Building competitive agricultural markets for Zambia: Unlocking export potential

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Table of Contents

Abstract

Zambia has the potential to become the region's breadbasket with abundant arable land and water. Global and regional food demand continues to grow for crops such as soybeans and maize which are inputs to animal feed and vegetable oil. However, trade restrictions and anti-competitive conduct are major roadblocks to realising Zambia's potential. Farmers in Zambia have received prices for crops like soybeans and maize which were as much as 40-50% lower than what they could have obtained in more attractive export markets. Prices for key imported inputs, such as fertilizer, in Zambia have been inflated by up to 45%, exacerbating the drain on subsidies for the Farmer Input Support Program (FISP) and eroding the competitiveness of non-subsidized agriculture. Competitive markets are also essential to realise the potential for downstream growth of poultry and to relieve consumer food price pressures in Zambia for staples such as vegetable oil.

1. Introduction

With immense agricultural potential, Zambia stands at the forefront of countries capable of significantly expanding their agricultural production to meet the increasing demands of regional and global food markets. Zambia encompasses a landmass of 75 million hectares, of which 42 million are arable[1]. A mere 15% of this arable land is presently under cultivation, and less than 5% is dedicated to crop production, the majority being allocated to livestock grazing. Moreover, Zambia possesses fertile soils and abundant water resources. Nevertheless, the agricultural sector is still struggling with low productivity, as outlined in the recent IGC Report looking at constrains agricultural productivity in Zambia (IGC 2023).

If Zambia were to utilise just half of its currently fallow arable land, realise yields at only half of their attainable levels and focus on poultry and fish farming. This would yield an additional $32 billion in exports, providing low-priced fish and chicken for local markets and maize and vegetable oil as by-products [2]. The additional combined food exports would be four times Zambia's copper exports and still lag behind Brazil's soybean exports[3].

Zambia is, however, a net importer of staple foods such as chicken, fish, and vegetable oil, despite its inherent capacity to be a global production hub for these very commodities. Additionally, consumers pay food prices which are significantly higher than international levels, while prices could drop by a third or more, if aligned more closely with competitive international prices. This raises major questions about the effectiveness of Zambia's agricultural markets.

Hence, we ask how well these agricultural markets have been working. Zambia's relatively small population in relation to its arable land underscores the need for export-oriented growth and the enhancement of value addition within the agricultural and food sector.

[1] https://www.zda.org.zm/agriculture/#:~:text=Zambia%20is%20endowed%20with%20a,hectares%20is%20cultivated%20every%20year.

[2] Assumes additional 16mn ha utilised for maize and soybean production, using 6mn for maize and 10mn for soy; yields of 5t/ha for maize; 2t/ha for soybeans. This gives production of an additional 30mn tonnes of maize; 20mn tonnes of soy (which in turn yields 16mn tonnes of cake and 3.4mn tonnes of oil). Using a conservative feed conversion ratio of 2 means using half of the maize and oilcake in feed would produce 11.5mn tonnes of fish and chicken, at prices of $1.5/kg gives $17.25bn of exports; with exports of remaining oilcake and maize around $8bn, and $7bn of vegetable oil. Note that South Africa has quadrupled soybean production over a decade without having the favourable soils that Zambia has. As rapidly growing countries such as India increase meat consumption from very low levels, global demand will rapidly expand. The global growth in demand for animal feed has seen increases in the global land used for maize and soybeans cultivation of 33mn ha and 26mn ha in the decade from 2011 to 2021. As this growth continues, Zambia's available land is an important productive asset to meet global demand.

[3] Brazil's soybean exports in 2021 were US$39bn. The main soybean producing areas are a similar distance to the main cities and ports as in Zambia.

We find that export markets, especially for exports to the region, are working very badly. Restrictions on exports and high transport and related costs are harming Zambian producers and undermining investments, which could help improve agricultural productivity. Zambia's reputation as a reliable supplier could further be compromised by ad hoc export restrictions, prompting potential buyers to seek alternative sources of supply.

In tandem with augmenting agricultural productivity, it becomes imperative to enhance value-addition in the sector. Zambia's agri-food potential holds the key to revitalising the country's industrial base, combatting the deindustrialization trend where primary products are exported, and manufactured goods are imported. However, concerns loom over the potential repercussions of an export-centric approach on local food security. If markets work well, then this concern is misplaced, where an expansion in production would translate into abundant local food. The inland location of Zambia means that competitive local market prices at export levels will always be lower than international prices (as local prices will be net of transport costs), giving an in-built advantage to local buyers and processors. However, if there exist market power, then local prices can be marked-up above export prices to discriminate against local buyers. Hence, enforcement of competition law is essential to guard against this possibility.

This policy paper dissects the functioning of agricultural markets with a focus on Zambia's export competitiveness. It draws on primary market data and interviews with key market participants to assess market outcomes and their implications. The data indicates that farmers receive very low prices for key crops such as maize, soybean and sunflower when compared to export markets. There appear to be extremely high trading margins for fertiliser, much greater than reasonable transport and storage costs. Furthermore, government policies requiring permits for responsible export management have caused prolonged delays. As a result, many exporters struggle to honour their commitments to customers. Only the largest traders, with the necessary access, can expedite this process. **Hence, the core finding of the paper is that market failures and anti-competitive conduct are major roadblocks to realising Zambia's agricultural potential.**

An integrated policy framework is imperative, one that concurrently fosters research and development to enhance best practices, extends crucial extension services to farmers, facilitates development finance to allow for investments by both farmers and processors, ensures the competitiveness of critical infrastructure and logistics, including storage facilities, and establishes comprehensive systems for market information and monitoring. In light of the aforementioned challenges and opportunities, we propose a comprehensive package of market-supporting measures to unlock Zambia's agricultural production and unleash its potential, encompassing the following strategic actions:

1. **Rigorous monitoring of markets**: This includes the tracking of prices across various supply chain levels, to ensure that competitive conditions translate through the markets, translating into attractive returns, increased investments, and accelerated growth, particularly in value-added products.
2. **The formulation of appropriate trade policies**: These need to actively support, rather than hinder, exports while instilling confidence in Zambian supply among international customers. This includes strategies to reduce the costs associated with export compliance, meeting international standards and certifications, and transportation.
3. **Strengthening competition enforcement**: This includes regional collaborations, to safeguard against the abuse of market power by companies operating in oligopolistic industries. Membership in COMESA allows Zambia to benefit from more robust competition law enforcement in cross-border markets critical for exports.

4. **Targeted support for farmers**: This support should be aimed at enhancing water management, irrigation practices, and storage capabilities. These measures are pivotal for ensuring the resilience, sustainability, and diversification of agricultural production.
5. Linked support for producers and exporters through **research and development, development finance, and assistance in meeting standards and certification** along value chains.

2. Overview of production and trade

Although the agricultural sector has significantly contributed to the Zambian economy, accounting for roughly 9% of the GDP and employing 64% of the workforce over the past two decades (IGC 2023)[4], the sector's full economic potential remains largely untapped. This underdevelopment is primarily driven by underutilisation of arable land, low agricultural productivity and limited value addition, factors that have been well-documented.

Small and medium-scale farmers, comprising nearly 90% of producers, are the backbone of Zambia's agricultural sector. They predominantly cultivate crops like maize, soybeans, sorghum, and groundnuts. However, despite the sector's potential, maize yields barely reach 2 tonnes per hectare, far below the water-limited potential yields of approximately 12 tonnes (IGC 2023). The gap between Zambia's potential and actual production levels becomes starkly evident when realising that crop production, particularly maize and soybeans, is similar to Malawi, a country with only 4 million hectares of arable land.

The sugar industry serves as a contrast in terms of yields with among the world's best yields in recent years. Sugar has significantly contributed to Zambia's exports, second only to copper.[5] Nevertheless, recent developments have seen soybean and oilcake exports surpassing sugar exports, highlighting the enormous potential within the soybean sector, a central focus of this paper.

Recognising the interconnected impacts of crops on related products such as poultry, fish, and vegetable oil is crucial. Vegetable oil, derived from soybean crushing for poultry and fish feed production, underscores Zambia's potential to transition from a net importer to a self-sufficient producer of these critical products[6]. Such a transformation carries far-reaching implications for food prices, food security, and value addition domestically and within the Southern African Development Community (SADC), where deficits in meat, vegetable oils, and cereals persist (see Appendix 1). Zambia enjoys optimal growing conditions for maize and soybeans, the primary poultry and fish feed ingredients.

Numerous factors contribute to the overall poor productivity and underutilization of arable land. When considering the productivity potential alongside land availability, Zambia could become the region's grain basket and a crucial international exporter, similar to countries like Brazil, which shares almost identical soils and climate in its primary growing areas.

2.1 Production and Trade of Selected Crops and Products

While Zambia holds great agricultural potential for the reasons described above, a comparison across some of the main commodities shows how very little of this potential is actually being realised. Outside

[4] https://www.mcti.gov.zm/euzef/?page_id=1234
[5] There have also been concerns about high local pricing of sugar, undermining the competitiveness of downstream industries.
[6] For example, fish accounts for 58% of Zambian households protein consumption, and yet the country has substantial net imports including of frozen farmed Tilapia from China.

of the growth in the production of soybeans, there has been marginal growth in the production of other crops, especially when Zambia's land availability is factored in.

In this section, we provide a brief snapshot of the production and trade of key agricultural commodities in Zambia relative to selected countries in the region. The data highlights the regional potential for Zambia as a key supplying country for commodities but also for value added products such as poultry and vegetable oil through increased agricultural production.

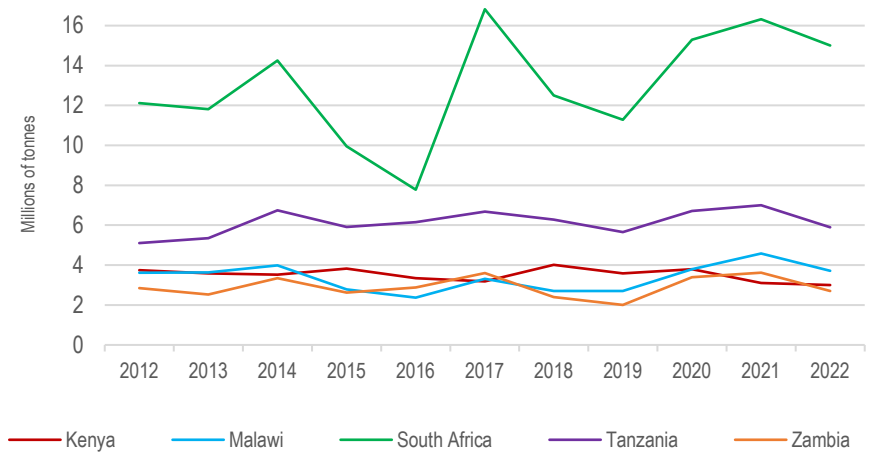
Maize

Maize, serving as the staple food, is prominent in Zambia's agricultural landscape. It is predominately grown for human consumption and is the most produced crop by volume, comprising 70% of the country's crop output. Maize's adaptability allows it to thrive in diverse geographic locations, spanning a range of soil types and climates.

Despite its widespread cultivation, maize productivity and production have yet to reach their potential. Since 2018, Zambia has produced smaller volumes than its neighbouring country, Malawi, (as illustrated in Figure 1). In fact, Zambia's maize production is only approximately half that of Tanzania, while South Africa maintains its position as the region's largest producer and exporter of maize.

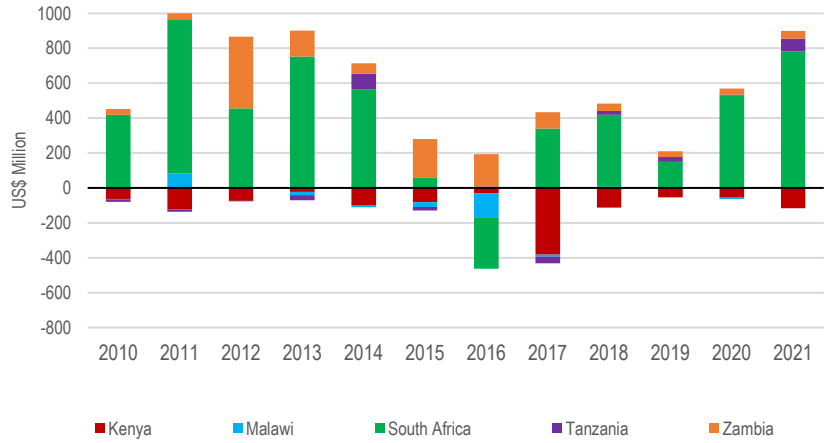
Notably, Zambia has seen very small levels of maize exports, even as international demand has been robust, including from East Africa which has suffered from drought over the last two growing seasons. Realising this potential hinges on creating favourable incentives, such as competitive pricing, and appropriate support to Zambia's farmers. With these conditions in place, Zambia has a substantial opportunity to significantly enhance maize yields and production, which should lead to surplus production levels each year. Capitalizing on good returns from export markets, especially for animal feed (as elaborated upon in Section 4), will play a pivotal role in achieving this objective.

Figure 1: Maize production for selected countries (2012-2022)



Source: FAOSTAT; 2017 - 2022 Malawi data is from the Ministry of Trade in Malawi

Figure 2: Maize net exports for selected countries (2010-2021)



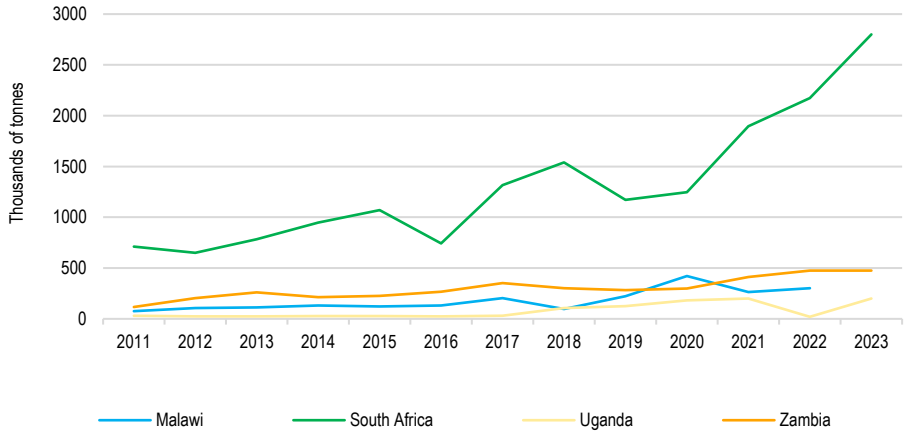
Source: TradeMap

Soybean

Soybeans, primarily processed into animal feed and vegetable oil, have seen a surge in demand due to regional urbanisation and increasing poultry production. This trend has driven significant growth in soybean cultivation not only in Zambia but also in neighbouring Malawi and South Africa, as illustrated in Figure 3. However, while Zambia has seen a rise in soybean production, it has not fully tapped into its potential, especially when compared to the remarkable growth in South Africa. Over the past decade, South Africa has nearly quadrupled its soybean output. Surprisingly, Malawi, with significantly less arable land than Zambia, has reached production levels similar to Zambia's in recent times such as in 2020. Notably, soybeans account for less than 10% of Zambia's total agricultural output.

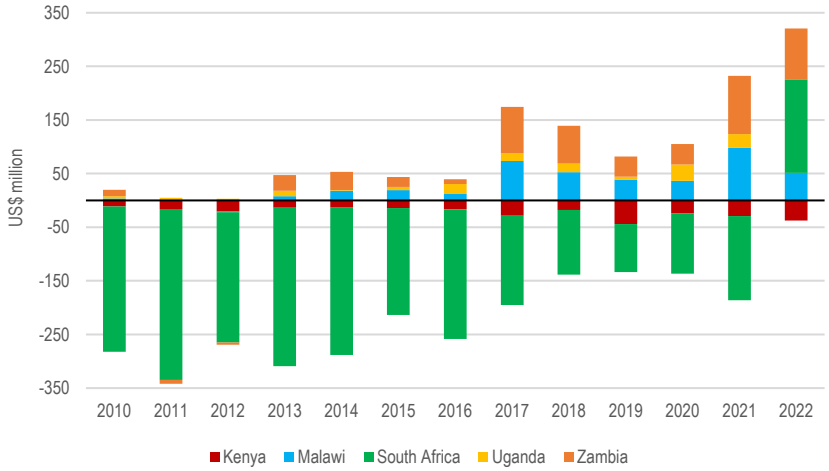
The returns to soybean cultivation hinge on effectively meeting the demand in both export markets and domestic processing for animal feed and vegetable oil. Zambia has made some headway in exporting soybeans to neighbouring countries such as Kenya, South Africa, Tanzania, and Zimbabwe, as well as to more distant markets like India and China. However, the paper will delve into a comprehensive evaluation of the challenges associated with significantly expanding soybean exports and the derived products in Section 5.

Figure 3: Soybean production for selected countries (2011-2023)



Source: FAOSTAT, Malawi data is from the Ministry of Trade in Malawi

Figure 4: Net export of soybean & oilcake for selected countries (2010-2022)



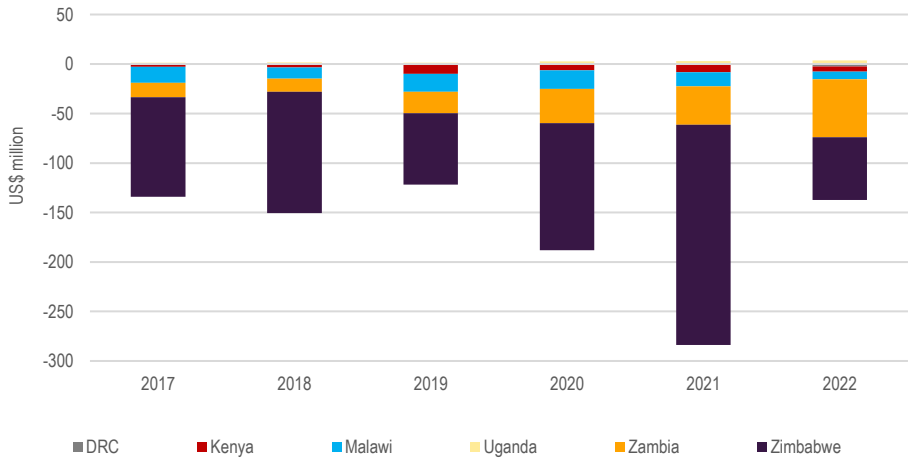
Source: TradeMap

In Zambia, the production of vegetable oil primarily relies on crushing soybeans and refining the crude oil produced. This means that oilcake/meal for animal feed and vegetable oil are essentially co-products derived from soybeans.

Examining trade data for refined vegetable oil unveils a notable trend. Despite the substantial increase in soybean production in Zambia, the country's imports of refined vegetable oil have surged from $13 million in 2018 to nearly $60 million in 2022, as depicted in Figure 5. This data highlights a substantial market opportunity for Zambia to replace these imports with competitive local production. Conversely, Malawi has reduced its vegetable oil imports as soybean production has risen.

In addition to satisfying local demand, Zambia can tap into significant regional export potential for vegetable oil, especially in neighbouring countries like Zimbabwe.

Figure 5: Refined soybean oil net export Zambia (2017-2022)



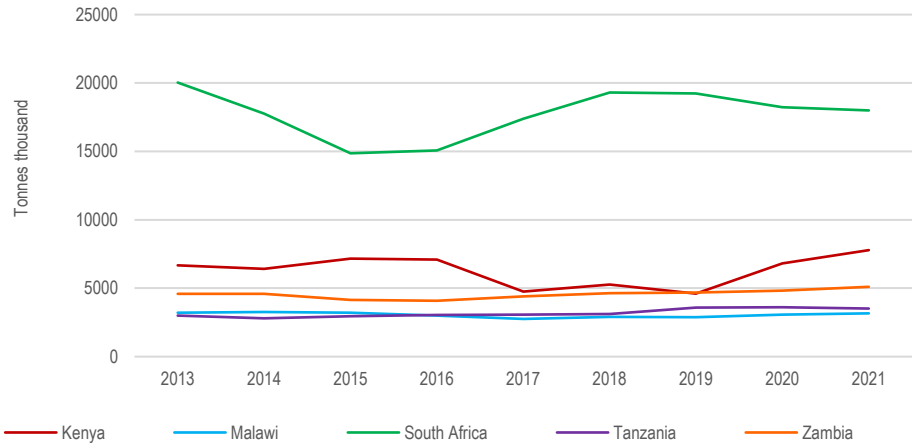
Source: TradeMap

Sugar

Sugarcane production in Zambia stands at 5 million tonnes per annum. In terms of value, Zambia's sugar exports have consistently ranged between US$60-80 million since 2019, establishing sugar as the country's second-largest merchandise export category after copper.

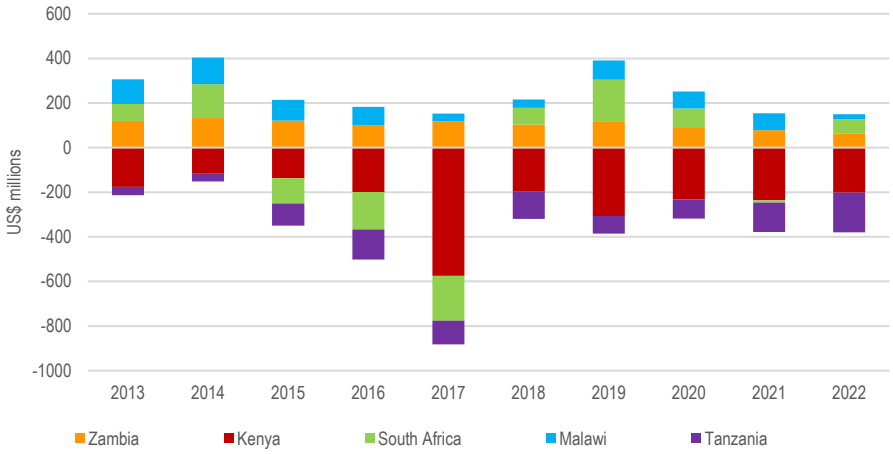
However, in 2021/22 the combined value of soybean and oilcake exports, totalling approximately US$100 million annually, surpassed the export value of sugar. This shift underscores the growing importance of soybean and its derived products in Zambia's export landscape, reflecting both increased production and the expanding global demand for these products.

Figure 6: Sugar production for selected countries (2013-2021)



Source: FAOSTAT, TradeMap

Figure 7: Net export of sugar for selected countries (2013-2022)



Source: FAOSTAT, TradeMap

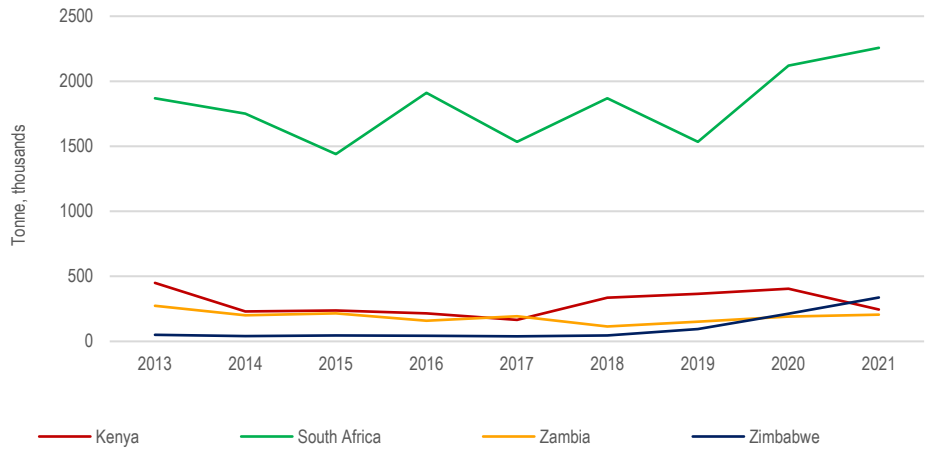
Despite favourable conditions for sugarcane production in Zambia, Figure 6 indicates that the country's sugar production has yet to experience significant growth. This is particularly noteworthy considering the substantial demand for sugar from countries in East Africa, including Kenya. Zambia has some of the best conditions for sugarcane cultivation, with yields that rank among the highest globally. Like soybeans, sugarcane presents an opportunity for increased agricultural production,

expanded exports, and value addition within Zambia. However, unlocking this potential necessitates competitive pricing for local users of sugar, especially in industries like beverage and confectionery manufacturing (including biscuits and sweets). Concerns have arisen regarding significantly higher prices for industrial sugar in the local market than in the export market. If this pricing disparity indeed exists, it poses a risk to local industrial development, potentially undermining the sector's growth and competitiveness.

Wheat

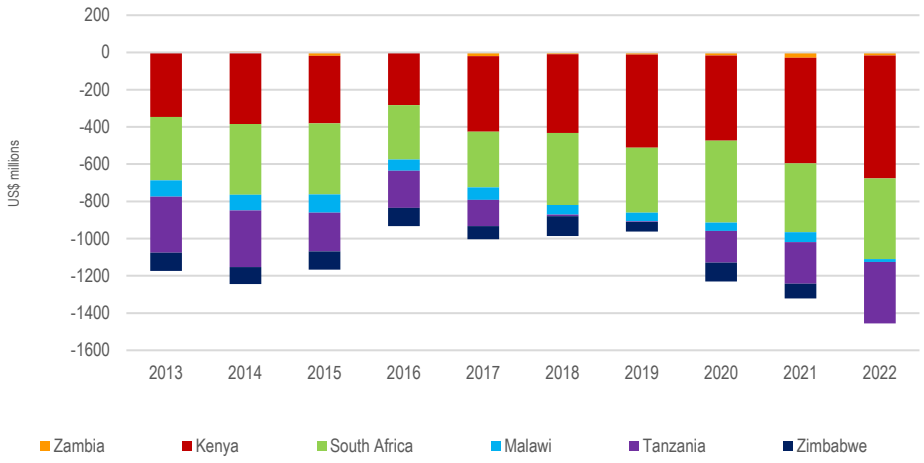
Zambia currently has limited wheat production due to its temperate crop nature, thriving best at temperatures between 15-20°C. However, the introduction of irrigation and improved cultivars could enable Zambia to increase winter wheat production when rainfall is scarce. Presently, Zambia's wheat production meets local demand, resulting in minimal imports or exports, as shown in Figures 8 and 9. In contrast, neighbouring countries like Kenya, South Africa, and Tanzania import substantial volumes of wheat, with South Africa and Tanzania having large milling capacities and exporting wheat products like flour.

Figure 8: Wheat production for selected countries (2013-2021)



Source: FAOSTAT, TradeMap

Figure 9: Net Export of Wheat for selected countries (2013-2022)



Source: FAOSTAT, TradeMap

2.2 Growing Production, Value-Addition, and exports

The Eastern and Southern Africa region exhibits significant disparities in food crop production, as highlighted earlier. Despite the abundance of arable land, the region remains a net food importer. Furthermore, the demand for food products in this region is subject to substantial growth due to rapid urbanisation from relatively low levels (as seen in Figure 10) and rising incomes, presenting a significant opportunity for Zambia.

Figure 10: Share of people living in urban areas (2021)

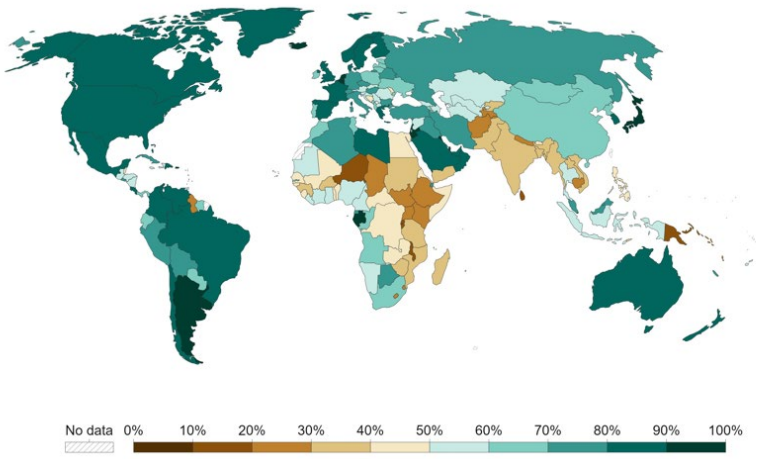


Image Source: Our World In Data, Data Source: UN Population Division via World Bank

Urbanization, while still below 50% in many parts of Eastern and Southern Africa, is undergoing rapid change, with profound implications for food demand. A similar trend is observed in India and other South Asian countries, further amplifying global food demand.

Zambia, like its neighbours, is affected by these dynamics, with one of the main drivers being the increasing demand for meat as incomes rise. This translates into higher demand for animal feed, primarily composed of soybeans and maize. Globally, agricultural land allocated to maize and soybeans has increased by 33 million and 26 million hectares, respectively, over the past decade (roughly a 19% and 25% increases). Few regions, apart from Zambia and its neighbours, have available arable land, without deforestation, capable of accommodating such significant expansions to meet global demand.

The magnitude of change is evident when looking at per capita meat consumption (see Figure 11). Zambia's per capita consumption is approximately in line with the African average at around 26-28kg per person, with fish and beef representing the primary categories. This consumption level is roughly one-quarter of that in middle- and upper-income countries like the European Union, China, and Brazil. India, with its vast population, has even lower per capita meat consumption, signalling rapid growth potential from this low base. Notably, India has witnessed a more than 40% increase in per capita poultry consumption in the past decade. Poultry and farmed fish have the most efficient conversion of animal feed and are also perceived as healthier.

Figure 11: Per capita meat consumption by type (2020)

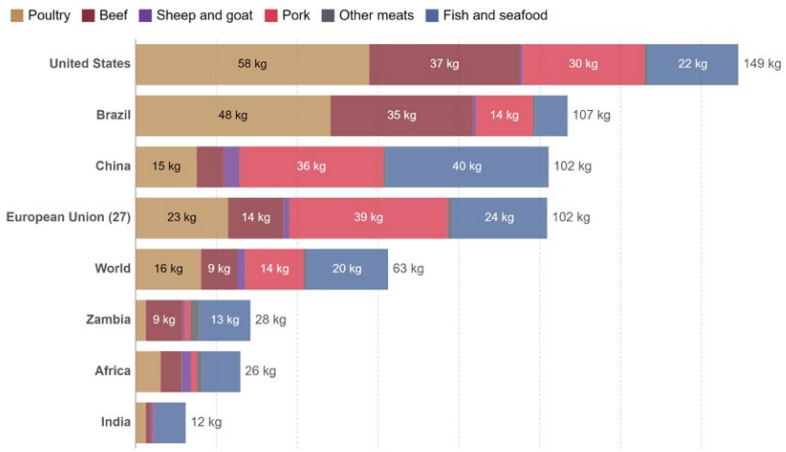


Image Source: Our World In Data, Data Source: Food and Agriculture Organization of the United Nations

Examples of countries achieving this agricultural transformation to meet growing food production demand include South Africa which, for instance, quadrupled its soybean production in a decade, despite less favourable soils compared to countries like Zambia and Uganda. However, South African yields in 2021 were still only 2.3t/ha compared to Brazil's 3.4t/ha. Uganda, with fewer investments, approached South Africa's yields due to favourable rainfall and soils. Zambia, despite its excellent growing conditions, recently achieved yields of just 1.3t/ha, highlighting the immense untapped potential that can be unlocked through improved advisory services and irrigation investment, stimulated by more efficient markets.

Brazil stands out as a prime example of what coordinated strategies can achieve in rapidly expanding production of soybeans, maize, and poultry. Production of soybean nearly doubled in a decade, from 75 million tonnes in 2011 to 135 million tonnes in 2021, surpassing the USA (see Figure 12). Zambia shares similar soil and weather conditions with Brazil, along with comparable distances to major cities and ports. However, Zambian producers must navigate border crossings to reach these key locations, emphasizing the importance of efficient regional markets.

Figure 12: Soybean Production in million tonnes by top five producing countries (1961-2021)

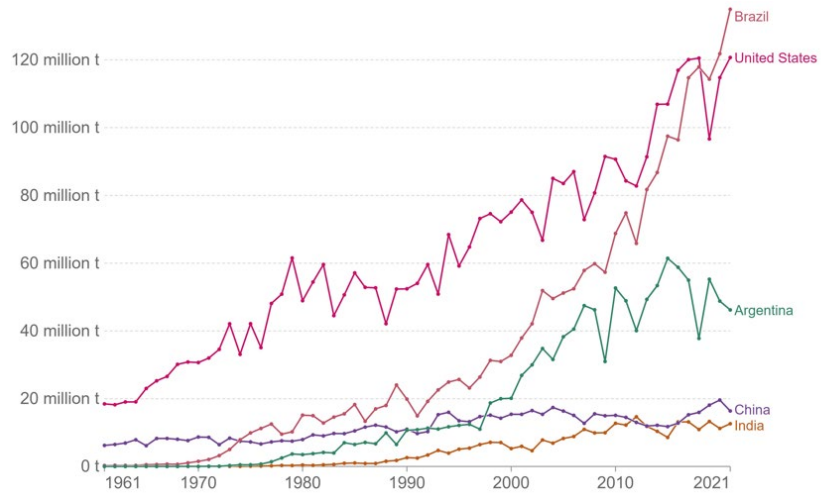


Image Source: Our World In Data, Data Source: Food and Agriculture Organization of the United Nations

Brazil's growth is closely linked to increasing Chinese demand. China imports around 100 million tonnes of this commodity in addition to their local production. However, land constraints in Brazil indicate that production growth cannot continue at the rates required to meet global demand.

3. Key Markets and Value Chains: Fertilizer

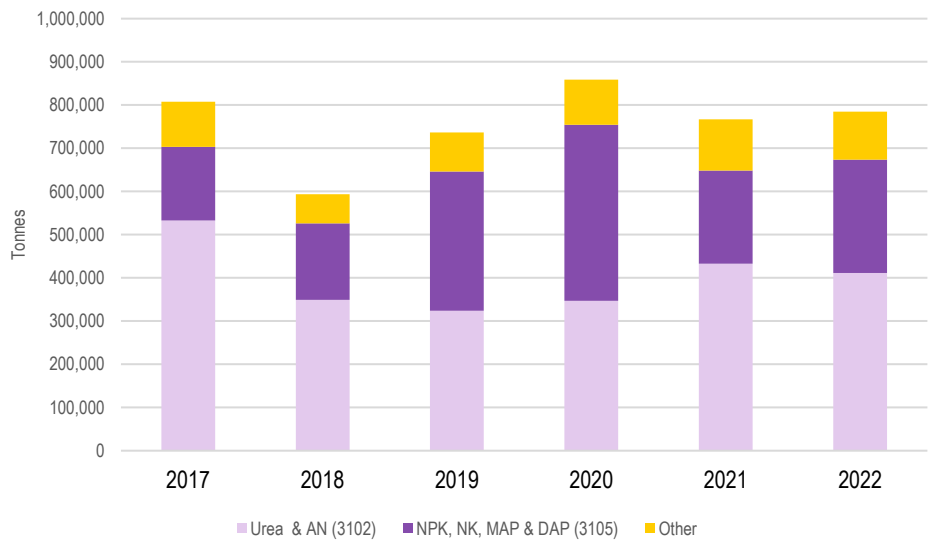
3.1 Overview

Zambia's fertilizer application rates have shown improvement, reaching approximately 40-50kg per hectare of cropland since 2015. This marks a significant increase compared to the preceding decade from 1980 to 2010 when rates were half[7]. However, it's worth noting that Zambia's current application rates remain below those of countries like Brazil and much of Europe, where rates exceed 90kg per hectare.

Zambia's reliance on fertilizer has necessitated the importation of roughly 700-800 thousand tonnes of fertilizer annually (as depicted in Figure 13) [8], primarily due to the absence of local primary fertilizer production. Nevertheless, some local fertilizer production is on the horizon, as discussed below.

On a global scale, nitrogen (N) is the most crucial plant nutrient, constituting approximately 70% of all fertilizer use. The remaining nutrients primarily comprise phosphate (P) and potassium (K), often supplied in various forms, including NPK combinations. It's important to note that fertiliser application rates vary significantly by crop type. For instance, maize typically requires substantial nitrogenous fertiliser, while soybeans have the unique ability to fix nitrogen in the soil, reducing the nitrogen requirements for other crops, such as maize, when they are part of a rotational cropping system.[9]

Figure 13: Zambia Fertiliser Imports



Source: Authors calculations, using data obtained from Trade Map

[7] https://ourworldindata.org/fertilizers from FAO. The World Bank (2020) estimates Zambia's fertilizer application at close to 80kg/hectare.
[8] Some of which is trans-shipped to the DRC and not recorded.
[9] Soybean may use phosphate fertilizer to improve yields.

Zambia's fertiliser imports are primarily facilitated through ports in Mozambique, namely Beira and Nacala, as well as from South Africa, particularly through Durban port. Some imports also occur through Dar es Salaam.

These fertilisers are imported as final products and for blending in local plants[10]. Among the imported fertilisers, nitrogen-based urea accounts for approximately 200 thousand tonnes per year. Additionally, Zambia imports substantial quantities of ammonium nitrate products, such as calcium ammonium nitrate (CAN), from South Africa, along with various NPK (nitrogen, phosphorus, and potassium) blends to meet the diverse nutrient requirements of different crops and soil conditions[11].

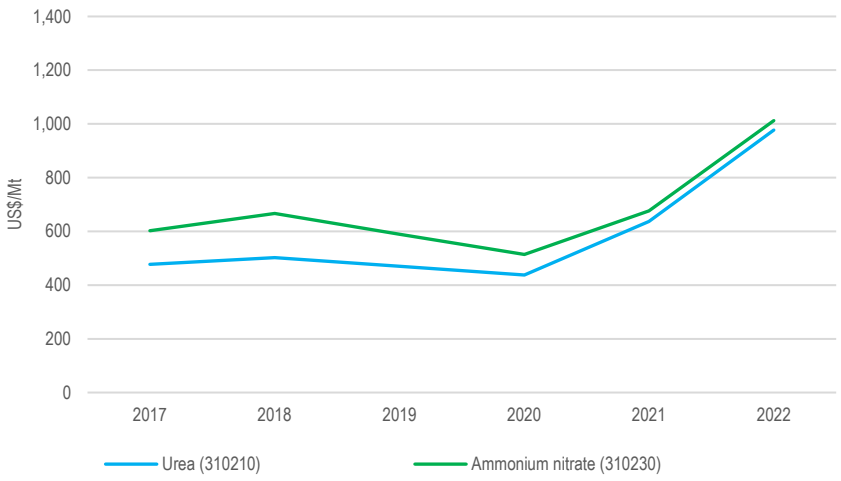
3.2 Prices, markets, and competition

Zambia's fertilizer prices have consistently exceeded world benchmark prices by a substantial margin. While global prices for urea fertiliser hovered around $200 per ton up to 2020, the prices of imported urea in Zambia ranged from $400 to $500 per ton (as depicted in Figure 14). Prices to farmers in Zambia included mark-ups by suppliers, and the government allocated significant funds to subsidise fertiliser prices for specific farmer groups and crops.

From 2021 to 2023, global fertiliser prices experienced a significant spike, with urea prices reaching approximately $900 per ton due to increases in natural gas prices—the primary energy input for urea production. In Zambia, this price surge pushed local fertilizer prices to exceed $1400 per ton (as shown in Figure 15). Remarkably, these prices have remained elevated, surpassing $900 per ton, even as global prices began to decline to approximately $300 per ton in early 2023.

The subsidy efforts are evident in the recorded prices in mid-2022 in Figure 15, incurring substantial costs to the government. The subsidized price during this period was roughly $700 per ton, reflecting a government subsidy of approximately $600 per ton[12].

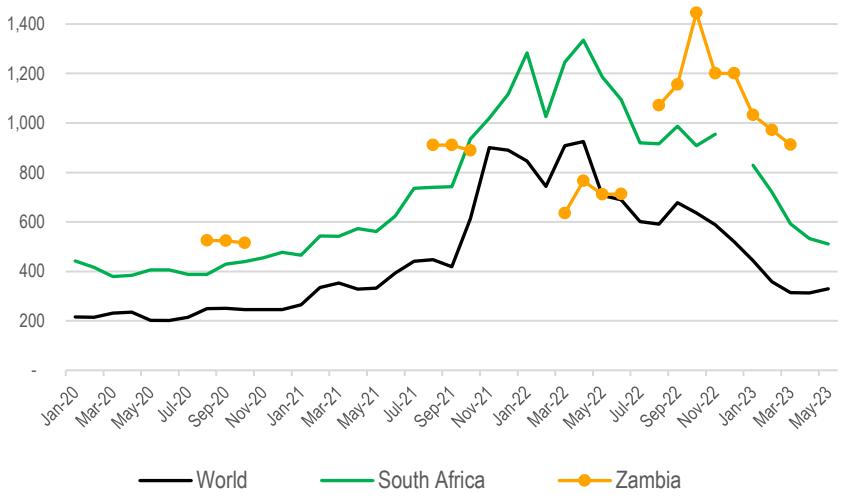
Figure 14: Zambia Import Prices - cif - (2017-2022)



Sources: Authors calculations, using data obtained from Trade Map

[10] Yara Zambia, Meridian/FSG, Nitrogen Chemicals of Zambia (NCZ) and UCF have blending plants.
[11] Imports have also been recorded as sourced from China and Switzerland, although this may reflect the registered location of the trader (as with Mauritius, where both Meridian and ETG have registered entities).
[12] £400mn was allocated for 2023 for FISP (IGC Ag PFP)

Figure 15: Zambia and South Africa average urea agro-dealer prices compared to international fob (2020-2023)



Sources: Authors calculations, using data obtained from World Bank and IFDC

The high prices of fertilizer inputs in Zambia significantly handicap farmers, rendering agriculture less profitable, especially for crops like maize that rely heavily on fertilizer application.

Fertilizer supply and pricing in Zambia are closely tied to import costs and logistics. We have estimated the transport costs from international sources for major suppliers. When considering freight charges, port fees, related expenses, and allowing for a 20% trader margin, the total costs amount to roughly $270 per ton. When added to the international prices of around $350 per ton, this calculation yields fair prices of approximately $620 for urea fertilizer in the first half of 2023 (Table 1).

Comparatively, actual bulk prices recorded in Zambia are approximately $900 per ton, approximately 45% higher than the estimated fair prices.

Table 1: Transport costs, and impact on pricing of urea, H1 2023

Costs	Supplier 1	Supplier 2	Supplier 3
Fob price, urea, H1 2023	350	350	350
Sea freight	40	40	35
Port charges	35	55	35
Bagging	20 [10]		20 [10]
Transport: Beira	100	150	75[#]
Transport: Dar	80[#]	90[#]	90[#]
Landed Zambia (via Beira *or* Dar)	515	535	505
Trader & agrodealer margin (20%)	103	107	101
Estimated Reasonable cost-plus price	618	642	606
Price (bulk) month	900	900	900
Excess mark-up	**46%**	**40%**	**49%**

Source: authors calculations from industry interviews.

Notes: Data in square bracket indicate estimate of actual rather than reported costs, [#] Grain Traders Association or transporter estimate

The fertilizer market internationally and in Zambia exhibits relatively high concentrations. In Zambia four major suppliers are playing prominent roles:

1. **ETG/Zambian Fertilizers**: Holding approximately a 40% market share[13].
2. **FSG/Meridian**: Owned by the Saudi Arabian company Ma'aden, also with a roughly 40% market share[14].
3. **Omnia**: A South African producer of ammonium nitrate and ammonium phosphate fertilizers.
4. **Yara**: One of the largest global fertilizer producers with operations across the African continent.

It is worth noting that there are close links between ETG and FSG due to ETG's joint venture with SABIC from 2022 and Meridian's acquisition by Ma'aden in 2019. SABIC and Ma'aden, both owned by the Saudi Arabian state, have common shareholdings in fertilizer operations in Saudi Arabia. Historically, there have been instances of collusion in fertilizer supply, both internationally and within South Africa and Zambia supply (Roberts 2019). A fifth supplier, United Capital Fertilizer (part of the Wonderful Group), recently entered the market. Established in 2021, United Capital Fertilizer completed Phase 1 in August 2022, enabling the supply of locally blended fertilizers using imported constituents[15]. While the construction of an ammonia and urea plant commenced in May 2023, production is still pending for the planned 300 thousand tonnes of fertilizer. Announcements regarding this investment indicated an intention to reduce fertilizer prices by 40-50%[16]. However, it is important to note that this production might not be sufficient to meet local demand, and the market-clearing price is likely to remain influenced by imports.

In the medium-term, Zambia has significant potential to produce green ammonia from renewable energy sources, which could be used in the production of environmentally friendly green fertilizers. This potential is explored further in Box 1.

[13] Industry interviews.
[14] FSG manager profile, and industry interviews.
[15] https://www.foodbusinessafrica.com/wonderful-group-of-companies-opens-us300m-united-capital-fertilizer-manufacturing-plant/
[16] https://zambianbusinesstimes.com/new-300m-fertilizer-plant-to-cut-prices-by-40/

Box 1

Potential for Green Ammonia and Fertilizer

Green ammonia, used in fertilizer production, ranks as the second most crucial driver for decarbonisation worldwide, following electric vehicles (Meldrum et al., 2023). Several small-scale green ammonia projects are already operational worldwide and the first large-scale facility is set to launch in 2023. Notably, ammonia production from fossil fuels is significantly more emissions-intensive than the production of crude steel or cement (Chung et al., 2023, citing IEA, 2021). Around 70% of ammonia goes into fertilizer production, a vital component for decarbonizing agriculture. Ammonia is also crucial in mining minerals needed for renewable energy, like copper and platinum group metals. Historically, global ammonia prices averaged $300/tonne between 2011 and 2020 before rising to $1000/tonne due to energy price increases (Meldrum et al., 2023). In contrast, as of early 2023, green ammonia cost approximately $700/tonne, with further declines projected to $500/tonne by 2025 in locations like Namibia and Brazil, assuming a green hydrogen price of $2.2/kg. Costs are expected to continue dropping to $400/tonne over the next decade. To incentivise the shift to green ammonia, a $100 carbon tax could raise the cost of grey ammonia (made from natural gas) from $300/ tonne to $500/ tonne, aligning it with the expected future green ammonia price by 2025. Considering fertilizer prices in Zambia and neighbouring regions, the financial case for green ammonia becomes compelling. Local fertilizer prices already surpass the threshold for investing in green ammonia. Moreover, Namibia's abundant solar and wind energy resources make it an ideal location for green hydrogen production with major investments underway, with the potential to lower fertilizer prices and enhance agricultural sustainability in Zambia.

Note: Draws from Andreoni et al 2023

4. Key Markets and Value Chains: Maize

4.1 Overview

Maize, the primary human staple in Zambia and much of the region, is also crucial for animal feed, fuelling its rising global demand. However, its cultivation, largely reliant on rainfall, is vulnerable to weather fluctuations and climate change. Additionally, maize farming demands significant fertiliser use. Zambia has the opportunity to become the grain basket for the region, with exports to meet growing regional and global demand. However, recent challenges, such as unrealised export opportunities amid East Africa's drought and diminished returns for farmers due to high fertiliser costs—despite subsidies—have set the sector back. Coupled with export hindrances, concerns over local maize availability have led to even stricter restrictions, further hampering export potential.

4.2 Opportunities in the context of climate change?

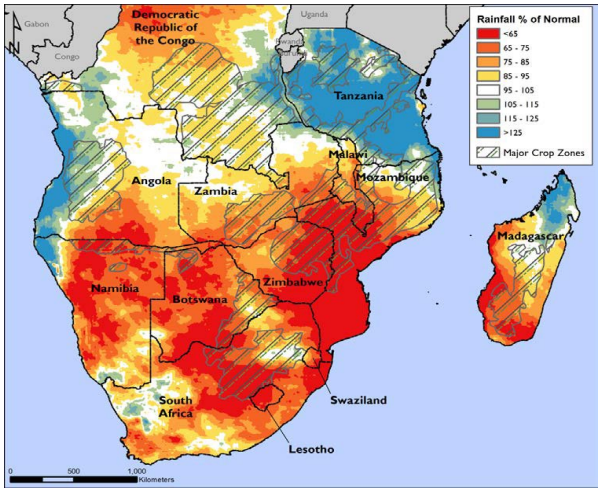
In the medium to long term, accelerating global warming poses grave risks for the SADC region (Shepard 2019; Engelbrecht and Monteiro 2021). Southern Africa is notably susceptible to climate change, exhibiting above-average temperature rises, reduced rainfall, and heightened occurrences of severe droughts in its southern areas (IPCC, 2021; Engelbrecht and Monteiro, 2021; see annex) [17]. In contrast, the central and northern parts of the region, including Zambia, enjoy more consistent rainfall and abundant water resources, making them prime areas for sustainable agricultural expansion. However, the potential for maize production in these areas remains underutilised, marked

[17] The agriculture and food systems are naturally among the most vulnerable to the effects of climate change (Ramasamy 2012; World Bank 2015; Von Braun 2020). Climate projections suggest that effects will include shifting growing conditions, increased climate and weather variability, and more uncertainty in predicting weather conditions, which will disrupt supply chains (IPCC 2021).

by modest yields and production levels. There's a pressing need to enhance productivity, ensure sustainable farming, and bolster resilience against droughts (Jayne et al., 2018; Goedde et al., 2019).

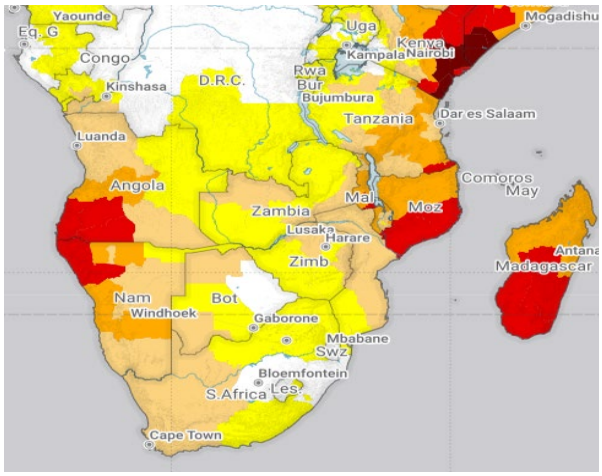
Recent climatic events provide insight into the increasing intensity we might anticipate in the imminent future. During the 2015/16 El Niño weather pattern, Southern Africa underwent a significant drought (see Figure 16). Predictions hint at comparable conditions concluding 2023[18]. Concurrently, regions like Mozambique, Malawi, and Zambia observed a marked uptick in rainfall[19]. The period from 2020 to early 2023 was dominated by the contrasting La Niña pattern, bringing drought to northern and eastern Kenya, while west Tanzania and Zambia experienced more favourable conditions (see Figure 17). The international soybean and maize markets felt the strain as prices surged. This was in part due to Brazil enduring its most severe drought in a century in 2021 and exacerbated by extreme weather events in the USA and Canada, including heatwaves, tornadoes, and wildfires.

Figure 16: Southern and East Africa rainfall conditions - El Niño weather 2015/16



Sources: FEWS NET/USGS CHIRPS. Note: The shaded areas indicate the main crops zones.

Figure 17: Southern and East Africa rainfall conditions - La Niña weather 2021/22



Source: Global Gro Drought Index November 2021, Gro Intelligence, the Gro Drought Index (GDI) provides measurements of droughts worldwide. The GDI measures drought severity on a scale from "0" (yellow) no drought, to "5" (red) or severe drought.

[18] The El Niño Southern Oscillation (ENSO) is one of the most important weather phenomena which is characterized by three states - “El Niño”, “La Niña” or “neutral”. El Niño is a warming of the central to eastern tropical Pacific Ocean, with drought in southern Africa whilst inducing heavy rainfall and floods in eastern Africa. 1982, 1997 and 2015 El Niño were identified as ‘super’, breaking new average temperature records and triggered catastrophic natural disasters including severe drought in Southern Africa (Rao & Ren, 2017). These are expected to be more frequent.

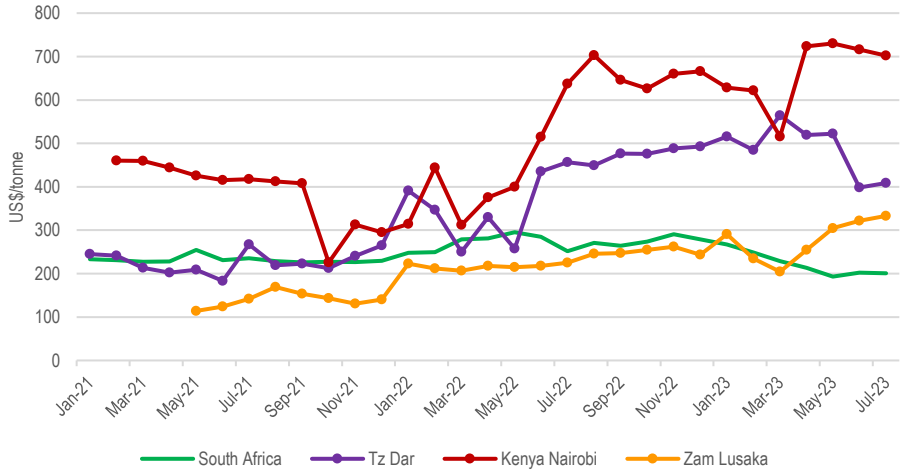
[19] There was localized flooding, as in other years, including the two consecutive Category 5 tropical cyclones Idai and Kenneth in April 2019 in Mozambique and Malawi

Zambia holds a strategic position to cater to the demand in both southern and East Africa, responding to increased demand stemming from weather shocks. For instance, in 2015/16, South Africa faced a maize deficit exceeding one million tonnes, prompting other Southern African nations to boost their imports. In 2021/22, Kenya was in pursuit of maize imports, even at elevated prices. Hence, enhancing intra-regional trade through expanded and more integrated markets, coupled with ramping up Zambia's production, is vital to counteract the challenges of climate change. This approach capitalises on regional variability, where some areas maintain favourable production conditions despite adverse weather in other parts. To fully harness the benefits of efficient agricultural markets, there's a need to empower smaller farmers with tools like irrigation and storage facilities[20], promote climate-resilient farming practices, and bolster export capabilities (AGRA, 2021).

4.3 Export Returns?

Maize prices in major cities like Nairobi, Kenya, and Dar es Salaam, Tanzania, present significant export opportunities for Zambia and an expansion of production with favourable returns. Notably, maize prices in Zambia have been exceptionally low (see Figure 18). In 2021 and 2022, they were considerably lower than South African prices, benchmarked at export parity with world markets (roughly $50-80/t below global prices). **This places Zambia among the countries with the lowest maize prices in the world. Considering the exceptionally high fertilizer prices, this also implies that returns for maize farming in Zambia are among the lowest globally.** In contrast, prices in Nairobi averaged between $400-500/t, reaching as high as $700/t in August 2022. Similarly, prices in Dar es Salaam in 2022 ranged between $400-500/t. The distances between the primary growing areas and major cities like Nairobi and Dar es Salaam are comparable to those in the USA or Brazil, with the key difference being that Zambian produce must cross two international borders to reach these markets.

Figure 18: Maize prices in selected markets (2021-2023)



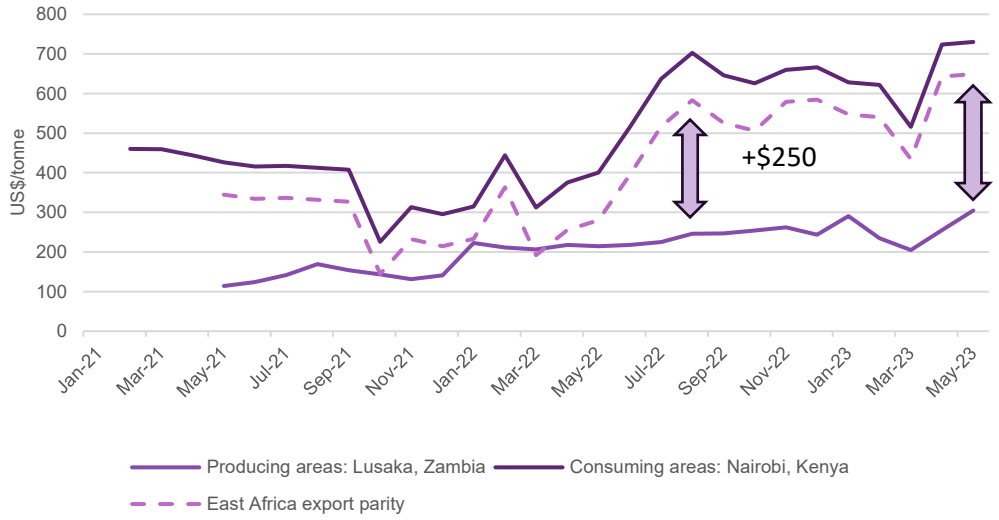
Source: African Market Observatory

Export returns are influenced by transport and related costs, and while it's often suggested that high transport costs, inefficient borders, and non-tariff barriers hinder intra-African trade, in this case, transport costs don't seem to be the primary explanation. Extensive information on road freight costs, including border costs, has been collected, and it turns out that these costs are not significantly higher in Zambia than in many other regions. They typically range from $0.04/t/km to $0.06/t/km (accounting for fuel costs) and can even be lower when not considering independent freight company margins

[20] See Newell et al. 2019; Ramachandran Nair et al. 2019; World Bank 2021

(Nsomba et al. 2022). Considering transport costs around $80-$140/t, the net prices achievable through maize exports to Kenya are illustrated in Figure 19[21]. **This analysis suggests that substantial profit margins, exceeding $150/t at times, could be realized by those able to export maize to Kenya from mid-2022 onward**.

Figure 19: Maize prices in Zambia and Kenya, and export parity (less transport) prices to Kenya



Source: African Market Observatory

However, many regulatory measures govern maize, both to producers and consumers. This has meant prices are influenced by the purchases of the FRA, export restrictions from time to time, and export permit requirements, which we discuss below.

Concerning food price sensitivities, it is important to consider the other drivers of maize meal prices, which depend on millers and retailers. Comparisons in Nsomba et al (2022) indicate that Zambian maize meal prices were only around 20% lower than Kenyan prices for roller meal (while for a breakfast meal, prices were higher and in line with Kenya) even though maize prices were less than half those in Kenya.

4.4 Government Intervention

Over the years, Zambia has intermittently imposed export bans on maize and maize-meal, with notable instances such as the 2018 ban following a significant drop in annual output from 3 million to 2.4 million tonnes[22]. A series of export bans between 2008 and 2016 were implemented due to poor harvests due to poor rainfall and armyworms, even though many of these years saw substantial surpluses that could have been exported. This resulted in estimated foregone export earnings of approximately US$1.4 billion, as Chisanga et al. (2018) indicated. Additionally, Zambia has maintained a 10% export tax on maize, which supress local prices[23]. More recently, a system of export permits implemented in 2022/23 has further constrained exports, negatively affecting farmers' incomes.

[21] If Lusaka to Nairobi is used, then we have a distance of 2400km, although Kasama to Nairobi is 1600km. Lusaka to Dar es Salaam is 1950km.
[22] http://www.renapri.org/zambia-lifts-costly-maize-export-ban/
[23] Kenya has also imposed import restrictions from time to time such as in November 2020, for example, Kenya imposed an import ban on maize imports from its east African trading partners on the basis of aflatoxin levels being higher than safety levels. Aflatoxin is a poisonous compound produced by moulds that grow on cereals and nuts in warm and humid conditions, either before or after harvest.

Research indicates that trade restrictions, especially on maize, have not effectively stabilized prices in the long run, and often intensified price fluctuations (Pierre and Kaminski, 2019; Mabiso and Pradesha, 2013; Gondwe and Baulch, 2017; Porteous, 2017; Edelman and Baulch, 2016; Paul and Edelman, 2015; Baulch and Ochieng, 2020). Price shocks in one domestic market can furthermore create prolonged price disparities between neighbouring markets (Pierre and Kaminski, 2019). Restrictions appear to have exacerbated spikes in neighbouring countries facing production shocks. A case in point is Malawi in 2019, when cyclones struck, and both Zambia and Tanzania responded by blocking exports.

Trade restrictions have also prompted extensive grain trade through informal channels across ESA to circumvent such restrictions (Burke and Myers, 2014; Pierre and Kaminski, 2019). These informal traders often deal in modest quantities (typically 50–100 kg) without official licenses or transaction records (Burke and Myers, 2014). Yet, the cumulative volume of these numerous small-scale transactions can be significant. Studies have shown that informal trade routes in the region are competitively priced with quick price adjustments (Burke and Myers, 2014; Bouet et al., 2018). Conversely, heavy government interventions in formal cross-border trade have disrupted price transmission, contributing to long-term price volatility (Burke and Myers, 2014; Edelman and Baulch, 2016; Pierre and Kaminski, 2019).

While empirical evidence highlights the ineffectiveness of ad hoc trade restrictions, it is equally evident that free agricultural markets have faced their own challenges. Market concentration and significant market power in agricultural and related markets (such as transportation), have hindered the effective functioning of markets within the ESA region.

5. Key Markets and Value Chains: Soybean, animal feed and poultry

5.1 Overview

We examine the influence of soybean on the evolution of downstream industries aiming for value-added exports and import substitution. Rising soybean production, together with maize, when paired with increased trade, can cater to the regional demand for animal feed and vegetable oil. Notably, countries like Kenya, Tanzania, Rwanda, and Zimbabwe have a significant dependency on these imports. Concurrently, Zambia can enhance its value-added exports and reduce its dependency on imports, particularly in products such as poultry, fish, and vegetable oil.

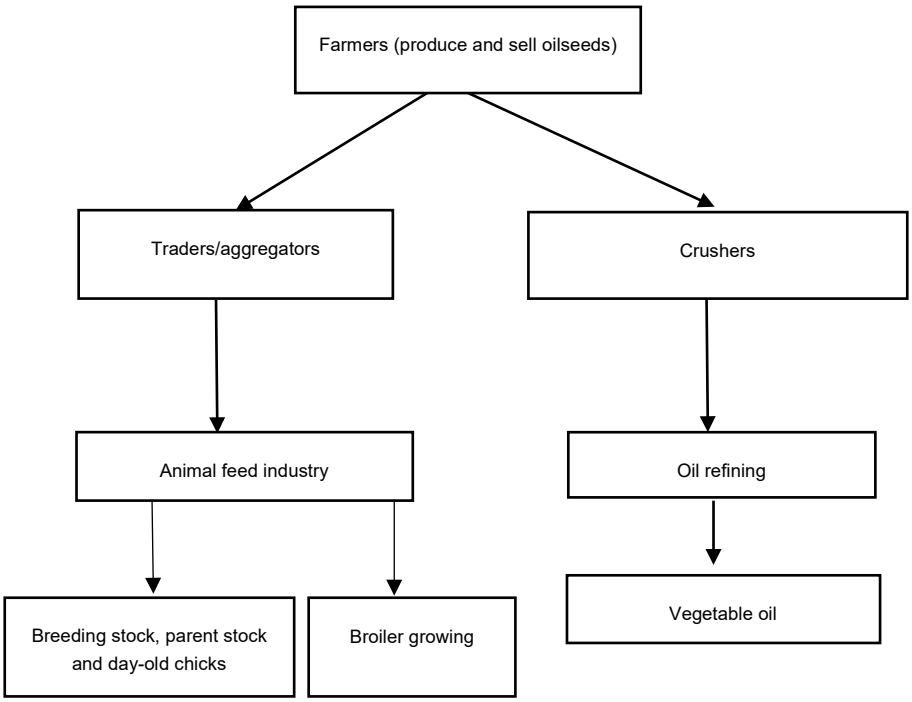
To navigate this potential effectively, it's imperative to incentivise farmers to increase production. This includes support in areas such as irrigation, water management, efficient transport, storage services, and guaranteeing equitable prices for their produce. Additionally, the credibility of Zambia as a trading partner in the region is vital to ensure consistent markets for its farmers. It's equally essential to ensure that increased production and trade initiatives do not inadvertently stifle local downstream industries. These industries must also benefit from competitive market prices, stimulating investments and facilitating the participation of small to medium-scale competitors.

Presently, prevailing conditions suggest farmers receive low prices, while the region grapples with inflated import costs for maize and soybean oilcake, exacerbated by trade restrictions. These dynamics have a pronounced effect on feed and poultry producers in the region (Nsomba et al., 2022a; Nsomba et al., 2022b). Emerging data highlights potential cartel dynamics in soybean trading and processing, restricting active participation in poultry production and leading to inflated consumer prices (Nsomba et al., 2022b, Nsomba and Roberts, 2023). In the subsequent sections, we delve deeper into these issues and explore the nuances of competition and trade policies.

5.2 The poultry value chain

Soybeans play a pivotal role within two interconnected value chains: the production of oilcake, a critical component in poultry feed, and the production of crude soybean oil, used as an input in vegetable oil production (Figure 20). The links into the two value chains mean that constraints to absorb increased seed production in one industry can in part affect the development of the other. For instance, if the feed industry cannot absorb increased oilcake production or constraints to exports, growth in the oilseed to vegetable oil value chain can become constrained. In section 6, we focus on the vegetable oil value chain.

Figure 20: Soybean to poultry and vegetable oil value chains



Source: compiled by authors

In Zambia, soybean cultivation primarily involves small to medium-scale farmers, typically managing land plots of up to 20 hectares[24]. The recent surge in production, as depicted in Figure 3, is largely attributed to market dynamics. Favourable pricing for soybeans, coupled with the escalating cost of fertilizers, has prompted farmers to pivot from maize to soybean cultivation in recent times[25]. This transition is motivated by the comparatively lower fertilizer requirements of soybean relative to maize.

The soybean seed crushing industry in Zambia, which also encompasses soybean and oilcake trade across the region, has experienced significant growth in crushing capacity over the past decade[26]. Between 2013 and 2023, Zambia's installed crushing capacity has expanded from 400,000 metric tonnes per annum to 1,000,000 metric tonnes[27]. However, this substantial growth in capacity has occurred within a highly concentrated market, with only a few companies making the necessary investments to scale up their capabilities. In fact, two companies jointly represent a crushing capacity

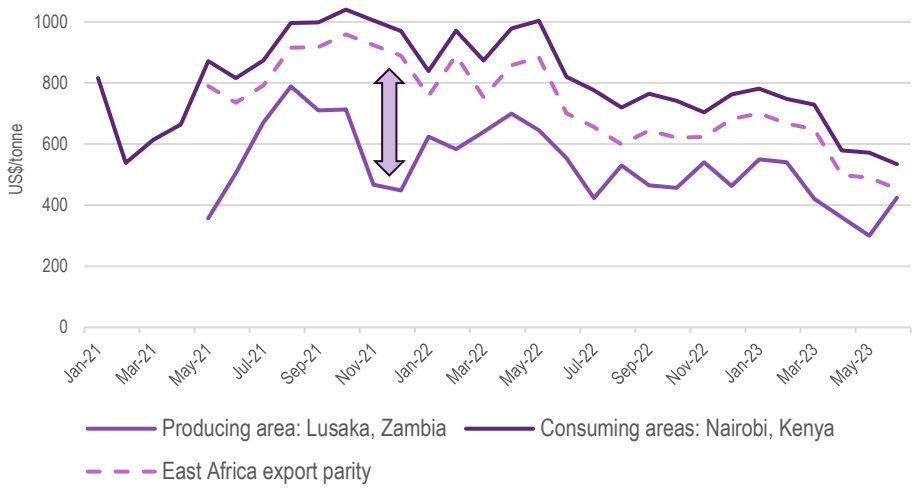
[24] Interview with Smallholder Farmers Association of Zambia, 12 June 2023.
[25] Interview with Smallholder Farmers Association of Zambia, 12 June 2023; interview with the World Bank, 7 June 2023.
[26] Interview with Smallholder Farmers Association of Zambia, 12 June 2023.
[27] Interview with Crushers and Edible Oil Refiners Association, 23 March 2023.

of 600,000 metric tonnes per annum[28]. Consequently, the trade in oilcake across the region also involves only a limited number of firms.

The feed segment of this value chain is of paramount importance, constituting approximately 70% of the cost of poultry production. It plays a pivotal role in driving both poultry production and the costs associated with day-old chicks, influencing production costs at two levels. The competitive production of maize and soybeans, which serve as key inputs for feed production, is essential for sustaining a competitive and viable poultry industry. For instance, the prosperity of Brazil's poultry industry is deeply tied to its access to affordable maize and soybeans, a crucial factor in the success of its producers. This advantage has been complemented by policy measures to foster growth and improve access to essential inputs (Bosiu and Goga, 2019; Scott and Vigo, 2022).

The growing regional demand for poultry feed inputs, coupled with global supply, climate, and economic challenges, underscores the immense opportunities for Zambia to serve as a key production source for regional markets while still meeting local feed and vegetable oil demands. The surge in demand in East Africa, along with drought conditions in the northern part of the region, is expected to exert upward pressure on regional soybean prices. To assess the implications for prices, we incorporate reasonable transport and related costs into the prices observed in Zambia to derive an import parity price upon arrival in consumption hubs like Nairobi, Kampala, or Dar es Salaam. We use benchmark wholesale prices from Lusaka, where soybeans are aggregated and stored for potential export. Remarkably, we observe substantial profit margins between Zambia and these hubs, even after accounting for transport and related costs (Figure 21) [29]. There is an average excess margin of approximately $300 per metric ton (equivalent to roughly 40% of the selling price). During specific periods, such as between November and December 2021, estimated excess margins exceeded $400 per metric ton.

Figure 21: Soybean prices in Zambia and Kenya, and export parity (less transport) prices to Kenya)



Source: African Market Observatory

[28] Interview with Crushers and Edible Oil Refiners Association, 23 March 2023.

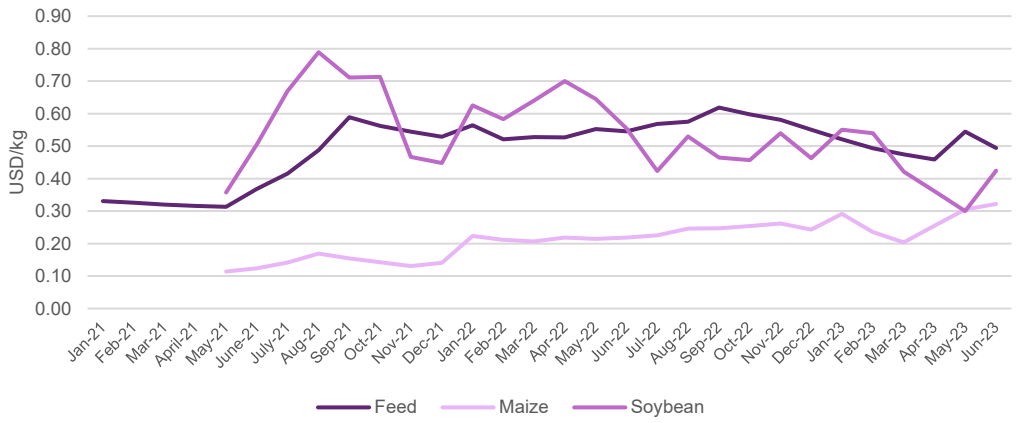
[29] In assessing margins, we take into account reasonably transport costs (estimated at US$0.04 per tonne per km (Nsomba et al., 2022a), increased to $0.06 from March 2022 to reflect the effects of higher fuel costs, noting that the major traders are integrated across the region with in-house trucking services.

The difference in soybean prices across different regions and over time cannot be solely attributed to transport, storage, and transaction costs. Despite the region's favourable conditions for soybean production, animal feed customers faced the challenge of high prices, which eroded their competitive edge. In 2022, the Kenyan animal feed industry grappled with a crisis, resulting in the closure of 20% of feed producers due to the exorbitant costs associated with maize and soybean (as outlined in Nsomba et al., 2022b). These elevated feed prices were subsequently passed on to consumers through high poultry prices. However, larger poultry and feed producers, who maintain strong connections with traders in the region could circumvent these elevated input costs.

5.3 Zambia's Feed Industry

We analysed broiler finisher feed prices in Zambia, considering the prices of local maize and soybeans, which are the primary inputs. In 2021, there were notable price fluctuations, with soybean prices experiencing substantial increases while maize prices remained low, even when compared to global market prices. Soybean prices in Lusaka surged from $350 per ton around the harvest season in May 2021 (with even lower prices reported in producing areas) to a peak of $780 per ton just three months later in August 2021, despite significant exports taking place during this period. Prices began to decline in September following the implementation of an export ban, only to rise again towards the end of the year after a partial relaxation of the ban in October.

Figure 22: Prices of broiler finisher feed in Zambia, against maize and soybean prices



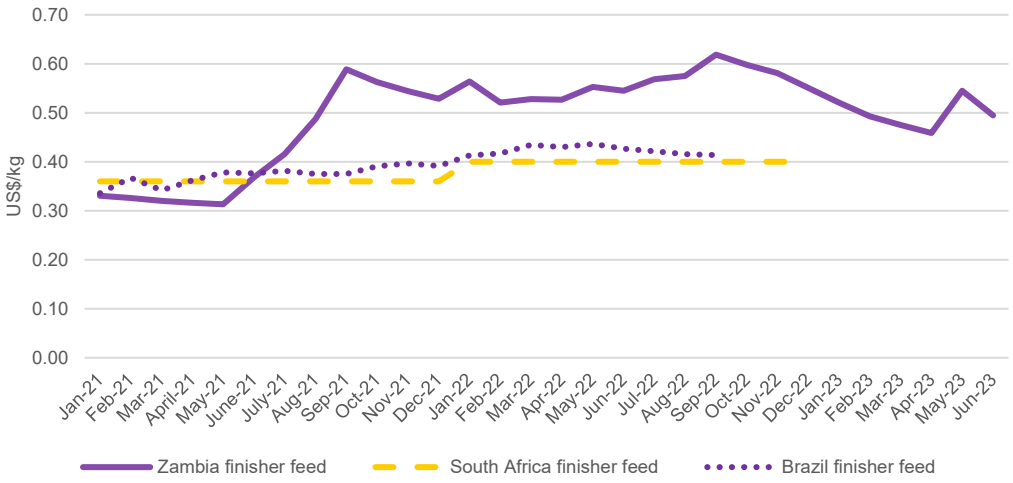
Source: African Market observatory data, Poultry Association of Zambia

The prices of feed in Zambia closely mirrored the fluctuations in soybean prices during the same period (as depicted in Figure 22). However, it is essential to note that large feed producers, many of which are vertically integrated into poultry production, typically source soybeans during the harvest season in April/May. They benefit from substantial storage facilities and likely have long-term supply agreements with crushers, enabling them to avoid exposure to the higher spot prices in the market. Interestingly, despite a subsequent drop in soybean prices following the 2022 harvest, feed prices did not decrease proportionately. This suggests a need to investigate the pricing dynamics of maize and soybean in the context of their ratios in feed production, warranting further research in this area.

Furthermore, we compared Zambian feed prices with countries with more established poultry value chains, such as Brazil and South Africa (as illustrated in Figure 23). In the first quarter of 2021, Zambia's feed prices were lower than those in Brazil and South Africa by over 10%. However, prices in Zambia later experienced a substantial increase, surpassing those in Brazil and South Africa by more than 20 US cents per kg. Despite a significant drop in prices by April 2023, Zambian feed prices have not yet returned to a competitive level when compared to these countries. This price differential

presents a notable challenge to Zambian poultry producers, particularly smaller and independent producers that lack vertical integration. For a more detailed analysis, refer to Nsomba et al. (2022).

Figure 23: Prices broiler finisher feed in Zambia, South Africa and Brazil



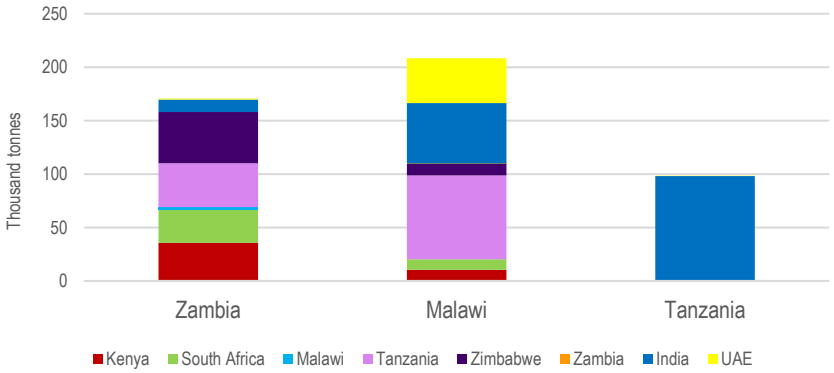
Source: Poultry Association of Zambia, South African Poultry Association, CEPEA Brazil

5.4 Coordination in cross-border markets for soybean oilcake exports?

Both Zambia and Malawi have significantly increased their exports of soybeans and oilcake within the region, starting from a relatively low base. In 2021, combined exports from these two countries reached just under 500,000 tonnes. Considering local demand in the range of 200-300 thousand tonnes, this implies that approximately half of the production is exported. As of 2022, South Africa has also achieved a status of a net soybean exporter (although this is GM produce which cannot be imported into Zambia).

There has been a notable increase in intra-regional trade. Furthermore, international markets, particularly India, played a substantial role in driving exports from Malawi and Tanzania in 2021 (as shown in Figure 24). It is worth noting that there might be some double counting if Malawi's exports to Tanzania were subsequently re-exported to India. The trade data indicates that a combination of global and regional market dynamics have driven markets within the ESA region.

Figure 24: Zambia, Malawi & Tanzania main export destinations, soybean and oilcake, 2021



Source: Trademap, Ministry of Trade in Malawi

International prices of soybeans, approximated by USA export prices, did experience an increase in 2020 and 2021. They rose from around $350 per tonne for much of 2020 to over $600 per tonne in 2021. During this period, prices in Zambia and Malawi increased but reached significantly higher levels. In Zambia, prices reached $800 per tonne in August 2021, while in Malawi, they exceeded $1300 at the end of the year. Interviews conducted with industry stakeholders suggest that strong demand from higher-priced international markets significantly drove up regional prices.

However, it is noteworthy that regional prices in the ESA region remained well above world prices, even when accounting for transport and related costs. In competitive markets for homogeneous commodities, prices typically fluctuate within a range determined by factors like alternative supply sources for countries facing deficits or alternative export market opportunities for countries with surpluses. In such markets, where firms act as price-takers, prices are influenced by elastic supply and demand dynamics and tend to align with international prices.

The observed pricing in the ESA region does not conform to this pattern. Instead, it suggests the presence of price-setting entities, which can occur through monopolistic power or collusion. In these scenarios, firms can set prices based on what customers are willing to pay, influenced by factors such as the availability of alternative sources of imports and the potential for buyers to switch to alternatives.

The soybean processing industry in the ESA region is primarily concentrated in Malawi and Zambia, with several major companies operating across both countries. Notable global and regional commodity traders, such as Mount Meru, ETG, and Global Industries (Wilmar), have integrated themselves into soybean crushing for vegetable oil production, storage, and logistics. However, Kenya and Tanzania lack large-scale soybean processing plants. Instead, animal feed companies in these countries source soymeal, oilcake, and maize from other countries in the region. Companies like ETG and Mount Meru also export oilcake across the region, leveraging their sourcing, supply, and logistics coordination capabilities with sister companies in Zambia and Malawi.

Table 1: Main soybean processors and traders, annual crushing capacities (metric tonnes)

Malawi	Zambia
ETG: 100 000	Parrogate/ETG: 300 000
Mount Meru: 150 000	Mount Meru: 150 000
Sunseed Oil/CP: 180 000	Global/Wilmar: 300 000
CORI: 70 000	Alliance: 100 000

Source: Compiled by authors drawing on interviews

In a competitive market, rival firms would typically offer to supply goods to higher-priced markets, thus bringing prices down to a level consistent with the export parity price. However, the situation observed in 2021 does not align with this competitive pricing model. Even as international soybean prices increased from around $350 per tonne in 2020 to over $600 at times in 2021, prices to buyers in Kenya and Tanzania surged above $1000. Exports from Malawi and Zambia, on the other hand, were carried

out at average prices of $550 per tonne and $600 per tonne, with monthly fluctuations ranging from lows of $450 to highs of $700.

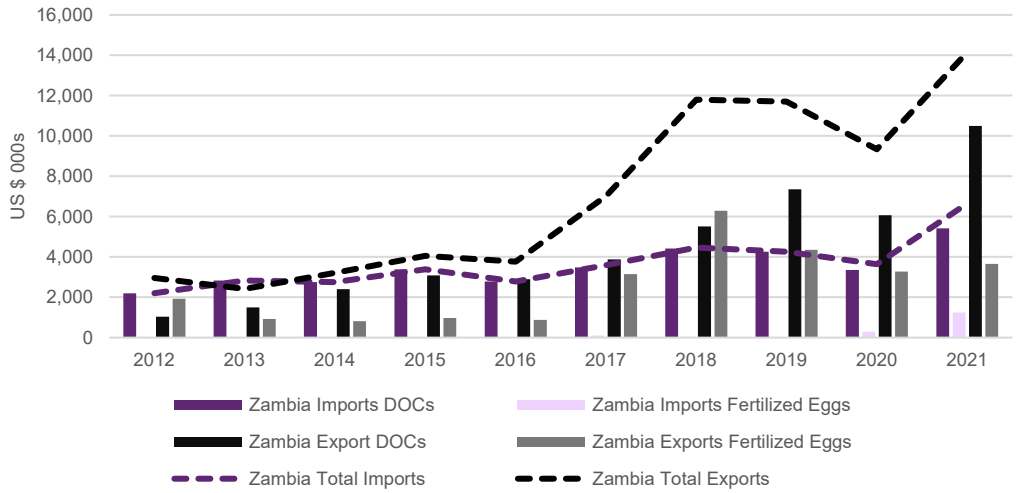
These prices, while reflecting a regional supply surplus and falling below world prices, were still significantly lower than the prices charged to domestic buyers within Malawi and Zambia. Customers in the region were paying prices as if there were severe shortages, with prices at or above import prices. Notably, substantial regional exports took place, primarily among related companies. As a result, third-party customers faced prices marked up by approximately 30%.

Given the oligopolistic nature of the export market, sustaining supra-competitive prices requires control over supply, careful monitoring of sales volumes to share the 'pain' of the volumes into lower-priced export markets, along with the collusive gains from the margins on volumes sold to customers in the high-priced local markets in the region.

5.4 Supply of Day-old Chicks

Breeding stock plays a pivotal role in influencing poultry production costs. Throughout the eastern and southern region, producers of breeding stock operate under licenses from global breeding conglomerates, as detailed by Goga and Roberts (2023). Their research offers an extensive mapping of global concentration, positioning Zambia as a central hub. Excluding South Africa, Zambia is the primary supplier of day-old chicks to both eastern and southern Africa. Ross Breeders Zambia (RBZ) and Hybrid Poultry entities hold the grandparent breeding licenses within this region. Since 2016, Zambia has witnessed a marked escalation in the production and export of day-old chicks and fertilised eggs, as illustrated in Figure 25. This underscores Zambia's strategic designation as a poultry breeding hub.

Figure 25: Trade in day-old chicks and fertilized eggs in Zambia

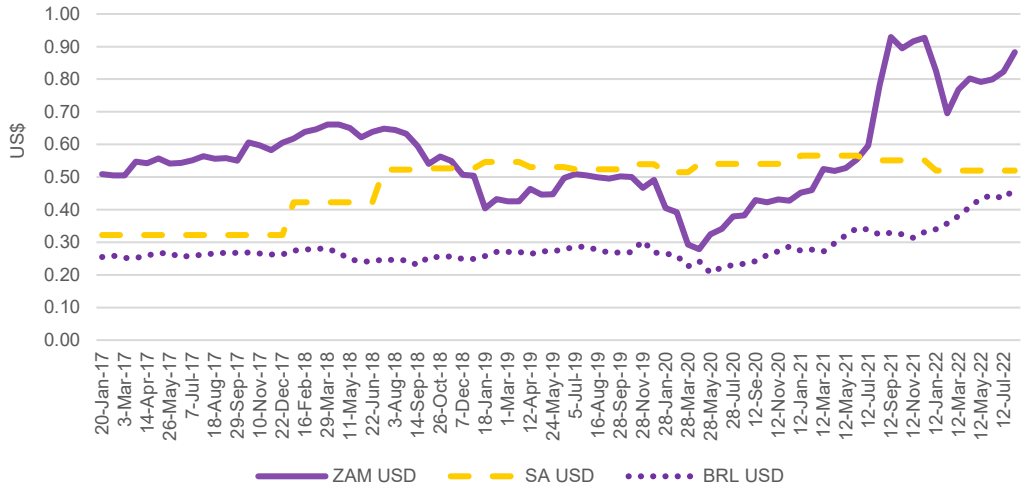


Source: Goga and Roberts (2023)

To analyse day-old chick prices in Zambia, we compare them with prices in Brazil and South Africa, as illustrated in Figure 26. In 2020 and 2021, there were sharp fluctuations in the exchange rate of the Zambian Kwacha against the US Dollar. These fluctuations partly contributed to the dramatic shifts in day-old chick prices when measured in US dollars. Notably, a major depreciation of the Kwacha in February 2020 resulted in a substantial drop in dollar prices. Conversely, between June and September 2021, there was approximately a 30% increase in prices when measured in the local

currency. Due to the Kwacha's appreciation during this period, this increase translated to a nearly 67% rise in US dollar terms (Goga and Roberts, 2023). These exchange rate dynamics have had a noteworthy impact on the pricing of day-old chicks in Zambia, causing fluctuations that can significantly affect the local poultry industry and its competitiveness relative to other countries like Brazil and South Africa.

Figure 26: Day-old chick prices in Zambia, Brazil and South Africa



Source: i) Zambian DOC price data was obtained from Poultry Association of Zambia website; ii) Brazil DOC price data was obtained from Conab via Brazilian researchers; iii) data for South Africa from 2018 onwards was obtained from SAPA reports that collects data from smallholder farmers; iv) data for South Africa for 2017 was obtained from Van Horne (2017).
Notes: We have averaged prices for Parana, Santa Catarina and Rio Grande Do Sul for Brazil. All prices have been converted from local prices to US$.

In 2021 and 2022, Zambian prices were over 50% higher than those in South Africa. A possible reason for the difference is that costs may be higher in Zambia than in South Africa. There have also been possible explanations such as shocks in supply as a result of COVID. However, neither of these explanations appear consistent with Zambia being selected as a poultry breeding hub with grandparent breeding licences and substantial and growing exports to the region (see figure 25).

When compared to Brazil, Zambian prices were double those in Brazil for much of 2017 to 2022. Brazil sources the same breeding stock under licence (Van Horne, 2017; Goga and Roberts, 2023). Brazil has ensured policies which support production, investments and effective markets through the supply, including through market information, such that we are able to assess prices, margins and competitiveness. The same information is not available in Zambia or most other African countries.

6. Key Markets and Value Chains: Soybean and Vegetable Oil

6.1 Overview

While several oilseeds, including sunflower, cotton, and groundnuts, contribute to vegetable oil production, in the case of Zambia, soybeans are the main input for local vegetable oil production for household and industrial use. Recent reports highlighting the upward trajectory of retail vegetable oil prices have ignited a renewed interest in dissecting the components that determine the cost structure of refined vegetable oil[31].

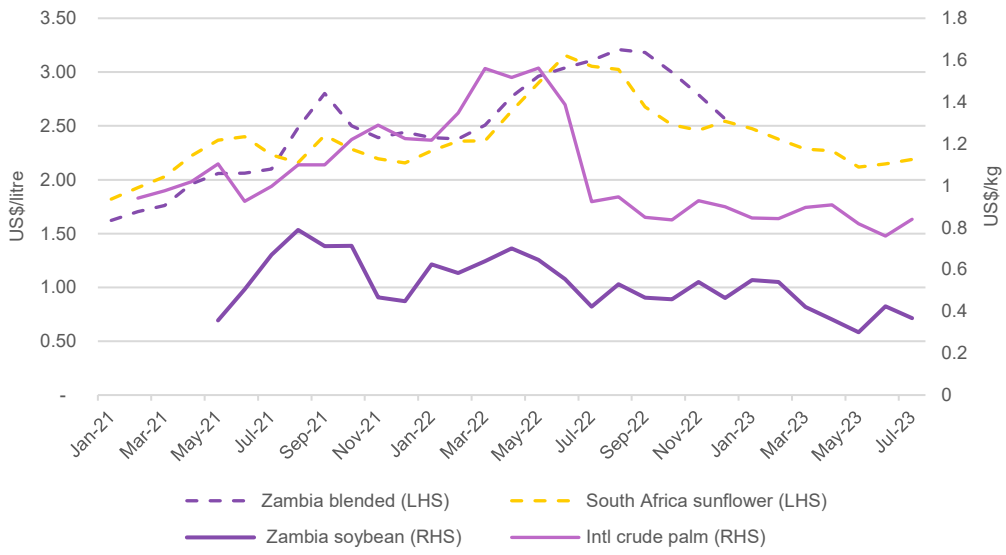
This presents a dual opportunity for Zambian producers. On the one hand, there is an opportunity for Zambian producers to replace imports given the rising production of inputs, increases in processing capacity, and rising demand. For the 2022/2023 harvest season, Zambia anticipates producing 700,000 tons of soybean, with an installed crushing capacity of 1,000,000 tons, and an estimated annual vegetable oil consumption nearing 270,000 tons[32]. The question remains as to why Zambia's reliance on imports of vegetable oil has increased.

6.2 Prices, Production and Trade

We compare vegetable oil prices in Zambia with those in South Africa. Retail prices for vegetable oil in Zambia experienced a notable surge, climbing from US$1.70 per litre to US$3.18 by September 2022, as illustrated in Figure 27. This price escalation occurred in the backdrop of soybean prices increasing in mid-2021 and a subsequent rise in mid-2022, while crude palm oil prices increased by 50% by June 2022. Interestingly, despite a dip in soybean prices in July 2022 as well a sharp crude oil price decline in the same month, Zambian vegetable oil prices did not exhibit a similar trajectory.

South Africa's vegetable oil pricing has followed the same pattern. Prices in South Africa increased from US$1.93 per litre in January 2021 to US$3.05 per litre in July 2022. The South African market experienced a subsequent decline, with prices dropping to US$2.19 per litre by December 2022.

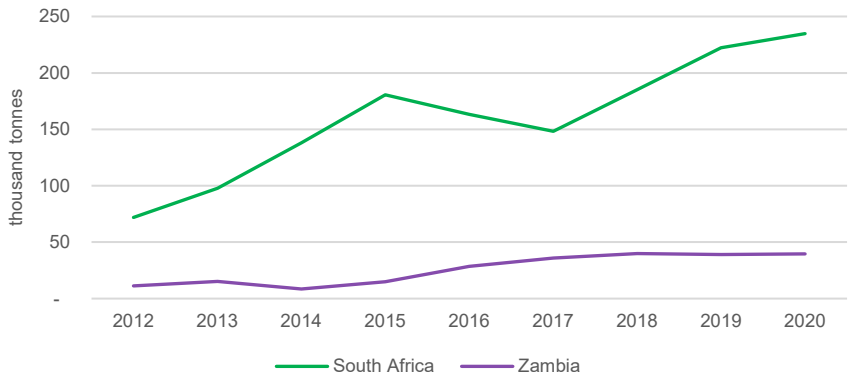
Figure 27: Zambia soybean oil prices per litre against soybean prices per kg



Source: African Market Observatory data, Zambia Statistics Agency. Note: Vegetable oil prices exclude VAT of 16% in Zambia and 15% in South Africa

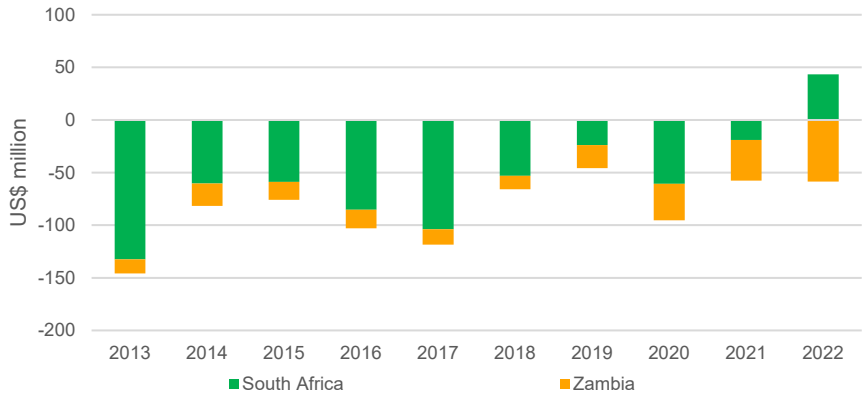
Zambia's soybean oil production has grown but it remains a net importer (see Figures 28 and 29). This surge has led to greater utilization of crushing capacity for animal feed, resulting in increased production of crude soybean oil. By comparison, South Africa has seen a more substantial rise, albeit starting from a higher base. This increase in crude oil production has positively affected South Africa's position in refined vegetable oil trade and value-added product trade.

Figure 28: Production of soybean oil in South Africa and Zambia



Source: FAOStat

Figure 29: Net Export of soybean oil in South Africa and Zambia



Source: Trade Map

Zambia's reliance on imported refined soybean oil has been on the rise, reaching $58 million in imports in 2022, up from $35 million in 2020 and $39 million in 2021. Despite Zambia's exports of soybeans and oilcake to countries like Zimbabwe and South Africa, it primarily sources soybean oil from South Africa, Equatorial Guinea, Argentina, and Zimbabwe.

While data shows a notable increase in refined soybean oil production in Zambia between 2015 and 2018, from 15,000 tonnes to 40,000 tonnes, the recent surge in soybean production from 2021 to 2023 hasn't translated into increased vegetable oil production. In contrast, South Africa has substantially increased its production of refined soybean oil, growing by nearly 40% between 2017 and 2020.

7. Conclusion and Policy Recommendation

Zambia possesses remarkable agricultural and agro-processing potential, ranking among the world's foremost, an asset particularly at a time when global and regional agriculture grapples with the severe implications of climate change—realizing Zambia's full production and value-creation potential hinges largely on a substantial expansion of exports. However, the functioning of regional export markets could be better, and government policies have often exacerbated rather than rectified these issues.

The discrepancies between prices in international markets and those in Zambia are significantly larger than reasonable transport costs, amplifying Zambia's inherent challenge of being landlocked. These disparities can be attributed to concentrated markets, anti-competitive outcomes, and policies that hinder rather than facilitate international trade. These factors further compound the issues stemming from inadequate logistics and transport infrastructure investments. The adverse repercussions are substantial:

1. Prices for key imported inputs, such as fertilizer, in Zambia, have been inflated by 40-50%, exacerbating the drain on subsidies for the Farmer Input Support Program (FISP) and eroding the competitiveness of non-subsidized agriculture.
2. Farmers in Zambia receive prices for crops like soybeans that are approximately 40% lower than they could obtain in more attractive export markets.

Given these market dynamics, it is no surprise that Zambia's vast potential remains largely untapped, with a significant portion of its high-quality land being utilized or left idle. The rationale behind export permits and restrictions, aimed at ensuring low food prices in Zambia, inadvertently reduces returns to farmers. While buyers of crops benefit, this does not necessarily translate into lower food prices for consumers. Instead, Zambia remains a net importer of key staples such as vegetable oil, poultry, and fish, with prices reflecting the costs of importing rather than leveraging its substantial agricultural potential.

Despite low prices offered to Zambian farmers for agricultural crops, conditions for local agro-processing and value addition in growing local value chains remain suboptimal due to market failures:

1. Low prices for primary animal feed components have failed to translate into competitive poultry production, with Zambia's animal feed prices exceeding those in South Africa by over 25%.
2. Despite being an export hub for poultry breeding stock, Zambia experienced a surge in day-old chick prices to local poultry producers, surpassing South African prices by 40-50%.
3. Zambia continues to rely on poultry and fish imports.

Market failures and distortions persist due to high levels of concentration in inputs, processing, and trading. Strengthening competition law enforcement is imperative to address these issues, particularly as Zambia, a member of COMESA, stands to benefit from cross-border competition law enforcement crucial for exports. However, tackling concentration and substantial profit margins poses additional political economy challenges, as companies benefiting from these margins will exert extensive lobbying efforts to protect their positions. A crucial test for Zambian policies and institutions lies in their ability to withstand this inevitable pressure.

The experience of countries like Brazil underscores the necessity of an integrated policy package that supports research and development, extension services, development finance, infrastructure, logistics, and market information across value chains. Unlike Zambia, where this information is limited

to large companies, Brazilian farmers and agro-processors can track prices throughout the value chain, from the farm gate to the processed product.

The impact of poor markets is partially mitigated through the FISP, primarily focused on fertilizer subsidies, rather than supporting investments in more productive and sustainable agriculture. Government policies aimed at managing exports through permit issuance have resulted in extensive delays, preventing exporters from fulfilling commitments to customers, except for the largest traders with the necessary access to expedite the process.

To address these challenges, we propose a comprehensive package of measures to support Zambia's agricultural production and value creation potential:

1. **Rigorous monitoring of markets**: This includes the tracking of prices across various supply chain levels, to ensure that competitive conditions translate through the markets, translating into attractive returns, increased investments, and accelerated growth, particularly in value-added products.
2. **The formulation of appropriate trade policies**: These need to actively support, rather than hinder, exports while instilling confidence in Zambian supply among international customers. This includes strategies to reduce the costs associated with export compliance, meeting international standards and certifications, and transportation.
3. **Strengthening competition enforcement**: This includes regional collaborations, to safeguard against the abuse of market power by companies operating in oligopolistic industries. Membership in COMESA affords Zambia the opportunity to benefit from more robust competition law enforcement in cross-border markets critical for exports.
4. **Targeted support for farmers**: This support should be aimed at enhancing water management, irrigation practices, storage capabilities, and yields. These measures are pivotal for ensuring the resilience, sustainability, and diversification of agricultural production.
5. Linked support for producers and exporters through **research and development, development finance, and assistance in meeting standards and certification** along value chains.

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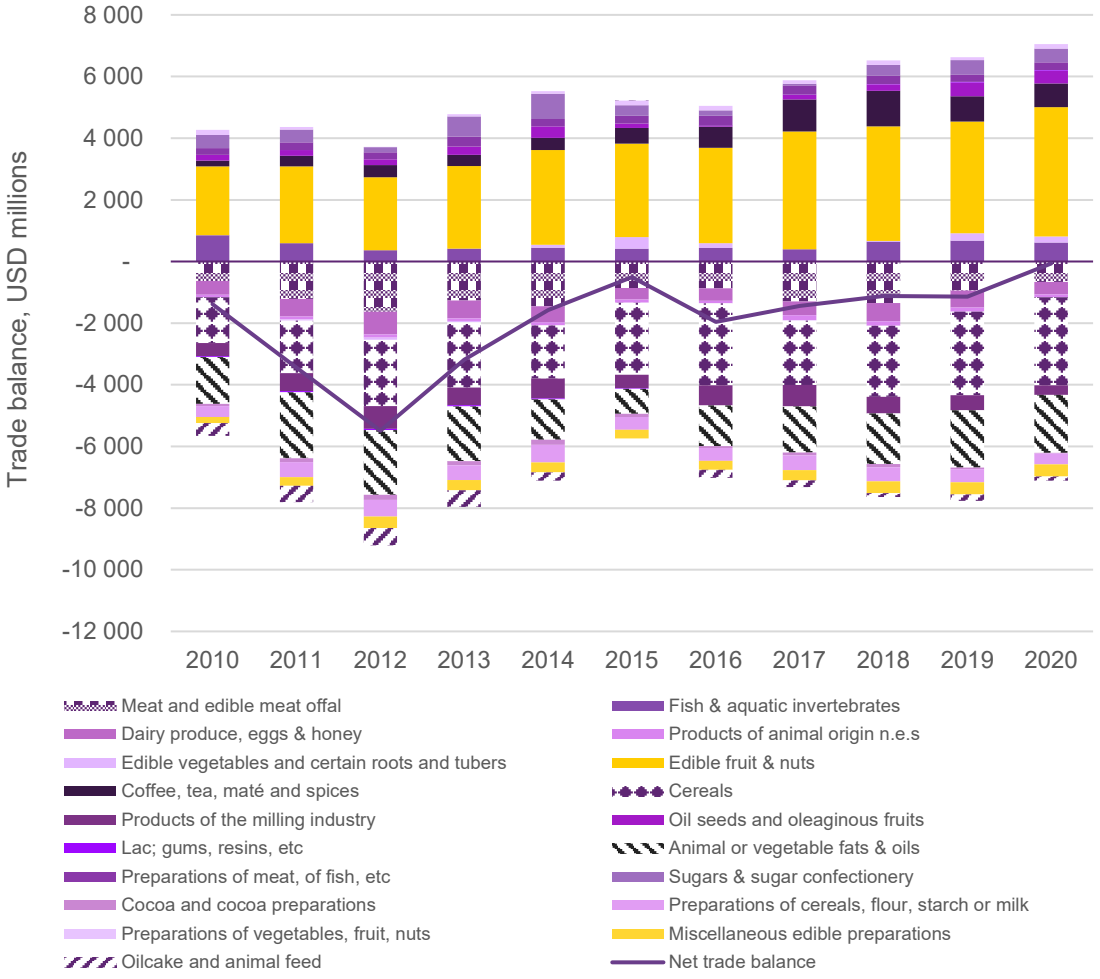
9. Annex

Annex 1. SADC Trade Balance

SADC has been a net importer of food products over the past decade, even though the deficit reduced to close to zero in 2020 (see Figure A1). The major net imports by the SADC are of cereals, followed by animal fats and oils, and meat and poultry products. This is balanced by exports, especially of fruit and nuts.

This potential has been stymied by the lack of effective regional value chain strategies to link increased agricultural production with agro-processing so as to foster rapid industrialisation and economic diversification in food (Annan et al. 2015; Hussein and Suttie 2016). The region is thus faced with a huge challenge, along with having the potential for transformative industrialisation to meet it (Paremoer, 2021).

Figure A1: The SADC's Net Trade Balance for Main Food Product Categories

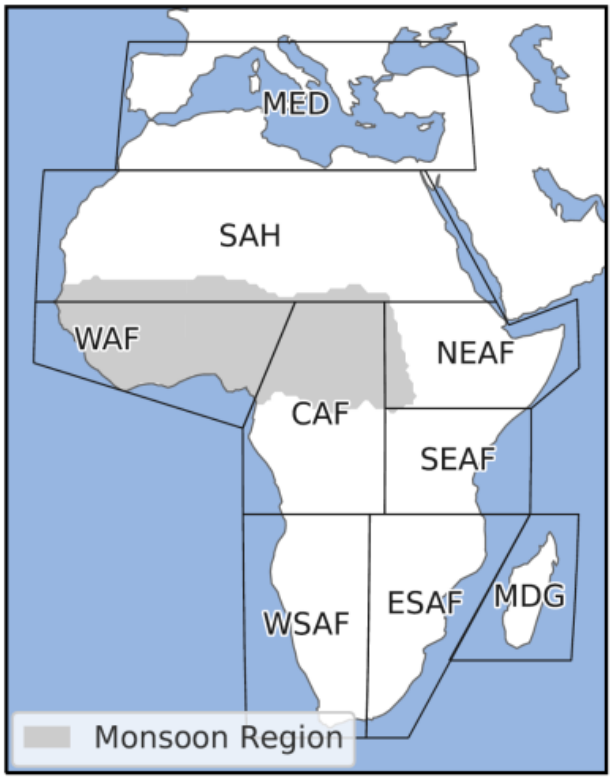


Source: Authors analysis based on Trade Map

Annex 2: International Panel on Climate Change projections

As the IPCC (2021) has projected (Figure A2), as rainfall reduces in Southern Africa (west and east), Eastern Africa is expected to experience increased rainfall accompanied by flooding, especially along the coastal areas. The changes and increased variability in weather places further pressure on producers, food systems and rural livelihoods.

Figure A2: IPCC's Segmentation of the African Continent into Blocks Likely to Experience Similar Climate Change Patterns



Notes:

West Southern Africa (WSAF) has observed decreases in mean precipitation, despite an increase in heavy precipitation and pluvial flooding. An increase in aridity, and agricultural and ecological droughts is expected. Increases in mean wind speed and fire weather conditions are also projected.

East Southern Africa (ESAF) has observed decreases in mean precipitation and increases in meteorological droughts. It is projected to experience an increase in fire weather conditions, mean wind speed and heavy precipitation.

Southern East Africa (SEAF) is projected to experience an increase in the frequency and/or the intensity of heavy precipitation and pluvial flooding.

In Central Africa (CAF), decreases in mean precipitation and the standardised precipitation index have been observed. An increase in agricultural and ecological droughts has been observed, with projected increases in heavy precipitation and pluvial flooding.

Source: *IPCC WGI Interactive Atlas (https://interactive-atlas.ipcc.ch/)*