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Assessing agriculture markets in Eastern and Southern Africa: Implications for inclusion, climate change and the case for a market observatory

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Abstract

The agricultural sector is key to fostering economic growth, reducing poverty and improving food security in Eastern and Southern Africa (ESA). It is important to realise the potential to substantially and sustainably increase food production to meet the demand from ESA's rapidly expanding urban areas and population. However, Africa has run an average food trade deficit of about $30bn a year over the last decade with many countries in ESA remaining net food importers, despite good soils, land availability and growing conditions in the region as a whole. In this paper we assess the prices for staple food products in ESA within countries and across borders to build on previous studies which have observed large differences and high levels of volatility. The paper uses data that has been collated from various sources, along with data has been collected in Malawi, Tanzania, Zambia and Zimbabwe. We find variability and volatility in prices, pointing to the potential for large arbitrage profits by large players whilst undermining small farmers and processors.

Key words: agriculture; food prices; climate change
JEL Codes: O13; O18; Q18; Q54

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1. Introduction

The agricultural sector is key to fostering economic growth, reducing poverty and improving food security in Eastern and Southern Africa (ESA). It is important to realise the potential to substantially and sustainably increase food production to meet the demand from ESA's rapidly expanding urban areas and population. However, Africa has run an average food trade deficit of about $30bn a year over the last decade with many countries in ESA remaining net food importers, despite good soils, land availability and growing conditions in the region as a whole (FAOSTAT).

Empowering small and medium-scale farmers is central to achieving more inclusive economies and they are very significant in food production (with the exception of South Africa where large farmers predominate). There are also important questions about the participation of smaller businesses in agro-processing and trading where they face large and integrated rivals and general challenges such as limited access to finance, skills, and training, along with the availability and costs of transport and storage facilities (das Nair & Landani, 2020; Bell et al., 2020).

There has been an expansion of major traders across the region which can provide better pricing information and deepen markets reducing price variations, however, there are also concerns about the market power of these businesses, and it has been observed that price variability has not, in fact, reduced in ESA.[1] High levels of concentration in trading and poor storage alternatives can mean that small farmers have to sell their harvest at low prices. Powerful traders can then on-sell at much higher prices with big profit margins to buyers including small agro-processors. Poor information and high apparent levels of concentration at different levels in input supply, trading and processing reinforces questions which have been raised about the nature and effectiveness of competition in agricultural markets (IPES-Food, 2017; Vilakazi and Roberts, 2019; Swinnen, 2020).[2]

In addition, agricultural markets are clearly massively impacted by the climate change emergency. In the short term, there is the increased probability of extreme events such as droughts, heatwaves and floods. The frequency of weather- and climate-related disasters has increased since the 1970s, with many regions in Africa becoming drier since that time (Davis and Vincent, 2017; WMO, 2020; IPCC, 2021). The impacts are compounded by the continent being largely dependent on rainfall, with little irrigation. Much higher levels of investment are urgently needed to adapt to the accelerating effects of climate change while stronger regional value chains can dampen the impacts.

In this paper we assess the prices for staple food products in ESA within countries and across borders to build on previous studies which have observed large differences and high levels of volatility (Bell et al., 2020). The paper uses data that has been collated from various sources, along with data has been collected from market participants and organisations in Malawi, Tanzania, Zambia and Zimbabwe. This enables us to identify the gaps in data and to highlight concerns with the quality of the data itself. Various information sources and initiatives for collating and disseminating agricultural prices have been reviewed (see Table 1).[3] Some repositories have inconsistencies in the frequency of the data recorded.

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[1] Based on the national data from 1990 to 2014 (in Sitko et al. 2018), and more recent data in Bell et al (2020). There are high levels of concentration in commodity trading globally (IPES-Food, 2017), concerns about common ownership across some of the major traders (Clapp, 2019) and collusion between them (for example, with regard to fertilizer see Vilakazi and Roberts, 2019; in grain storage and trading in South Africa see Roberts 2020).

[2] Traders appear to benefit from poor information, and conversely make lower margins when information improves (see Djanian and Ferreira, 2020).

[3] These include the Regional Agricultural Trade Intelligence Network (RATIN); the Food and Agricultural Organization's Corporate Statistical Database (FAOSTAT); the World Food Programme's Vulnerability Analysis and Mapping database (VAM); the International Food Policy Research Institute

Importantly, different methodologies are employed by different repositories, which creates problems when trying to compare or combine different sets over a long period of time. These concerns in themselves are a strong motivation for the Market Observatory initiative to which we return in the conclusions.

Table 1: Available data on maize and soya prices

Maize	
Malawi	Agricultural Commodities Exchange for Africa (patchy); IFPRI VAM and FAO - only retail
Kenya	RATIN (not freely available and gaps in coverage)
Tanzania	Newspaper publications, RATIN, Ministry of Agriculture
Uganda	RATIN (not freely available and gaps in coverage)
Zambia	Potential App users, CCPC VAM – only retail
Zimbabwe	Fixed by government
Soya	
Malawi	Agricultural commodity exchange (ACE), IFPRI, potential App users
Kenya	RATIN (not freely available and gaps in coverage)
Tanzania	RATIN (not freely available and gaps in coverage), Ministry of Agriculture
Uganda	RATIN (not freely available and gaps in coverage)
Zambia	CCPC, potential App users
Zimbabwe	None

The paper proceeds as follows. Section 2 provides an overview of the concerns about agri-food markets with reference to recent literature. Sections 3 and 4 evaluate information on maize and soybean markets. Section 5 highlights implications of climate change and section 6 points to factors influencing substantial variations in prices across the region. Section 7 has short conclusions.

2. Agri-food markets need to work better for smaller farmers and producers, and market information is essential

In many ESA countries, the agricultural sector has been identified as key to realizing a number of economic objectives, including boosting regional trade and investments, fostering rapid industrialization and economic diversification, job creation, and eradicating hunger and poverty (das Nair & Landani, 2020; Hussein & Suttie 2016; SADC Industrialization Strategy Roadmap, 2015 – 2063). ESA has rapidly expanding urban areas and, given the availability of arable land, continues to encompass promising potential for increased food production (Annan et al., 2015). Smaller farmers and small and medium sized enterprises (SMEs) play an important role in food production, processing and retail (Demmler, 2020), yet there are high barriers to entry which limit the contestation and participation of new entrants and SMEs in agriculture and agro-processing value chains (das Nair & Landani, 2020). High levels of concentration and vertical integration in these markets, particularly in agro-processing, mean a few large firms with market power control most levels of value chains (Paremoer 2018).

Realising the potential gains from better-working agricultural markets entails supporting smaller farmers and producers, and enabling climate-smart agriculture that adapts to the effects of climate change and severe weather patterns (AGRA, 2021). With increasing temperatures and more droughts and flooding identified for ESA (WMO, 2020; IPCC 2021), there is need to not only empower smaller market participants through participation in agricultural markets but to also address the impacts of weather shocks on food prices and

Malawi Strategy Support Programme; the Agricultural Commodity Exchange for Africa; and ministries of agriculture and national statistics institutions.

security. This means among others, investments in and access to storage facilities, as well as in better information systems.

Empowering smaller farmers and producers

The importance of small farmers and agri-businesses is widely recognised (das Nair & Landani, 2020; SADC Industrialization Strategy Roadmap, 2015 – 2063). However, recent analyses and available data have pointed to markets not working well for smaller farmers in Africa, who receive poor prices, in part due to high volatility (Sitko et al. 2018; Bell et al. 2020; Ochieng et al, 2019; Baulch et al. 2021; Bonilla Cedrez et al. 2020). The explanations from analyses of maize markets, on which there is most information, include: [4]

Pronounced seasonal variations associated with poor infrastructure and lack of competition in transport and storage, which increase with remoteness. This means that farmers have poor alternatives to selling soon after harvest, causing prices to drop sharply, while prices increase to a peak just before harvest (Baulch et al., 2021).

Poor market price information inhibits the assessment of, and response to, market developments, exacerbating variations.

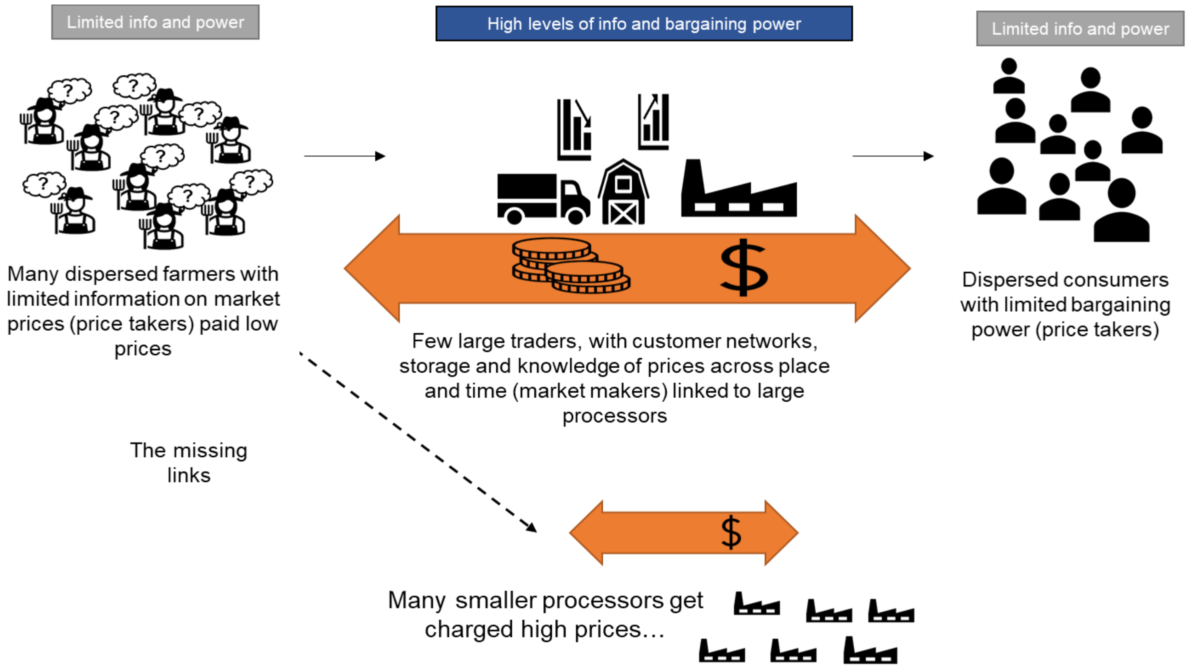
Short-term government maize trade bans may explain substantial geographic price variations, and greater seasonal price variations, in ESA. These bans can act to suppress farmer prices (Sitko et al, 2017; Koo et al., 2021).

The price variation points to the potential for large arbitrage profits, as well as raising concerns about what lies behind the differences observed. Bell et al. (2020) notes that in Mozambique, there are often US$200/t differences between Maputo and Nampula wholesale prices, which are substantially more than would be justified by transport costs. Similarly, in Tanzania prices in Dar es Salaam are much higher than in Iringa and Mbeya, by margins greatly exceeding the transport costs from producing to consuming areas (Bell et al., 2020). Baulch et al. (2021) using crowdsourced farm gate prices for Malawi find that 90% of soybean farmers and 75% of maize farmers received substantially less than the set minimum farmgate prices (MFG) in 2020. The situation improved for soybean farmers in 2021, with only 22% receiving less than the MFG price, but deteriorated for maize farmers.

The large margins between low farmer prices and high prices charged to agro-businesses such as processors and poultry producers disincentivises their production and is only possible due to market power on the part of the big intermediaries (Figure 1). Smaller traders and processors are effectively undermined and excluded in such circumstances.

[4] For example, Bonilla Cedrez et al. use three different data sources for prices of maize, millet, rice and sorghum, imputing retail prices where only wholesale prices are reported, and inferring maize prices where the prices of other grains are reported and not maize, in order to build a bigger maize price data set.

Figure 1: Impact of price information scarcity on small players in agriculture



Source: Authors

Transparency can improve the bargaining power of smaller farmers and has the potential to reduce the large trader margins. If accompanied by better options for storage and transport, it can allow farmers to plan based on any reasonable expectation of the prices they may be paid in future. It allows small farmers and producers to realize rewarding opportunities to store maize in good years with very low prices, for sale in poor years or processing when prices spike.

Climate change and weather patterns

Climate change compounds the challenges facing farmers and producers, especially smaller farmers. In the short term, there is more frequent extreme weather such as droughts and floods. In the medium-term, Southern Africa will experience much higher temperatures and become much dryer in the south. Africa in general is also particularly vulnerable to climate change impacts as the continent largely depends on rainfed agriculture and has little investment in water management and irrigation (Bell et al., 2020). Southern Africa is identified as a climate change hotspot with the predicted temperature increases predicted to be double the global average.[5] In other words, if global temperatures increase by 2 degrees, the increase in Southern Africa will be 4 degrees.

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. The 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.

La Niña is the opposite, with cooling of the central to eastern tropical Pacific Ocean, and countries such as Brazil and Argentina getting drier whilst southern Africa has normal to above normal rainfall and generally 'good' weather. A La Niña pattern led to Brazil experiencing the worst drought in a century in 2021, while there has been extreme weather

[5] Wits University Global Change Institute (2021); World Meteorological Organisation (2020).

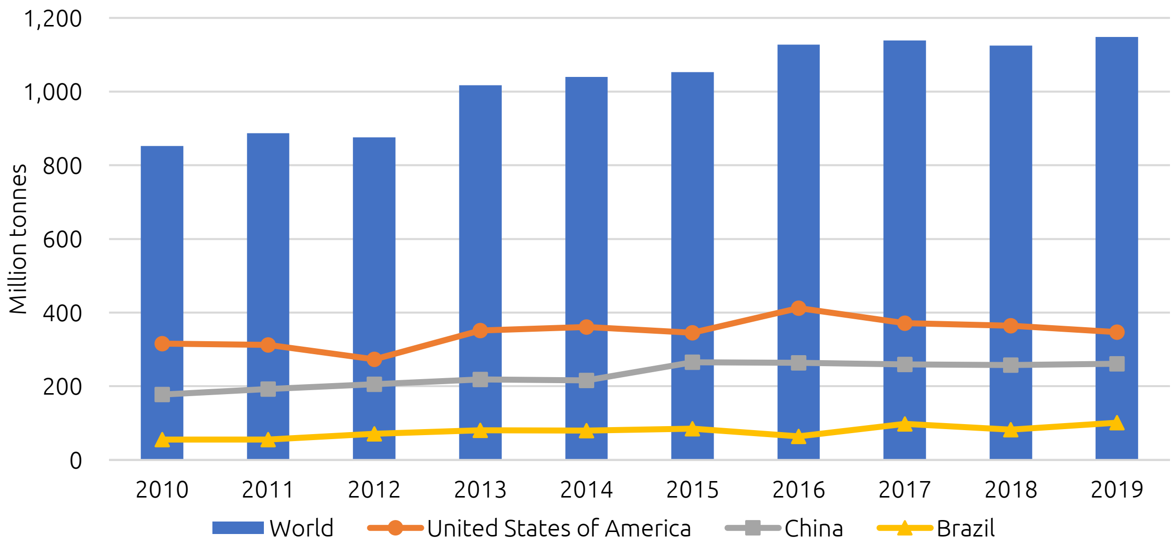
in the USA and Canada with heatwaves, tornadoes and wildfires. International prices of soybeans and maize have risen sharply, even while there are bumper harvests in the ESA region.

The climate emergency makes it imperative that concerted actions are taken to improve the workings of agricultural markets across the region. The increased volatility in rainfall, alongside the projected long-term developments from climate change, imply integrated regional markets are very important to dampen the effects of supply shocks on food prices. There is also great potential for investments and actions to be taken to tackle climate risk, that can generate better economic growth while helping to deliver on the Sustainable Development Goals (Brahmbhatt et al., 2016).

3. Maize review

Maize is the third largest planted commodity in the world, following wheat and rice, however, in many African countries it is the leading staple food. Internationally, maize demand is driven by animal feed, while maize is predominantly grown for human consumption in Africa. As incomes increase in African countries the demand for meat will rise further meaning growing demand for animal feed. Around 13% of all maize globally is exported with the biggest producer and exporter being the USA, reflected in the USA Gulf of Mexico price being an international benchmark. The second biggest producer, China, is also the biggest importer given the size of its demand, and it runs a persistent trade deficit. The USA accounted for 30% of the global production of maize in 2019, followed by China and Brazil which made up 23% and 9% respectively (Figure 2). Growing demand in Asia is a key driver of markets, while extreme weather events in the main producers have huge impacts, as we have seen in the past 12 months as international prices have doubled.

Figure 2: Global maize production and top three producer countries



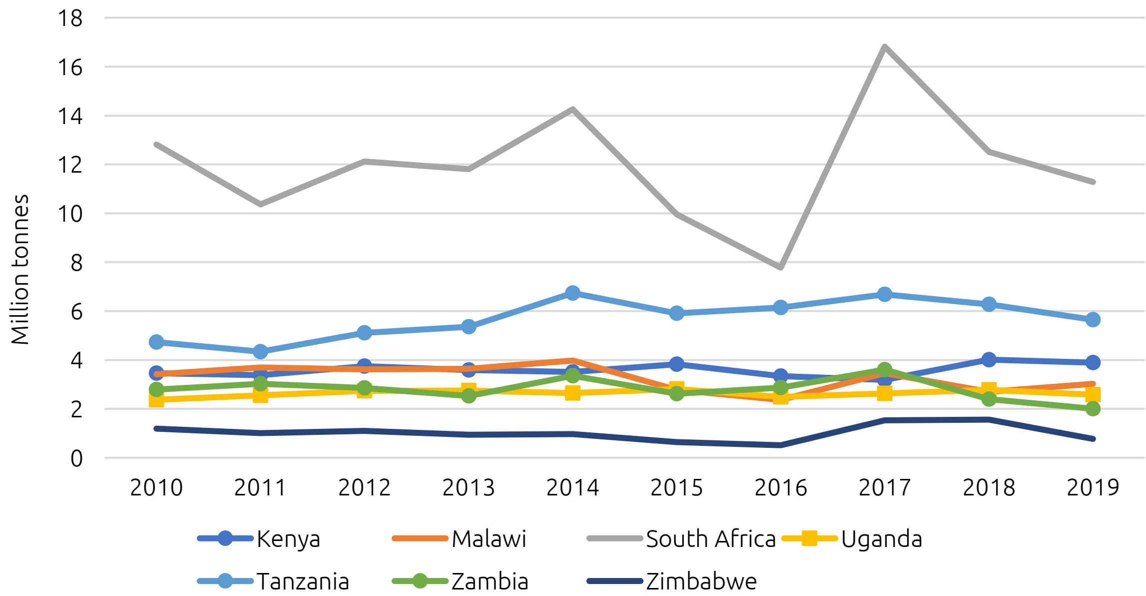
Source: Food Agricultural Organisation (FAOSTAT), data only available until 2019

The exceptional adaptability of maize allows it to be grown in various geographic locations with a diversity of soil and climates. The global market also recognizes maize as the queen of cereal grains as it has the highest genetic yield potential among all other cereal grains (Dass et al, 2012). The maize market can be segmented based on type, colour, end use, nature and region. In terms of colour, the market is segmented into either yellow or white maize, with yellow maize constituting majority of production, as it is the most geographically adaptable of the two and is predominantly used for animal feed.

Maize also has a wide range of other industrial applications in food and beverage, pharmaceutical, personal care and cosmetics as well as chemical industries. There is growing use of maize as a source of ethanol for biofuels to replace petrol and diesel.

Maize is a major agricultural crop across ESA and is produced by smaller farmers in most of the countries, across large areas of land. Since 1970, maize production in the ESA region has almost quadrupled reaching over 48 million tons harvested in 2018 (Bell et al, 2020). South Africa is by far the largest producer and a substantial exporter, apart from in 2016 as a result of the severe drought (Figures 3 and 4). Zambia, Uganda and Tanzania are all exporters. Tanzania is the second largest producer but a relatively small exporter, given the size of local demand. The third largest regional producer, Kenya, is also a net importer due to the size of its demand. Zimbabwe's production has faltered, with some recovery after 2016.

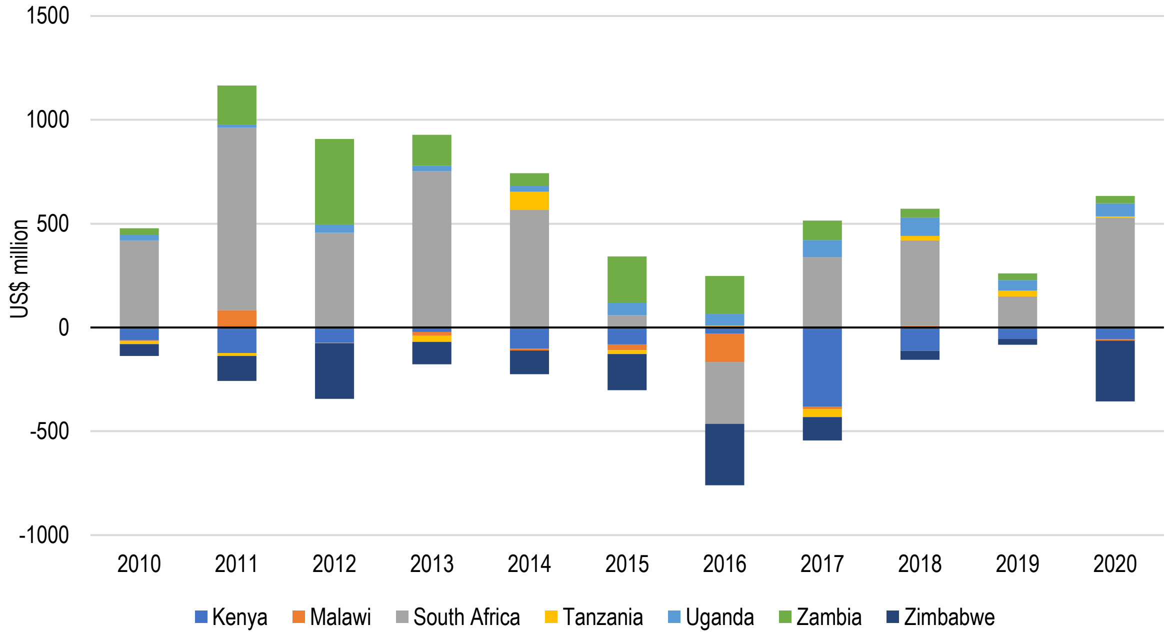
Figure 3: Regional maize production



Source: FAOSTAT

The supply and demand balances have meant that South Africa's benchmark price (set inland at Randfontein close to Johannesburg) is important for the region. It has generally been based on what can be earned in international export markets, given the substantial surplus in that country (Figure 4). In other countries, prices have varied substantially, due to weather variations, seasonal factors, government interventions and with differences which require further explanation (see section 6). For example, in Kenya the market clearing prices are based on imports but have been far above what would be reasonably expected given transport costs.

Figure 4: Regional maize net exports



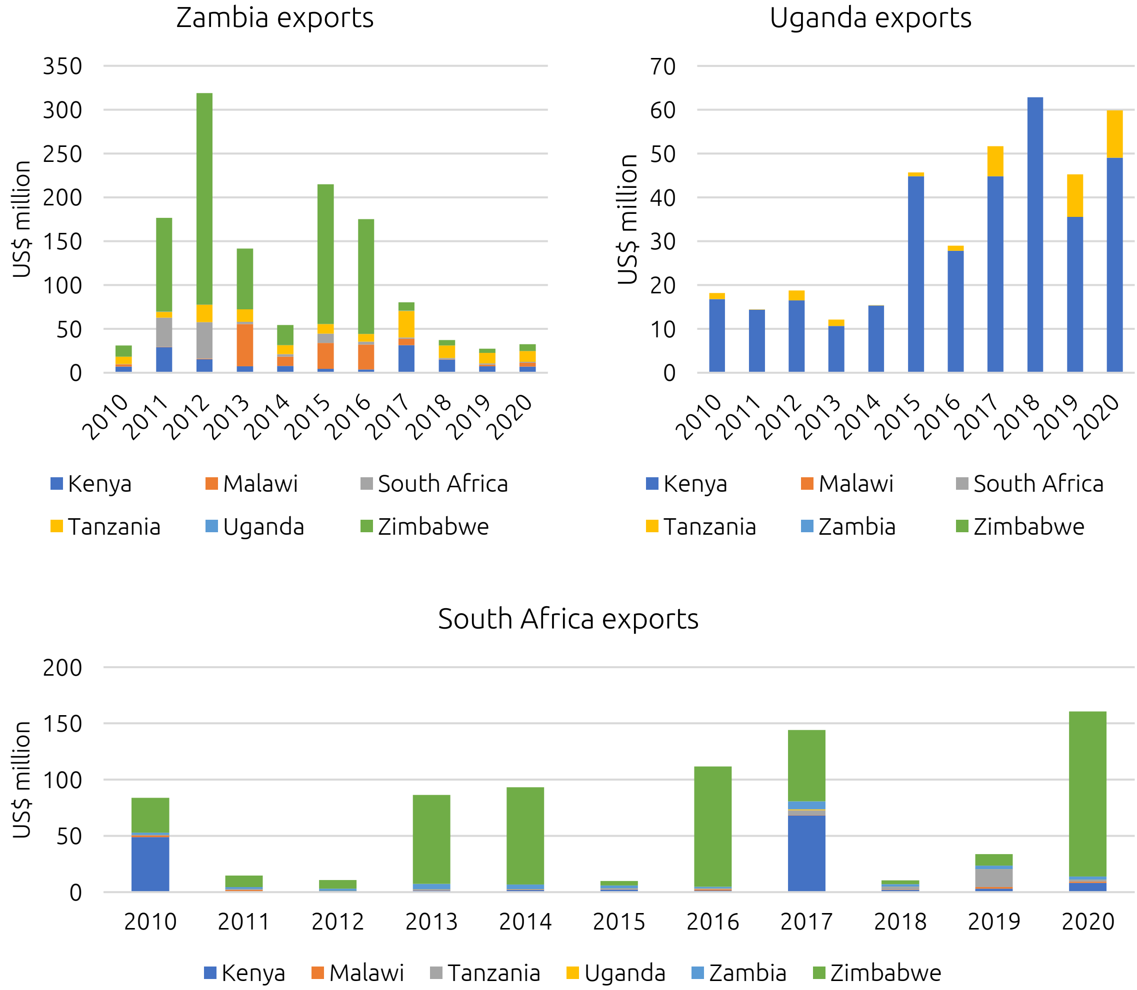
Source: Trade Map

The 2015/16 drought in Southern Africa points to major impacts which need to be anticipated for the next El Niño episode. Production fell by 45% in South Africa in 2016 compared to 2014 (Figure 3), even while production in East Africa, led by Tanzania, remained good. South Africa's maize trade balance shifted from a US$500 million surplus to a deficit of US$295 million. Imports were mainly from deep sea sources, and prices doubled, from export parity to import parity levels around US$300/t in early 2016 (Bell et al, 2020), even while there were still exports to regional neighbours. South Africa's market is dominated by large and internationalised traders who have networks of silo storage, are integrated into global markets, and trade on the South African Futures Exchange (SAFEX).

Production was lower in 2018/19 once again in some countries, including South Africa, given relatively dry conditions and extreme weather events such cyclones impacting in Mozambique and Malawi. There was a spike in prices in some countries as supply constraints were anticipated. However, supplies remained relatively good with a surplus in South Africa, albeit smaller than in the preceding year. Maize production for South Africa for 2020 improved to over 15 million tonnes, which is an increase of over 30% from 2019.

The exports from Zambia and Uganda have been almost entirely to Zimbabwe and Kenya respectively (Figure 5). Kenya has also imported from Tanzania and South Africa, while Zimbabwe imported from South Africa in some years, notably in 2020. Aside from these, regional trade plays a relatively small role in maize markets. This partly reflects government interventions including temporary trade restrictions, market regulation and pricing, as well as concerns about ensuring local food security (see section 6).

Figure 5: Maize exports from the net exporters to countries in the region



Source: Trade Map

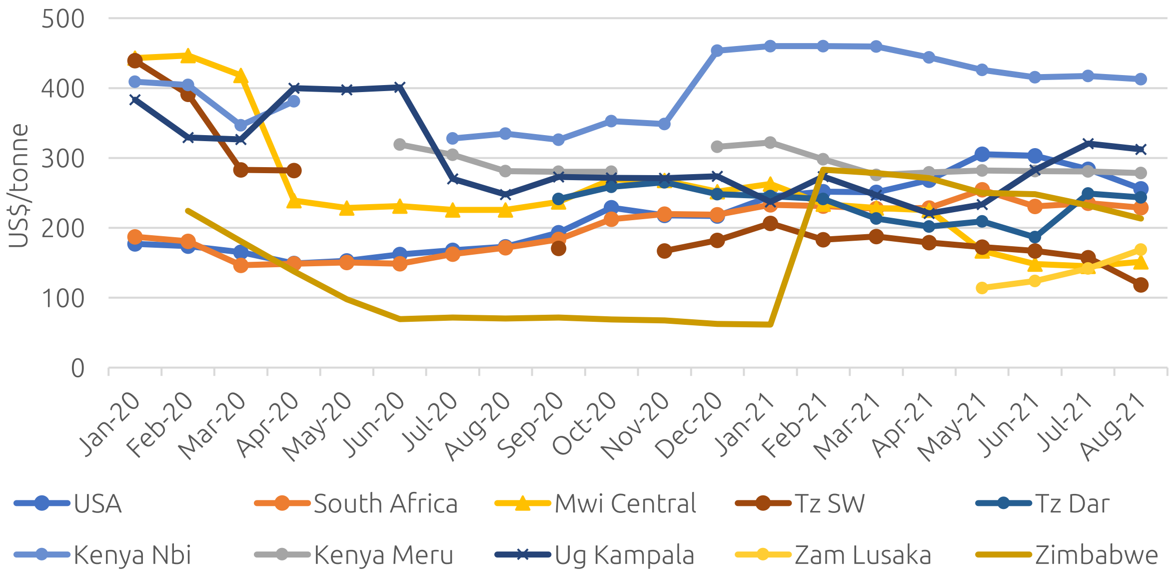
Recent developments

The most severe drought in a century in Brazil, along with drought in Mexico and extreme weather in the USA, has seen international benchmark prices increase sharply. The USA export price doubled from mid-2020 to above US$300/t in May 2021. In contrast, in the ESA region there have been very good harvests. Prices in Zambia, Zimbabwe, Malawi, Uganda and Tanzania are all substantially below international prices, as well as below South African prices (Figure 6). These prices reflect the different floor set by export opportunities given the transport costs to those markets.

There are important variations within and across countries, however, which raise questions about the data at a producer level and local market dynamics. Prices in Nairobi are extremely high, above US$400/t from late 2020 to date, which reflects import restrictions which were imposed based on concerns about grain quality from neighbouring countries. Nairobi prices are also much higher than in maize producing areas within Kenya. Within Tanzania, prices between the producing areas in the south-west of the country and Dar es Salaam have been relatively aligned from the beginning of 2021 but then diverged substantially in the middle of the year, with a difference that is much greater than transport costs. In Uganda, prices increased from around $220-230/t to above $300/t between April and August 2021, closer to the very high prices in Kenya.

Prices across Zambia have been around $120-$130/t in mid-2021 (which is lower than they have been for many years based on other sources) and a price difference from South Africa which is larger than justified by transport costs (see section 6.1 below). Prices in Malawi have been substantially lower in 2021 than in 2020, reflecting good harvests, and aligned with those in Zambia and south-west Tanzania around $150/t (similar to international prices in the first half of 2020, in fact).

Figure 6: Maize producer/wholesale prices in regional and international markets



Source: based on price tracker data from multiple sources (see Table 1)

Zimbabwe presents an individual case due to the massive government intervention in the maize market – setting prices and mandating all trade to be with the state Grain Marketing Board while banning imports of maize and maizemeal. The maize prices were set at Z$6958/t in February 2020 for 12 months and then hiked to Z$32000/t in February 2021. At the central bank determined interbank exchange rate, the February 2020 and 2021 prices were at high levels, just above US$380/t. In Figure 6 above, we use the exchange rates prevailing in the parallel market,[6] which means lower prices in US dollar terms and has meant that the prices reduced over 2020 until the fixed price was adjusted sharply upward in February 2021. The different effects of government intervention by ESA countries are reflected on in section 6 below.

4. Soybean review

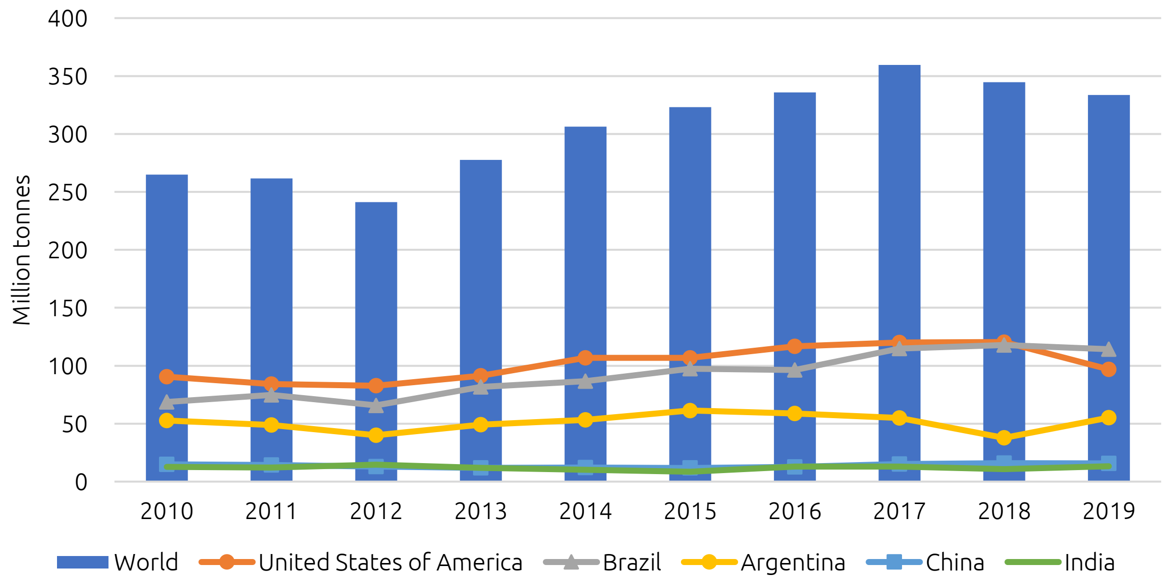
Soybean is grown in tropical and subtropical climates and is one of the most valuable crops in the world, not only as an oilseed crop and feed for livestock and aquaculture but also as a good source of protein in the human diet and as a biofuel. The global soybean market is therefore driven by demand for the derivative products, through the crushing industry, where soy meal and soy oil are extracted. By far the most important driver of soybean demand is the animal feed industry which consumes around 80% of global soybean production. A large proportion, more than 30% of soybean demand, is met by international trade (which would be an even higher proportion if we took trade in derivative products, such as animal feed, into account).

Brazil overtook the USA in 2019 as the world's largest producer (Figure 7), although 2020/21 production have been impacted by severe drought. Questions are also being raised about

[6] As quoted on www.zimrates.com

the extent to which Brazil's expanded production derives from deforestation exacerbating climate change. Both Brazil and the USA are large net exporters, however, Brazil is by far the largest, with supplies mainly going to meet the huge demand in China for animal feed for pork, poultry and fish farming, among others. Argentina is also a major producer and exporter. China's demand for soybeans has driven increased prices.

Figure 7: Global soybean production and top five producer countries

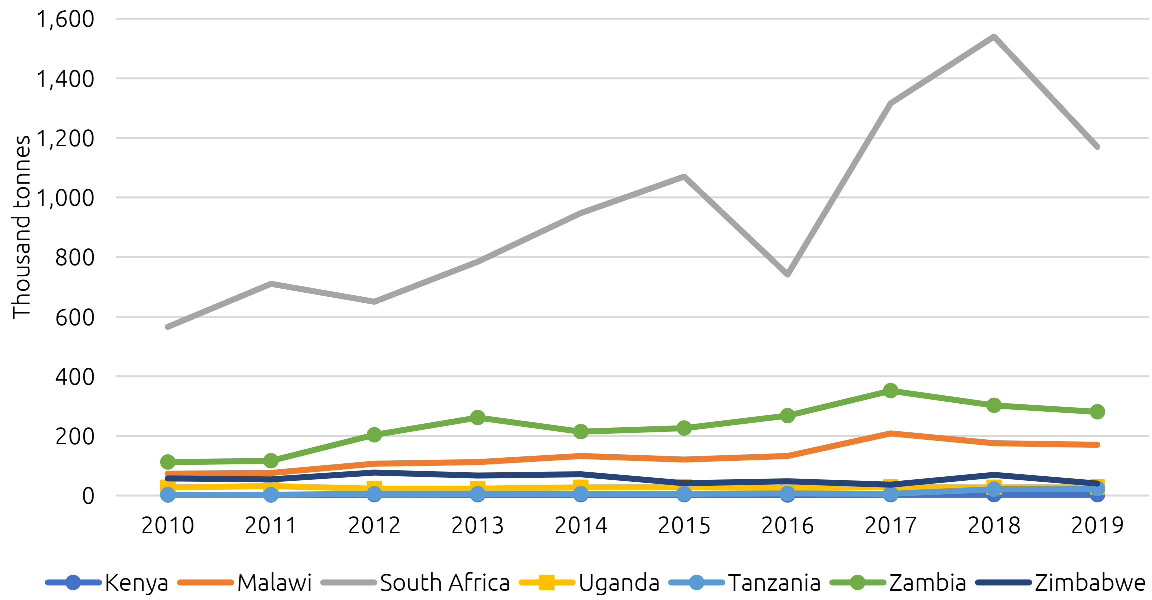


Source: FAOSTAT

Similar to maize, soybean demand and production has grown sharply mostly driven by the Asian-Pacific market due to rising incomes and urbanisation in the region, led by China. In addition, demand for soybeans in the Middle East, North Africa, Southeast Asia, and Latin America has also been rising as people around the world are increasingly capable of affording more animal protein and vegetable oil in their diets. The sustained increase in Chinese imports is the main driver on the demand side, while drought in Brazil impacting supply has seen huge increases in the international price for soybeans by more than 50% to over US$600/t in mid-2021 (Figure 11).

Notwithstanding good potential for soybean production, the ESA region is a substantial net importer. Production levels are very low in most countries aside from South Africa and Zambia (Figure 8). South Africa continues to be a net importer, especially when derivative products (oilcake and animal feed) are included while Zambia, Malawi and Uganda are net exporters (mainly to Zimbabwe and Kenya).

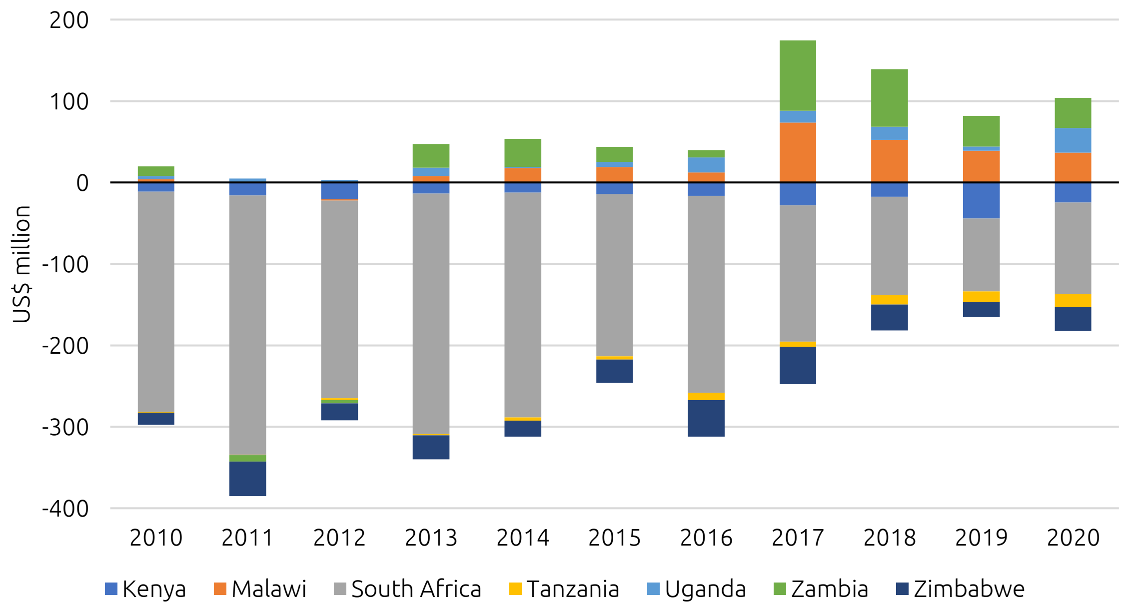
Figure 8: Regional soybean production



Source: FAOSTAT

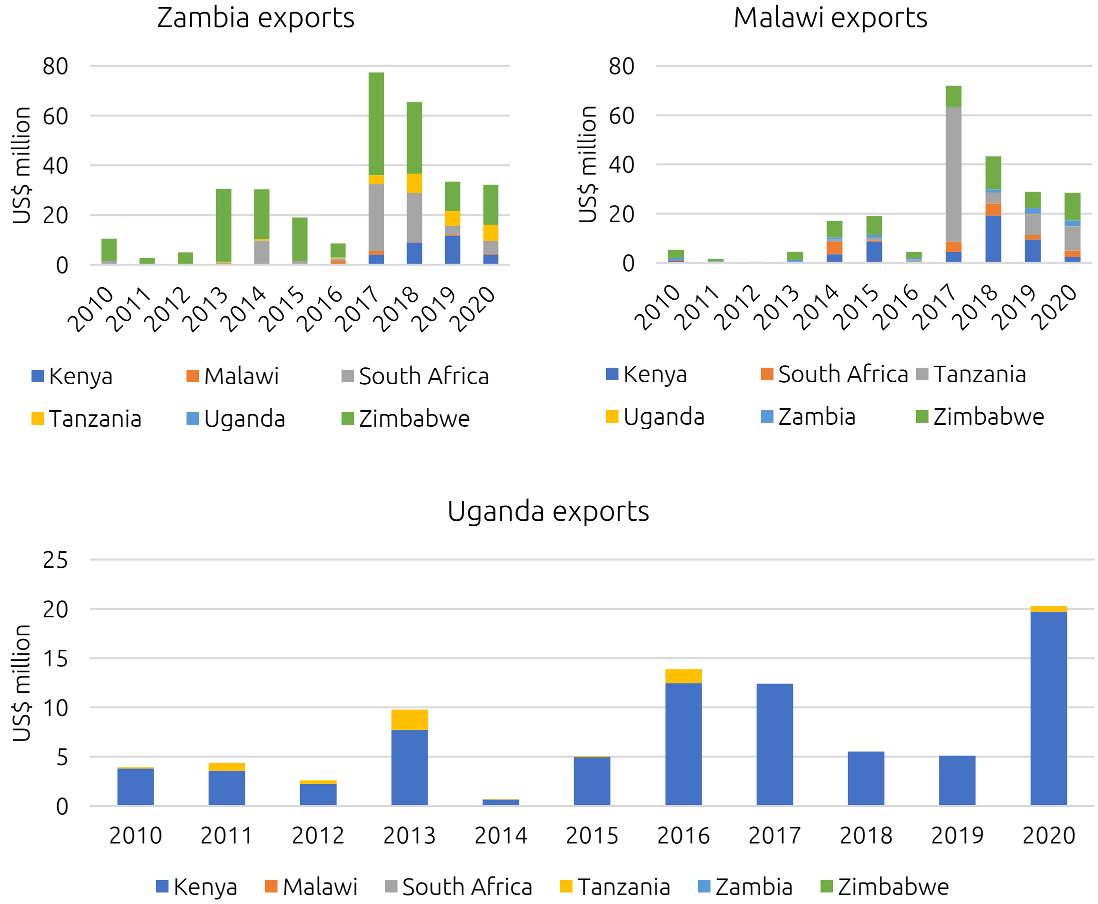
The attraction of the crop depends in large part on the local demand from commercial meat farming, and the soybean price is a key factor in the competitiveness of local poultry production (Ncube, 2018). Continued urbanization and rising incomes mean demand for poultry, as well as other animal and fish farming drives demand growth. For example, South Africa imports around 20% of its poultry requirements which represents derived demand for animal feed. Zambian production has also grown from a very low base and, given its demand (at around 200-250 thousand tonnes per annum), it has moved from being a net importer to be a net exporter (Bell et al, 2020).

Figure 9: Regional soybean & oilcake net exports



Source: Trade Map

Figure 10: Soybean & oilcake exports from the net exporters to the region



Source: Trade Map

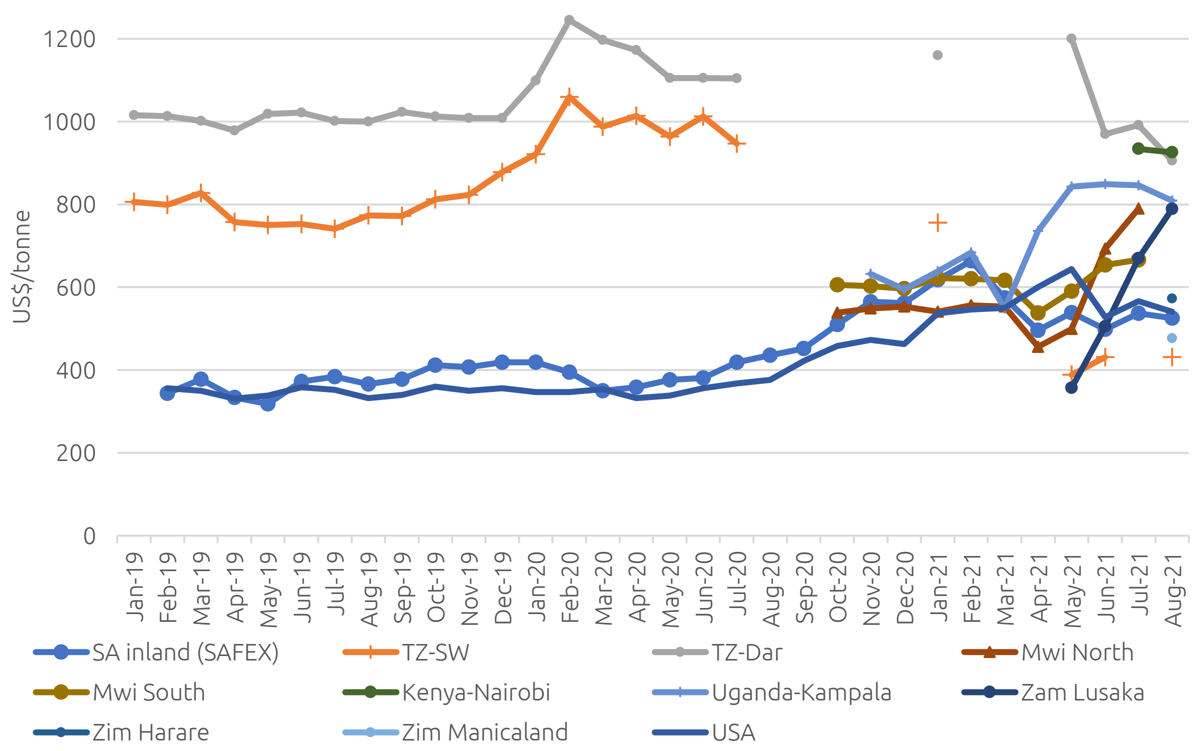
Uganda exports to Kenya are mainly made up of oilcake (accounting for 81% of the 2020 exports).[7] The data on Kenya's soybean imports for the period 2010-2020 indicates an overall decline in the total imports after 2012 until 2018. In 2019 & 2020, they began to import largely from the Ukraine.

Recent developments

While international soybean prices are at levels around 50% higher than those prevailing over the previous five years, improved regional production has meant lower prices in countries such as Zambia, Malawi and South Africa in early 2021 (Figure 11). However, a combination of growing production due to good weather in southern Africa and price increases in deep sea imports has unlocked regional exports from Malawi, Zambia and Uganda; leading to increased market opportunities and competitive prices. Between May and August 2021, for example, Zambia has seen prices sharply increase from just over 350/t to over $788/t; with Malawian prices reaching $790/t in August. Given the Malawi harvest is in April and May it is not clear whether farmers have benefitted from the price increases.

[7] Note that Kenyan import data records soybean imports from the Ukraine in 2019 and 2020 and not from Uganda.

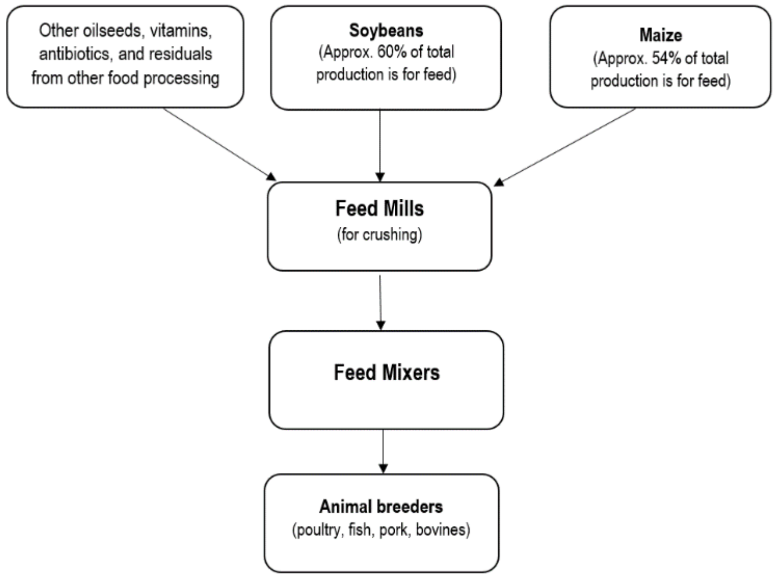
Figure 11: Soybean producer/wholesale prices, ESA and international



Source: based on price tracker data from multiple sources (see Table 1)

The animal feed value chain is key to understanding soybean as the 'green gold' being the key source of protein in much of animal feed around the world. It is thus crucial to understand the different levels of the feed value chain. At the upstream level, maize, soybeans, vitamins and other products are sourced by feed mills as the primary ingredients. The ingredients are then processed into animal feed. Typically, maize is the main energy ingredient for animal feed whilst soybeans are a source of protein (Figure 12). Feed typically, by weight, comprises 60% of maize and 25-30% of soya. As soybean prices are roughly double maize prices, in value terms they are roughly the same in the composition of feed.

Figure 12: Animal feed value chain



Source: derived from Centre for Competition, Regulation and Economic Development research (Goga & Bosiu, 2019; Ncube et al., 2017)

The prices of soybeans, maize and the meals are therefore critical in the cost competitiveness of poultry and fish farmers. High soybean prices undermine local farmers and has seen African countries being large net importers of frozen fish and chicken. Animal feed comprises approximately 70% of the input cost in poultry, which is one of the cheapest sources of animal-based protein (Goga and Bosiu, 2019).

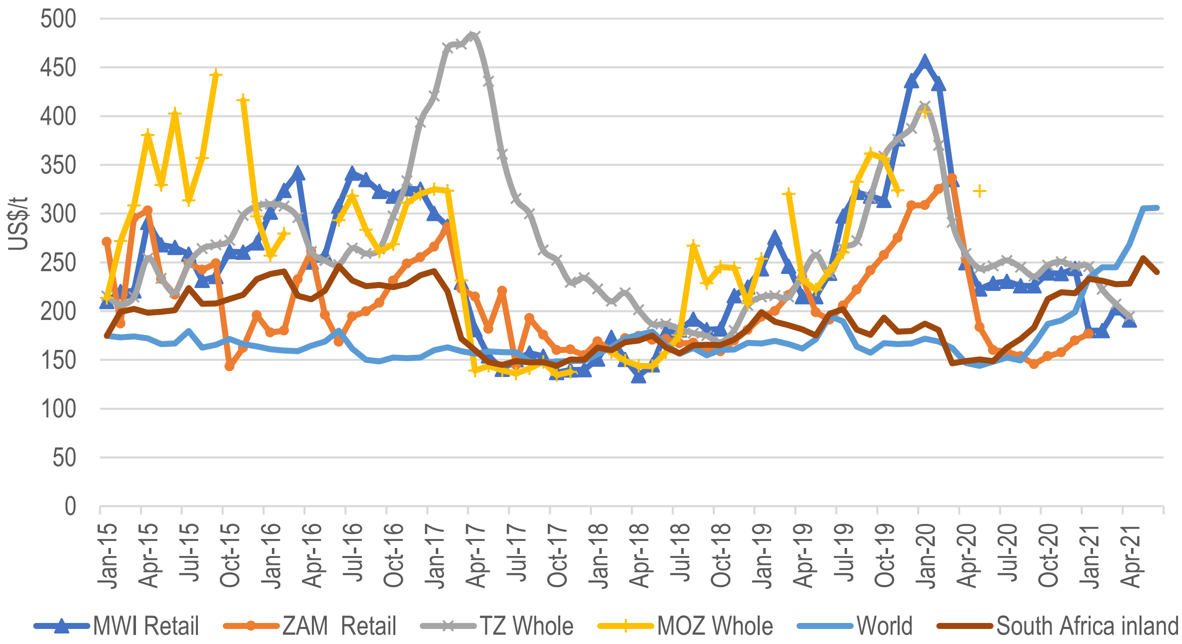
The African continent had a negative annual trade balance of about US$1.3bn per year in poultry over the past decade and an annual deficit of over US$2bn in animal feed. South Africa alone imports around 15-20% of its poultry consumption (which, in effect, represents imports of soybean and maize). Coupled with the net imports of soybean and oilcake (together amounting to a deficit of US$2.5bn in 2020), used predominantly for animal feed, this massive trade deficit is an opportunity for expanded agricultural production in the region.

With effective value chains and integrated markets across ESA, farmers can be better connected with producers to meet demand in the major cities. This is one of the main growth and regional integration challenges facing the continent. Addressing it can contribute to African countries moving to being net food exporters rather than being import dependent.

5. Climate Change

The impacts of rapidly developing climate emergency can be seen in the prices of key commodities, including maize, soybeans and rice, both internationally and regionally. In 2015/16, the worst drought in Southern Africa for around 30 years saw maize shortages and prices jumping in countries such as South Africa, Mozambique and Malawi (Figure 13). There were, however, good rains still in much of Zambia. In 2017 high prices in Tanzania occurred when there were low prices in neighbours, meaning trade in more integrated regional markets would have mitigated the impact. In 2019 extreme weather events (such as cyclones in Mozambique), poor rainfall and concerns about drought saw prices spike again.

Figure 13: Maize prices



Sources: WFP's Vulnerability Analysis & Mapping (VAM); SAGIS; World Bank

This impact of the 2015/16 drought can also be seen in the trade balances within the region, with negative trade balances peaking in 2016. In particular, South Africa, which is a significant exporter of maize in the region, had to rely on imports during the drought. However, Zambia and Uganda continued as net exporters within the region (as reflected in Figure 4 above).

In 2021 by contrast, droughts in Brazil and North America have seen global maize prices almost doubling to levels not seen since 2012, while there have been good rains and bumper harvests in ESA. The La Niña pattern also affected soybean production in Brazil, which saw soybean prices increasing significantly given the importance of Brazil (Figure 11). There is continuing concern about the impact on the prices of soybeans and maize even while expanded soybean production in ESA has mitigated the effects. The reduced dependence in the region on deep-sea soybean imports mean fish and poultry producers are more competitive.

Increased volatility and higher levels of uncertainty can also be magnified by speculation on crop production. Countering this requires appropriate measures such as buffer stocks, and better storage and logistics to enable regional trade between areas affected differently.

On the other hand, the climate emergency is raising significant concern about environmental ethics and the morality of some agricultural practices. Food and agriculture is responsible for around 33% of greenhouse gas emissions (Crippa et al. 2021), and major changes are required to reduce this impact. Although deforestation and conversion of tropical grassland and savannahs in Brazil and Argentina for planting soybeans yields economic benefits, there is concern about the negative externalities associated with these activities (De Maria et al, 2020). Environmentalists infer that these activities lead to the destruction of natural habitats and biodiversity loss (Ellwanger et al., 2020). Soybeans in particular also increases nitrogen pollution as it is a nitrogen fixing crop, meaning that they release nitrogen once they die (De Maria et al, 2020).[8] Furthermore, they increase pressure

[8] Although nitrogen may be good for fertilizing plants, it can also lead to more soil acidity and more greenhouse gas emission if applied in excess (Chen et al., 2019).

on ecosystems and natural resources such as water for other human activities and may impact the availability of some chemical compounds used for developing medicines (Ellwanger et al., 2020).

Deforestation for the purposes of planting more soybeans is also reported to bring about both negative and positive socio-economic impacts. Although there is evidence of economic growth and development, employment, better infrastructure and transport networks, along with better education and health outcomes, there are also adverse effects (De Maria, 2020). Land use change can lead to the displacement of whole communities as well as land disputes and illegal or coerced land acquisitions. Furthermore, in areas where the new farming areas are owned by a few large players there is more inequality and more people living below the poverty line than in areas where farming development is characterised by many small farmers (De Maria, 2020).

In the UK, there has been a growing dissatisfaction among consumers about soybeans and other products which are linked to illegal deforestation in the Amazon, Brazil. In particular, deforestation is said to delay and shorten the rainy season in the Amazon. As such, the government in the UK is considering legislation to ban imports of such products. In response, retailers, supermarkets and other sellers within food value chains have to invest in and ensure traceability for where they source their soybeans. Furthermore, supply chain ethics and laws will also require the impact of consumption to be traced. For instance, an organization called Foundation Earth will be piloting front-of-pack environmental scores on food items to evaluate customer responses in the UK. The environmental score is assessed through four key criteria including water usage, water pollution, biodiversity and carbon.[9]

African countries are in many cases in a relatively good position to adopt and certify sustainable farming practices to meet the growing global pressure for sustainability. Countries need to invest in monitoring and regulation to support producers with improved technologies.

6. Explaining price variations across ESA – preliminary findings

The last decade has seen significant fluctuations in the regional trade of maize (see section 3), while regional trade in soybean has begun to gain momentum in the last four years (see section 4). Studies have found that geographical distance and low trade volumes between ESA countries significantly contribute to weak price linkages (Pierre and Kaminski, 2019). Yet improved intra-regional trade through broader and deeper markets are an essential part in mitigating the risks associated with climate change through meeting demand and providing climate resilient agriculture that reduces the impacts of fluctuating food prices (Bell et al., 2020).

In this section, we discuss some preliminary findings that explain the price differences in maize and soybean across domestic markets in ESA. We note various concerns. Transportation, logistics and border issues are obstacles to regional markets working better. This is consistent with recent papers which highlight the impact they have in increasing the costs of relative 'remoteness' of producers from demand (see, for example, Brenton et al, 2014; Aggarwal et al. 2018). It reduces the returns to farmers and increases the prices paid by agribusinesses including processors supplying urban areas. As such, it compounds regional food net imports by undermining local production, and adds to high food prices for consumers.

While transport infrastructural development is important in reducing the costs faced by smaller traders, we note that the more prominent concern is that the region faces issues relating to competition and market power in transport, resulting in transport rates to smaller traders well above efficient rates. Issues in transport in the region, however, only in

[9] https://www.foundation-earth.org/pilot-launch/

part explain the varying prices of maize and soybean over space and time. Various ESA countries have engaged in the imposition of trade restrictions in the name of ensuring domestic food supply and to protect consumers from international food price hikes. However, studies have shown that trade restrictions, particularly on maize, have historically been ineffective in managing prices in the long run (Pierre and Kaminski, 2019; Mabiso and Pradesha, 2013; Gondwe and Baulch, 2017). Furthermore, a trigger in price shocks in one domestic market can generate lasting deviations in prices in adjacent markets within the region (Pierre and Kaminski, 2019), resulting in significant price differences over time.

Transport and market power

It is generally accepted that the prices of road transportation in different regions in Africa have been high relative to other regions in the world (Ncube et al., 2016; Teravaninthorn and Raballand, 2009; Vilakazi and Paelo, 2017; Vilakazi, 2018; Nsomba et al., 2020). This is the case even while the costs of trucking are not higher than in other regions. Fuel and labour are not more expensive than in other regions (indeed they are lower) and most trucks are relatively cheap second-hand imports. Moreover, improvements in trucking have been reported in the past decade, including with major investments in modernising truck fleets which have resulted in lower costs (Kunaka et al. 2016). However, routes within and through Tanzania are singled out as an exception in showing increases.

Evidence from the market observatory, along with other studies, points to issues relating to competition and market power in transport and trading. This includes protection of local truckers in some countries and observations of influential lead and large trucking companies (Byiers et al 2020; Sial, 2020).

There are various factors which contribute to high transport rates across the region, including structural and strategic entry barriers in transport markets, costs related to transit formalities, government intervention as well as the lack of transport alternatives (such as reliable railway transport). Moreover, the landlocked status of some countries such as Malawi, Zambia and Zimbabwe poses a development challenge with a greater distance to and from markets and a dependency on the transport and logistics networks of neighbouring countries through which products must travel (World Bank, 2021). The unbalanced trade in the region also means uncertainty of return loads for hauliers. Some routes, for example between Lusaka and Johannesburg, have seen improvements in this regard through higher levels of trade with lower costs (Vilakazi & Paelo, 2017).

We estimate what can be termed 'reasonable' transport costs and what can be targeted as 'efficient' rates on a per tonne per km basis in order to enable a comparison to the price differences observed by location. We acknowledge that there are many factors which need to be taken into account, including border costs and delays, length of trip (as the loading and unloading involves costs which are spread out over longer trips), volumes, and the potential for backhauls. Noting these caveats, recent studies have identified rates as low as US$0.03/t/km for Lusaka to Johannesburg and US$0.04/t/km for Blantyre to Johannesburg – these both long journeys benefitting from backhauls (with outward trips priced at roughly double meaning the average rate is around US$0.05 to US$0.06) (see Vilakazi and Paelo, 2017; Nsomba et al. 2020). However, they also involve multiple borders where there have been extensive problems noted and do not take into account recent apparent steps to improve transport routes with the most recent data being for 2019. Rates of US$0.03/t/km were also observed for Harare to Maputo, with a return rate of US$0.05, averaging US$0.04/t/km (Vilakazi and Paelo, 2017). A reasonable rate of US$0.06/t/km is thus simply the average being observed on some major routes. A rate around US$0.04/t/km is considered more in line efficient, competitive markets for road transportation (see also UNCTAD 2019).

Table 2: Indicative cross border trucking rates, US$ per tonne, per km, for given years

Route	Distance (km)	Katungwe (2015)	Vilakazi & Paelo (2015)	Nsomba et al (2019)
Lilongwe – Beira	944	0.08	0.07	0.06
Beira – Lilongwe	944	0.14	0.14	0.10
Blantyre – Beira	664	0.11	0.11	0.06
Blantyre – Jo'burg	1731			0.04
Jo'burg – Blantyre	1731			0.08
Lusaka – Jo'burg	1576#		0.04	
Jo'burg – Lusaka	1576#		0.08	
Harare – Maputo	1286		0.03	
Maputo - Harare	1286		0.05	

 # This is via Harare. The route via Botswana which is now being more widely used is 1736km and, while being longer, faces lower charges en route.

We compare how the efficient transport cost benchmarks match-up against price differences for soybean, along with information obtained from market participants about costs quoted in the May/June and July/August 2021 period. The May/June period indicates huge differences between some areas which translate into arbitrage margins that large traders with better market information than small participants and access to transport can make (Table 3). Noteworthy routes in this regard are Songea – Dar es Salaam, Mzuzu – Dar es Salaam and Lusaka – Nairobi, with potential margins net of transport costs being $502, $367 and $451 respectively. These are margins that were not accruing to smaller farmers and traders in Tanzania, Malawi and Zambia as they were receiving significantly low prices for their produce relative to what buyers in the markets were paying. In other words, farmers can earn *more*, and buyers can pay *less*, if they link better and reduce the trader & transport margin.

Table 3: Price differences for soybeans between locations and margins over efficient transport, May/June 2021

Locations	Distance (km)	Prices ($/ton)	Efficient transport cost *(Price difference net of transport)*
Songea – Dar es Salaam (June)	936	431 (Songea) 970 (Dar)	Transport: $37 *Extra margin +$502/t*
Mzuzu – Dar es Salaam (June)	1171	576 (Malawi) 970 (Dar)	Transport: $47 *Extra margin +$367/t*
Lusaka – Nairobi (May/June)	2286	393 (Lusaka) 936 (Nairobi)	Transport: $92 *Extra margin +$451/t*
Mzuzu – Kampala	1807	576 (Malawi North)	Transport: $72

(June)		849 (Kampala)	*Extra margin +$201/t*
Lilongwe – Kigali (May)	1929	567 (Malawi Central) 650 (Rwanda)	Transport: $77 *Extra margin +$6/t*
Kampala – Nairobi (June)	658	849 (Kampala) 936 (Nairobi)	Transport: $26 *Extra margin +$61/t*

Sources: various market participants

The July/August period saw an increase in prices in Malawi and Zambia resulting in a reduction in possible margins net of transport costs potentially as a result of the opportunities being realised from increased regional trade and better information to traders and farmers. Market participants and processors in cities like Lusaka, Mzuzu and Dar es Salaam can access lower cost supply, while smaller farmers and traders can potentially earn more on their produce if they are directly linked to processors. However, the sharp price increases in soybeans in 2021 mostly happened after the harvest in April & May in Malawi and Zambia.

Tanzania presents a specific case in this regard, where there appears to be separate markets inland. Prices in Songea, which is in south west Tanzania, have continued to remain relatively low into August and there appear to still be high margins between Songea and Dar es Salaam that are not explained by transport costs. This could be an indication of local market power within Tanzania, however, further research needs to be carried out to unpack the local market dynamics.

To illustrate the poor transport options that some are experiencing, market participants in Malawi indicated that those looking to export from Malawi to Rwanda were being charged around $230-250/t (for transport from Lilongwe to Kigali) or around US$0.12/t/km by Malawi transporters, and there were problems with transit through Tanzania. Tanzanian truckers offered rates of $175-180/t or US$0.09/t/km for this trip. Within Tanzania, there are also high rates being offered by local transporters meaning some participants resorted to small loads on buses at US$0.14/t/km to Dar es Salaam.

Trade and government interventions

Trade restrictions and government interventions on agricultural commodities have been widely used across ESA countries in order to stabilize domestic prices of staple grains (Porteous, 2017). Malawi, for instance, has used export bans to control trade flows of maize and soybean since the early 2000s for national food security and to benefit local buyers such as processors and poultry farmers (Edelman and Baulch, 2016). Kenya, Tanzania and Zimbabwe have also used the same rationale for imposing export bans on maize (but less so for other crops including soybeans).

Zambia has also historically imposed export bans on maize and mealie-meal from time-to-time, such as in October 2018, where the country experienced a slump in output to an annual quantity of 2.4 million tonnes down from 3 million tonnes in the previous harvest.[10] A series of export bans between 2008 and 2016 were also implemented as a result of poor harvests in some years due to poor rainfall and armyworms. However, in most years there were substantial surpluses which could have been exported and export earnings of approximately $1.4 billion were foregone (according to estimates of Chisanga et al., 2018).

Import restrictions on maize have also been imposed by some ESA countries to protect local producers. 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

[10] http://www.renapri.org/zambia-lifts-costly-maize-export-ban/

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. From early 2021, Zimbabwe imposed an import ban on maize, maize meal and other maize products to support domestic farmers and millers, alleviate the pressure on foreign exchange reserves and enforce stability of the national exchange rate.

In addition, ESA governments have employed various market intervention tools, in addition to trade measures, such as minimum farm gate selling prices, farmer support programmes, and government purchasing and stock release as ways to stabilise prices. These are countries that have substantially liberalised agricultural markets but where governments also continue to operate extensively in food markets (Chapoto and Jayne, 2009). Together with the impacts of climate change, transport costs and less resilient production systems, countries such as Malawi, Zambia and Tanzania have been found to have a high degree of price volatility and uncertainty attributed to discretionary trade policies and local market interventions (Chapoto and Jayne, 2009; Paul and Edelman, 2015; Pierre and Kaminski, 2019; Baulch and Ochieng, 2020).

Maize price volatility in domestic sub-Saharan African countries is also triggered more by price shocks in neighbouring countries than global markets (Pierre and Kaminski 2019; Sitko et al., 2014). We have observed above that the volatility in ESA countries for maize is much greater than in international prices. Trade restrictions and intervention in countries such as Malawi and Zambia appear to be associated with significantly higher levels of price variability than markets in South Africa, where the role of the government in price and trade controls is more limited (Sitko et al., 2014).

Trade restrictions and government interventions are much more prominent in maize markets, particularly because price seasonality is expected of a crop with a single harvest season (Baulch and Ochieng, 2020). Yet trade restrictions have been shown to strongly contribute to price volatility in the region. Malawi, has received much attention in this regard, with ad hoc export bans contributing to higher levels of maize price volatility in domestic markets (Edelman and Baulch, 2016). In some cases, export bans have been shown to be redundant, with domestic prices generally being above export parity price in some periods (Edelman and Baulch, 2016). Together with our assessment indicating that farmers have been receiving low prices that are often below the recommended minimum farmgate prices, attention should rather be placed on resolving issues relating to high transport costs and trader margins.

Discretionary trade restrictions have also led to considerable trading of grain across ESA through informal channels to by-pass the restrictions (Burke and Myers, 2014; Pierre and Kaminski, 2019). Informal traders deal in small quantities (usually just 50–100 kg at a time) without trading licenses and with no official record of their transactions (Burke and Myers, 2014). With hundreds or sometimes thousands of small informal traders operating daily, however, the aggregate volume of informal trade can be substantial. Informal trade links within the region have been found to be relatively competitive with rapid price transmission (Burke and Myers, 2014; Bouet at al., 2018), as opposed to formal trade links, where significant government involvements in formal cross-border trade led to a breakdown in spatial price transmission and have contributed to long run price volatility (Burke and Myers, 2014; Edelman and Baulch, 2016; Pierre and Kaminski, 2019).

In summary, while there is evidence that ad hoc trade restrictions have often not yielded their intended results and may have benefitted special interest groups, it is also clear that free agricultural markets have not worked so well. Issues of concentration and substantial market power in agricultural and related markets (such as for transport) mean markets within ESA are unable to function effectively. The issues that the market observatory has uncovered so far indicate that the focus needs to go beyond whether or not there is need for less or more government intervention. We need to address what are appropriate interventions to address the root causes for market outcomes, such as anti-competitive arrangements and poor infrastructure.

7. Conclusions

The region has potential for much higher levels of agricultural production in areas where there is abundant water and good arable land, while in other areas increasing water scarcity constrains output. The climate change emergency and Covid-19 have further pointed to the challenges of ensuring resilient regional value chains. The increases in volatility of rainfall and other extreme weather events, alongside the projected long-term dryer conditions from climate change in the southern part of the region, imply integrated and competitive regional markets are very important to mitigate the effects of supply shocks on food prices.

Market integration requires investment in logistics and storage facilities, alongside support for farmers to better manage water through increased use of irrigation, coupled with insurance to ride-out disasters. The data collated and assessed here demonstrate the case for a Market Observatory as part of the agenda for agriculture and regional integration in the face of climate change. Collecting data at the local level to have an accurate picture in close to real time of the market outcomes in each country and across the region is essential to assess the value of measures to support market participants and better integrated markets, and to demonstrate the practical implications of non-action. While the impacts of food insecurity are understood at a high level (as well as by those on the ground), it is striking just how poor the data are on wholesale prices within and across countries by location. The imputation of prices and econometric modelling (such as Bonilla Cedrez et al., 2020) is helpful but misses the volatility and outliers at a regional level which are very important to pick-up and evaluate. Regional transport markets are also a key part of the picture as transport costs are a significant percentage of the cost of imported products.

The available data assessed in the pilot phase of the market observatory indicate major concerns with the markets considered, and the related impacts on small farmers and agri-food producers. In the relatively mature maize industry, prices are volatile and differ substantially across different geographic locations within the region. These variations can be attributable to seasonality of the crop, limited market information and government interventions in the form of short-term trade bans. For instance, although ESA has had bumper harvests in the 2021/2022 season, maize prices in Nairobi are above $400/tonne due to import restrictions, prices are relatively high also in Dar es Salaam. On the other hand, prices in Zambia are extremely low at about $120-$130/tonne. In terms of seasonality, smaller farmers typically have to sell their maize soon after harvest and receive the lowest prices due to poor market opportunities whilst big traders with storage and transport facilities can sell at peak prices just before harvest. Although maize has the most available data, limited market information nevertheless undermines the bargaining power of small producers. The variability and volatility of prices points to the potential for large arbitrage profits by large players whilst undermining small farmers and processors.

On the other hand, soybeans are considered as the ‘green gold’ commodity as they are a key component of animal feed and impacts on the competitiveness of poultry and fish farmers. However, ESA is a net importer of soybeans and soybean oilcake. There are extremely high prices in some areas, even while the region has favourable climatic conditions great potential for expanding production to meet demand. There is limited price data for the commodity, while the price differences which can be observed across the region point to bottlenecks with transportation, logistics and border issues that hinder regional integration. Landlocked countries such as Malawi, Zambia and Zimbabwe have a greater distance to and from markets. Studies have highlighted a lack of competition and market power in transport and trading, including protection of local truckers in some countries and observations regarding influential lead and large trucking companies. For instance, even though we calculate the efficient transport rate to be $47/t between Malawi North and Dar es Salaam, there was an additional $367/tonne differential in soybeans prices in June 2021. The differential between Lusaka nad Nairobi was even higher at $451/t. This points to the arbitrage margins that the large traders with sufficient market information can make.

The region needs to act quickly to improve agricultural markets as this is essential to mitigating the threats of climate change. In 2020/21, the major producer of soybeans, Brazil, experienced the worst drought in a century. Climate change conditions, coupled with increased demand from China, led to increases in the price to around $600/tonne globally. In contrast, the ESA has had bumper harvests, however those countries dependent on deep-sea imports faced rising global prices, whilst countries which are less dependent on deep-sea soybean imports were more competitive.

Overall, the pilot phase of the market observatory has emphasised the importance of a better understanding of market trends, to identify competition concerns, within and across borders, and complementary measures such as for transport and logistics, storage facilities and other climate change mitigating strategies to foster regional integration.

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