inadequate inputs such as seeds and fertilizers, poor agronomic practices, rain-fed production with risks of losing a crop and lowering quality, and post-harvest losses due to challenges in storage, transportation, post-harvest handling and packaging. There is also limited processing capacity and outdated processing technology, weak linkage among the value chain actors and lack of credit facilities to the actors, among others (Getinet and Fekadu, 2023; Hartrich and Berhanu, 2021). Edible oil production in Ethiopia is largely uncompetitive and local processing is under threat as imported palm oil is much cheaper and more widely available (Hartrich and Berhanu, 2021). At the same time, there is an increased domestic demand for cooking oil. To bridge the gap, the country has been importing edible oil; mostly palm oil, sunflower, olive and peanuts (Getinet and Fekadu, 2023). In the 2019/20 (July to June) financial year, Ethiopia imported palm oil, sunflower oil, and soybean oil valued at nearly US\$283 million. Of this imported edible oil, about 71% by value was palm oil, followed by sunflower oil (27%) and soybean oil (1%) (FBMEA, 2021). In the 2020/21 marketing year (October to September), local edible oil production was 63,000 tonnes against consumption of 630,000 tonnes (FBMEA, 2021); 90% of the national demand of edible oil in Ethiopia was imported (Getinet and Fekadu, 2023). Ethiopia imports palm oil mostly from Indonesia (48%) and Malaysia (36%). The largest suppliers of sunflower oil to the Ethiopian market are Turkey (58%) and Ukraine (21%) while the leading suppliers of soybean oil are Ukraine and China at 33% and 26%, respectively (FBMEA, 2021). Oilcrops production in Ethiopia and local demand are set to increase following the inauguration of government-backed Integrated Agro-Industrial Parks and the entry of large-scale local edible oil processing industries in the market (FBMEA, 2021). However, the demand for raw materials by these edible oil processing industries is enormous and exceeds the national oilseeds production; consequently, most of the processing industries operate below 50% of their capacity (Getinet and Fekadu, 2023). The Ethiopian government has been working to boost domestic production of edible oil with an aim of reducing reliance on imports and improving food security (Yoseph, 2023). This is through strategies such as supporting farmers with inputs and technical assistance, promoting local processing, and strengthening market linkages. The primary objective is to increase local production of oil seeds to meet the needs of domestic cooking oil processing factories (FBMEA, 2023b).

Conclusions

Africa has suitable agricultural lands and weather conditions for vegetable oil crops production for local and international oil markets. However, oil crop production and productivity in Africa are low, and the continent is a net importer of edible oil. Palm oil is the most imported edible oil to the African continent. To counter the high cost of importation, local production of edible oil crops is being promoted. Major oil crops that are produced in the East African region are sunflower, oil palm, sesame, rapeseed (canola), soyabean, groundnuts and coconut. In Ethiopia, the primary oilseed crops are sesame, niger seed (noug), and to a lesser extent, soyabeans. Despite efforts to spur local production of edible vegetable oils, the East African region is still a net importer of the commodity.

Data availability statement

Data sharing is not applicable to this article as no data were created or analysed in this study.

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Conflict of interest

The authors declare that they have no competing interests.

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