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SCIENTIFIC ARTICLE

Nick VINKⒶ, Tracy DAVIDSⒷ, Mmatlou KALABAⒷ, Kandas CLOETEⒷ and Marion DELPORTⒷ

The Challenges to agri-food trade in Southern Africa

ABSTRACT

Deepening and expanding agricultural trade patterns require institutional and infrastructural investments that have to compete with other country and regional priorities such as expenditure on poverty alleviation and adaptation to, and mitigation of, the effects of climate change. As a result, arguments for expenditure on trade facilitation and on trade infrastructure need to be evidence-based. In this article we provide an overview of the wide range of challenges facing the Southern African region, then present two case studies that illustrate the benefits of investment in trade infrastructure. A reduction of 25% in the cost of regional trade in maize benefits producers and consumers, while reducing the cost of exporting citrus from South Africa leads to a 4.1% annual gain in revenue to producers.

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Ⓐ *Department of Agricultural Economics, Stellenbosch University, Stellenbosch 7600, South Africa. Corresponding author email: nv@sun.ac.za*

Ⓑ *Bureau for Food and Agricultural Policy and Department of Agricultural Economics, Stellenbosch University, Stellenbosch 7600, South Africa.*

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Introduction

The purpose of this article is to identify the main challenges confronting agricultural trade in Southern Africa. We take the African Union's definition of Southern Africa as point of departure, namely Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, noting South Africa's dominance of agricultural trade among these countries.

In the first section, we identify the main characteristics of trade flows in the region. This is followed by the identification of a series of challenges to the management of these trade patterns, with the emphasis on infrastructural deficiencies. The impact of inadequate infrastructure on regional trade is illustrated with two case studies in section 4. Section 5 concludes.

Agri-food trade flows in Southern Africa

Figure 1 shows exports and imports of agricultural products[1] expressed as a share of total sector output from 1990 to 2019. What is immediately evident is that while exports continued to grow after the formation of the World Trade Organisation (WTO) in 1995, the trend in trade growth continued beyond the global financial crisis (around 2008 and 2009), before imports started a long-term trend of relative decline around 2010. The export decline followed later, and a few years before the worst drought that affected the region in over a century.

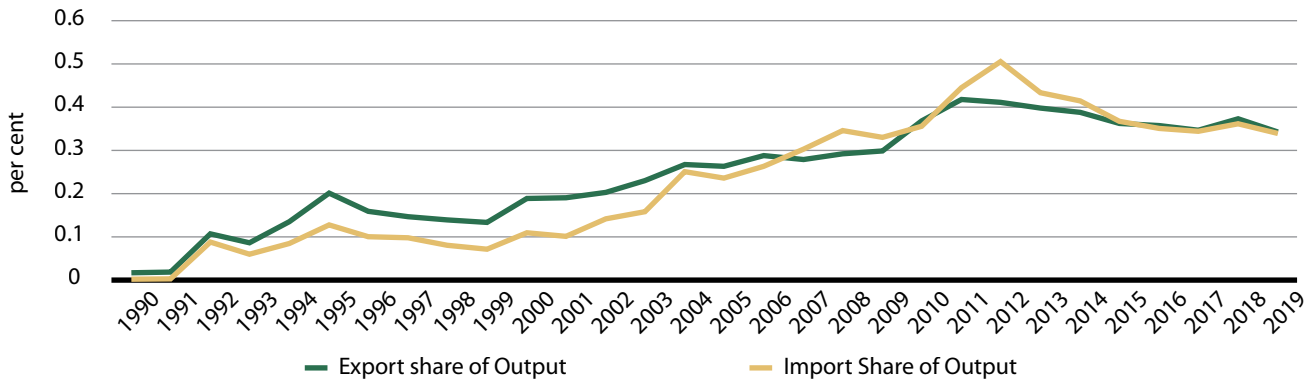

Figure 1: Southern African agricultural trade as % of output, 1990-2019.

Source: own composition based on WITS (2025) and ITC (2025) data.

[1] Defined as those in the Harmonised System (HS) Chapters, 01,02,04-24, 41-43 and 51-52.

Table 1: Average Southern African exports (1990-2023), nominal $m.

Products	Exports to RoA	Imports from RoA	Net exports to RoA	Exports to RoW	Imports from RoW	Net exports to RoW
Other processed	1,565.86	1,374.87	190.99	9,139.71	8,957.77	181.94
Animal products	422.23	337.99	84.24	2,935.99	4,439.42	–1,503.43
Field crops	1,063.02	676.82	386.20	827.95	1,305.81	–477.86
Horticulture	363.29	305.98	57.31	2,167.45	2,179.14	–11.69
Total	3,414.40	2,695.66	718.75	15,071.10	16,882.15	–811.04

Notes: ROA = Rest of Africa; ROW = Rest of the World.
Source: own calculations based on WITS (2025) data

Table 2: Regional and continental exports (in 1000 USD) and export shares (average 1990-2023).

	Exports to RoA	Exports to southern Africa	All exports	Export share to RoA	Export share to Southern Africa
Angola	28,389.39	1,273.00	37,011.67	77%	3%
Botswana	115,826.95	113,660.75	183,163.47	63%	62%
Eswatini	292,984.89	265,059.87	416,985.66	70%	64%
Lesotho	141,542.14	138,698.00	151,894.75	93%	91%
Malawi	309,836.40	172,417.34	1,173,608.92	26%	15%
Mozambique	181,309.80	166,013.29	698,807.18	26%	24%
Namibia	503,794.51	497,036.49	626,672.47	80%	79%
South Africa	4,183,375.00	3,346,016.06	11,901,283.62	35%	28%
Zambia	608,534.33	351,814.12	793,381.14	77%	44%
Zimbabwe	945,950.14	919,711.48	1,486,294.62	64%	62%

Source: own calculations based on WITS (2025) data

The Southern African region is a net exporter of farm products to the African continent, with "Other processed products"[2] the largest at an average of about $1.6bn per year between 1990 and 2023. Table 1 shows that the region is a net importer from the world. The largest imported product category is animal products[3].

Africa and the Southern African region are important destinations for agricultural exports. The region's dependence on South African exports is mirrored. Table 2 illustrates that all countries, except Angola, depend on the area as a market. Regional trade as a share of output has stagnated in the past decade. This is attributed to political instability and natural and geopolitical shocks in addition to macroeconomic challenges (e.g. Zimbabwe) and political decisions (e.g. Angola's concentration on the oil industry).

Challenges to agricultural trade in southern Africa

There are many opportunities and threats to agricultural trade in the Southern African region, but the purpose here is to identify those that are expected to have the greatest impact on agricultural trade in the region. In order to identify these, we start with a conventional environmental scan. The specific key challenges that we identify are discussed in terms of their potential impact on the region, rather than merely as components of the environment.

Political stability in the region

Table 3 is derived from the Worldwide Governance Indicators project of the World Bank (2024). This project assesses opinions about six elements of governance from a wide range of sources. Importantly, the elements are forward-looking to anticipated changes. Each element consists of a wide range of indicators, and a country's score is represented as units of a standard normal distribution, ranging from about -2.5 to +2.5, with the lower bound representing the weakest performance. According to these data, the region displays weak governance and political instability. Botswana scores highest in most of the elements, followed by Namibia. Zimbabwe scores lowest in four of the six elements, while South Africa has negative scores for three of the six. This latter observation is important, because the bilateral trade between South Africa and Zimbabwe was for a long time the largest flow of intra-Africa trade.

For southern Africa, only 16 of the 60 scores for the ten countries are positive. Botswana has been able to maintain its expected political stability since 2002, and has improved control of corruption since 2020 after a decline that had lasted for a decade (2010-2020), but it has lost ground in the other four elements. Namibia has seen an improvement in the maintenance of the rule of law (from 2017) and in voice and accountability (from 2008), but a weakening in the other elements from around 2008. At the other extreme, Zimbabwe, with its low scores, has seen an improvement in

[2] Other processed products include Harmonised System (HS) Chapters, HS11, 13-16; 18- 23, 41-43 & 50.
[3] Animal products are included in HS 01, 02, 04, 05 and 51.

Table 3: Political stability and governance in Southern Africa, 2014-2023.

Element	Angola	Botswana	Eswatini	Lesotho	Malawi	Mozambique	Namibia	South Africa	Zambia	Zimbabwe
Political Stability	–0.45	1.03	–0.34	–0.28	–0.16	–0.95	0.60	–0.37	0.08	–0.82
Government Effectiveness	–1.05	0.36	–0.66	–0.87	–0.78	–0.84	0.13	0.03	–0.70	–1.27
Regulatory Quality	–0.83	0.60	–0.46	–0.55	–0.79	–0.71	–0.01	0.02	–0.55	–1.54
Rule of Law	–1.02	0.43	–0.44	–0.36	–0.31	–1.01	0.34	–0.04	–0.43	–1.33
Voice and Accountability	–0.95	0.46	–1.33	0.03	–0.01	–0.48	0.55	0.68	–0.24	–1.16
Control of Corruption	–1.09	0.72	–0.38	–0.15	–0.65	–0.82	0.25	–0.12	–0.55	–1.30

Notes: The country's score is given in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5. Green denotes the country with the highest score (i.e. the best performer for that element), orange the second highest, and red the lowest.
Source: own composition based on World Bank (2025) data

all six elements from around 2007-2009, but sentiments still remain in negative territory despite almost two decades of improvement.

The general trend across the countries is one of negative expectations. Seven of the countries have lost ground in terms of government effectiveness and regulatory quality, and five each in terms of political stability and violence, and the rule of law. These are all elements that are vital to smooth and growing trade between the countries of the region, hence the outlook is not positive, and is only somewhat mitigated by the fact that six of the countries are better off now in terms of the voice and accountability element.

People and the social environment

The social environment includes issues that affect the well-being of the people of the region, and conventionally this includes their levels of education, health status, access to services, mobility, and their material wealth. The World Development Indicators of the World Bank provides a comprehensive list of indicators along these dimensions. The challenges facing the region are reflected in some of these, shown in Table 4. The following implications are pertinent:

- South Africans have the best access to services, scoring highest in three of the four indicators. However, the country does less well on indicators of education and health. Botswana's population has relatively good access to basic services, scoring highest in access to basic drinking water, second highest in access to basic sanitation, having the best primary school pupil/teacher ratio and the highest life expectancy.
- The Gini Index shows that South Africa is one of the most unequal societies in the world with little improvement over the past 30 years. The other countries also don't fare well, with only Lesotho and Malawi scoring lower than 0.5. Where South Africa scores highest is in the proportion of women in parliament.
- Some 200 million people live in Southern Africa, up from 100 million in 1993. This increment is, however, less than the increase in sub-Saharan Africa (SSA) as a whole, as the region now makes up 15.9% of the SSA population, compared to 18.7% in 1993.
- The region's population is on the move, both internally and across international borders. Half of the countries have urban population growth rates in excess of 4% per year, while only South Africa and Namibia have a net positive rate of in-migration. Migration is partly demand-led, but also the result of political instability. The UN High Commission for Refugees (UNHCR), for example, highlights the crises in northern Mozambique as well as

Table 4: Selected indicators of social well-being in Southern Africa, 2014-2023

	Angola	Botswana	Eswatini	Lesotho	Malawi	Mozambique	Namibia	South Africa	Zambia	Zimbabwe
Access to electricity (% of population)	48.50	75.90	82.30	50.00	14.00	33.20	56.20	86.50	47.80	50.10
% of poorest 40% with a bank account	..	47.59	61.21	58.64	33.09	34.48	56.38	77.82	32.91	46.92
% using at least basic drinking water	57.72	92.57	73.47	73.97	71.87	63.20	85.91	94.49	68.25	62.29
% using at least basic sanitation	52.18	80.55	64.42	50.28	49.24	37.38	35.84	77.63	36.30	34.62
Literacy rate (% ages 15 and above)	72.40	86.82	90.75	82.01	68.08	61.00	88.00	95.00	87.50	89.85
Pupil-teacher ratio, primary	50.03	23.71	26.60	32.95	58.68	55.27	25.09	30.33	42.06	..
Life expectancy at birth (years)	62	66	56	53	63	60	58	61	62	59
Proportion of women in parliament (%)	33.64	11.11	13.51	26.45	22.92	42.40	44.23	46.50	15.06	30.57
Gini index	51.2	53.30	54.60	44.90	38.50	50.30	59.10	63.00	51.50	50.30
Net migration	–995	–7,306	–8,549	–6,023	–5,231	–34,936	22,212	233,284	–8,566	–102,828
Urban population growth (% p.a.)	4.06	2.51	1.86	2.64	4.17	4.42	4.55	2.13	4.01	1.99
Per capita GDP as % of World GDP, 2023	0.18	0.59	0.27	0.07	0.05	0.05	0.32	0.46	0.10	0.16

Green denotes the country with the highest score (i.e. the 'best' performer for that indicator), orange the second highest, and red the worst performer.
Source: own composition based on World Bank (2025) data

the protracted refugee situations in Botswana, Malawi, Namibia, Zambia and Zimbabwe (UNHCR, 2025), while Human Rights Watch (2024) discusses the impact of political instability as the source of the refugee problems of the region. These migration patterns result in a strain on urban infrastructure and hence on social service delivery throughout the region, resulting in excessive informal economic activity, which adds layers of direct and indirect costs (in the form of waste, for example of food, energy and water).

The general poverty in the region creates a need to spend on social infrastructure, but this diverts money away from necessary spending on the physical and institutional infrastructure required for trade.

Limited structural transformation

Part of the reason for mobility in the region's population rests in the search for economic opportunities. Table 5 presents unemployment rates, which remain in double digit territory for most of the countries and have only improved in 3 countries over the past decade. Real GDP per capita in constant purchasing power parity (PPP) terms reflects limited purchasing power in the region, a critical constraint to increased intra-regional trade. Concerningly, it also illustrates that improvements in spending power have been slow at best, with negative growth in more than half the countries of the region.

Economies remain largely resource-based, relying heavily on agriculture, mining and energy, with slow development of industrial manufacturing. Figure 2 presents the share of agriculture in total GDP on average over the past three years, along with the average annual change over the past 30 years.

Agriculture's dominance stretches beyond just output, with half of the countries relying on primary agricultural commodities for foreign exchange. Furthermore, agriculture remains the dominant source of employment in the sector, accounting for anything from 13.8% of total employment in Eswatini to as much as 69% in Mozambique. Conversely, industry accounts for only 14.8% of total employment on average (World Bank, 2025).

The persistence of agriculture's strong contribution reflects the slow process of structural transformation in the region. Rodrik (2018) noted that many African economies

Table 5: Income and unemployment in southern Africa.

	Unemployment 2024	Unemployment 2015	Real GDP per capita (PPP) average 2022/24	Growth in GDP per capita 2015/24
	%			
Angola	14.5	16.5	8,870	–3.0
Botswana	23.1	18.9	17,200	1.0
Eswatini	34.4	23.3	10,989	1.9
Lesotho	16.1	16.3	2,858	–1.7
Malawi	5.0	5.0	1,530	0.2
Mozambique	3.5	3.4	1,483	–0.2
Namibia	19.1	20.8	10,255	–2.3
South Africa	33.2	25.1	13,892	–0.9
Zambia	6.0	5.9	3,686	0.2
Zimbabwe	8.6	5.4	4,430	–0.6

Source: own composition based on World Bank (2025) data.

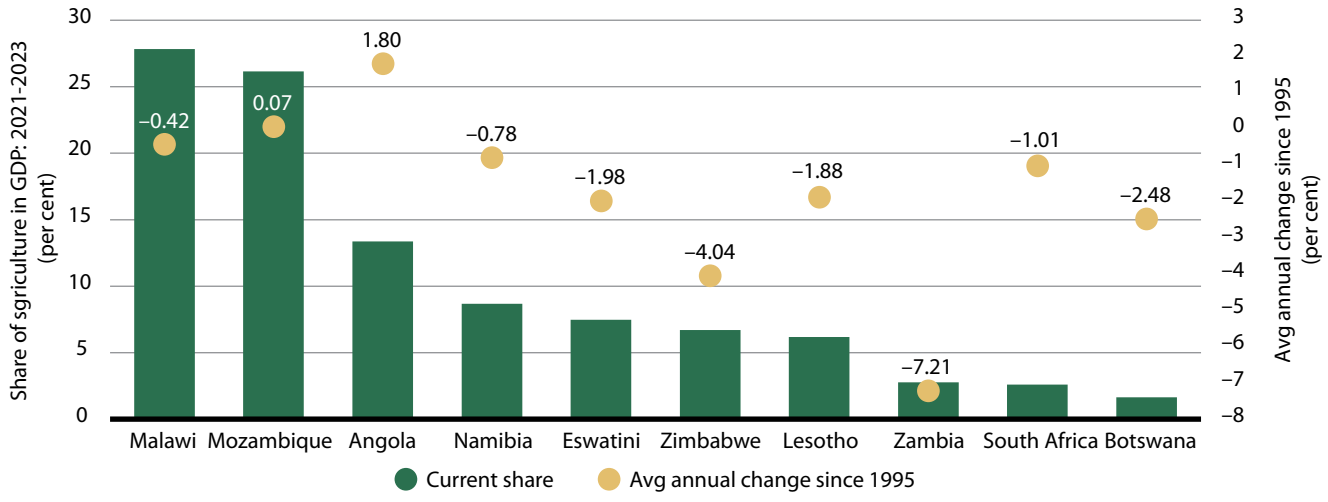

Figure 2: Share of agriculture in total GDP.

Source: own composition based on World Bank (2025) data

have de-industrialised, with labour shifting into informal, low productivity services, thus limiting potential growth in manufacturing. Structural transition to higher value adding sectors is critical to increasing overall income and purchasing power (McMillan *et al.,* 2014), thus structural change in Africa is critical to both improved spending power and advancing international trade.

Despite the slow overall pace of transformation and regression in some countries due to policy uncertainty, such as Zimbabwe's land reform programme and premature deindustrialisation in South Africa (Andrioni and Tregenna, 2021), there are also success stories, particularly in food manufacture. Reardon *et al*. (2021) note the emergence of several, often unaccounted for SMME processors in food value chains, which could contribute more meaningfully in an enabling environment that facilitates growth.

The technological environment

While the reach and speed of mobile and internet connectivity has improved globally and has led to some efficiencies in agricultural trade, not all sub-sectors and service providers have benefited from this access equally. Rural areas still suffer from poor connectivity, hindering their communication efficiency as well as access to digital marketplaces and real-time data (TechAfrica News, 2024). Border authorities in Southern Africa still largely rely on non-digitised systems and widespread inefficiency causes delays for perishable agricultural produce.

This lack of digital infrastructure has also reduced the attainable gains in cost reduction and efficiency enhancement, e.g. smart livestock monitoring, automation and precision irrigation in horticulture, and active participation in digital markets. Sustained but incomplete efforts to harmonise seed policy in the region, for example, have limited region-wide adoption of the latest seed technologies (Kassie *et al.,* 2013), which could potentially reduce the time lag between release of a variety and its access by farmers (Langyintuo *et al.,* 2010), while non-adoption of modern banana handling systems has resulted in high post-harvest losses in Zimbabwe (Mvumi *et al.*, 2016).

Without the latest technologies, tracking livestock origins and health history across borders becomes nearly impossible, an important factor given the Foot and Mouth Disease status of some regions in southern Africa. Countries that have been able to achieve this, such as Namibia and Botswana, have successfully exported premium products to Europe. Moreover, an adequate cold chain is vital for meat and fresh produce trade, and IoT-enabled technologies offer opportunities to improve such a chain's integrity, but high road transport and logistics costs have inhibited the degree of value chain integration within the region (Gregory and Bumb, 2006).

Furthermore, digital certification platforms for horticultural exports (e.g. GlobalG.A.P.) have encouraged transparency of product standards between producers and retailers (Tennent and Lockie, 2012) and enabled South Africa's participation in the global market. Surplus production in turn ensures local (and regional) affordability of products. The certification of herbicide and pesticide technologies that will enable weed, insect, etc. control without damaging the environment or jeopardising human health is as important. Examples from Mexico (Alcantara-de la Cruz, 2021) and France (Jacquet *et al.,* 2021) emphasise the potential dangers of neglecting this aspect.

In summary, while technological advancements offer transformative potential for agricultural trade, their uneven adoption and infrastructural limitations continue to constrain the sector's competitiveness in the region. Bridging the digital divide, harmonising regulatory frameworks, and investing in scalable, climate-smart innovations are therefore critical to unlocking the full benefits of technology.

Trade institutions

Five of the regional countries belong to the Southern African Customs Union (SACU), while all 10 are members of the Southern African Development Community (SADC), which has six other members from beyond the region. Four (Eswatini, Malawi, Zambia and Zimbabwe) are members of the Common Market for Eastern and Southern Africa (COMESA), which has another 15 members, while all are members of the African Continental Free Trade Area (AfCFTA) along with all other African countries. Even in SACU, where there are not supposed to be any hindrances to trade, there have been incidents of practices that are inconsistent with the agreements, when, for example, countries don't seek to resolve the matter before executing what are deemed retaliatory measures. This is usually attributed to a lack of protection from tariffs during adverse situations, such as supporting local producers to sustain competition from regional exporters.

Import tariffs in the region are generally low, often leaving local producers vulnerable to imported products. More importantly, South Africa's dominance in agricultural trade can be very disruptive. While more than half (53.8%) of the total tariff lines for SACU's common external tariff are duty-free, some products have tariffs higher than 50%, mostly at South Africa's insistence, e.g. some poultry meat and cheeses, pineapples, and worn clothing. The highest *ad valorem* rate (95%) applies to some dairy products, and the highest *ad valorem* equivalent (532.3%) applies to some worn textile articles. While these high tariffs are exceptions, they are also seen by competitors as a means of protectionism against the spirit of international trade.

Another practice by South Africa and its SACU members that has caused tensions is the use of contingency trade remedies, including anti-dumping duties, countervailing measures and safeguard measures. Between 2014 and 2022, South Africa initiated 25 anti-dumping investigations, while it already had 40 in force on 19 categories of products (WTO, 2025). Several safeguard investigations were initiated, provisional and final measures were adopted or extended, and investigations were terminated during this review period. A bilateral safeguard measure on frozen chicken cuts from the EU expired in 2022. While fewer than 5% of these initiatives involved the agricultural sector, these were in sensitive industries such as poultry, potatoes and milling products.

Environment and climate change

Southern Africa has experienced intensifying environmental challenges, primarily driven by climate change, which affects food systems in several ways ranging from direct effects on crop production to changes in markets, food prices, and supply chain infrastructure (Gregory *et al.*, 2005). The region has witnessed a marked increase in average temperatures, more frequent and severe droughts, erratic rainfall patterns, and extreme weather events (Sabola, 2024). These shifts have had differentiated impacts across agricultural subsectors:

- *Livestock:* The prevalence of extensive, pasture-based systems suggests that the livestock sector is particularly vulnerable to heat stress, water scarcity, and pasture degradation, leading to increased mortality, reduced fertility, and lower milk and meat yields. Additionally, the spread of vector-borne diseases such as Rift Valley fever and tick-borne illnesses has intensified under warmer conditions (Nhemachena *et al.,* 2020).
- *Field Crops:* Staple crops such as maize and sorghum have often experienced declining yields due to shortened growing seasons, increased evapotranspiration, and soil degradation. Rain-fed agriculture, which dominates the region, is especially susceptible to rainfall variability. Crop failures linked to droughts have become more frequent, undermining both food security and export potential (Sabola, 2024). For instance, in 2024 drought resulted in a year on year decline in maize production of 50% in Zambia, 70% in Zimbabwe and 20% in South Africa.
- *Horticulture:* While horticultural crops offer high-value trade opportunities, they are sensitive to temperature extremes and water availability. Climate-induced disruptions in flowering and fruiting cycles, coupled with increased pest and disease pressures, have constrained productivity and quality standards required for export markets (Nhemachena *et al.,* 2020).

From a trade perspective, these environmental challenges can lead to declining and/or more volatile yields and quality inconsistencies, which reduce competitiveness in global markets. Adaptation measures such as climate-resilient seeds, irrigation, shade netting, and pest control, etc. raise production costs while supply shocks exacerbate price volatility, complicating trade planning and contract fulfilment.

On the other hand, environmental challenges also create opportunities resulting from enhanced resilience through the adoption of climate-smart agricultural practices such as conservation agriculture, integrated pest management and drought tolerant crop varieties (Sabola, 2024). Growing global demand for sustainable and traceable agricultural products has also attracted investment in green technologies and climate-resilient infrastructure, offering new pathways for trade diversification.

These environmental challenges are reshaping the trade landscape, not just through adaptation measures but also through mitigation strategies and policies among some trade partners. While the threats to productivity and trade competitiveness are significant, they are not insurmountable. Strategic investments in climate adaptation, regional cooperation, and sustainable agricultural practices can turn them into catalysts for innovation and inclusive trade growth.

Infrastructure

Agri-food trade in Southern Africa is significantly constrained by infrastructure-related challenges. Awuah (2024), for example, reports that logistics inefficiencies can elevate food prices by up to 75%, and the African Union's emphasis on improving transport and trade infrastructure underscores that inadequate roads, unreliable fuel supply, and poor logistics are major impediments to intra-African agri-food trade (African Union, 2025).

Ports serve as critical nodes in the agri-food supply chain. However, most ports in southern Africa are plagued by congestion, outdated infrastructure, and inefficient customs procedures. These result in significant delays and elevated logistics costs (e.g. Munuhwa and Hove-Sibanda, 2024; Randrianandrasana *et al.*, 2024). Border posts are another critical component of the trade infrastructure. Inefficiencies create bottlenecks that, along with poor roads, the lack of return loads[4], and limited competition among transporters, result in higher transport costs (Arndt and Roberts, 2018).

A related problem is the availability of fuel, especially in landlocked countries (e.g. WFP, 2023). The Rockefeller Foundation (2022) highlights that broken distribution channels and logistical inefficiencies – including those caused by fuel shortages – are major contributors to post-harvest losses, which reduce income for smallholder farmers and disrupt market access. The World Bank (2021) also emphasises that while agriculture is central to poverty reduction, logistical constraints remain key barriers.

Rail transport presents a cost-effective alternative to road, but the rail infrastructure is outdated and poorly maintained. Luke and Walters (2023) recommend targeted investments and regulatory reforms to revitalise the rail sector. Similarly, reliable electricity supply, vital for processing, storage, and transportation within the agri-food supply chain, is bedevilled by limited rural electrification and frequent power outages. Of course, perishable agricultural products depend heavily on energy sources for a functioning cold chain. Awuah (2024) notes that the highest levels of fresh food losses occur in the early stages of the supply chain due to poor logistics and absent cold chain facilities. Finally, trade facilities such as warehouses, distribution centres, logistics hubs and storage facilities are also integral to the agri-food supply chain.

The negative impact of these deficiencies poses significant challenges to agri-food trade in southern Africa. Addressing them requires coordinated investments and policy reforms, and an accurate understanding of the impact that they have on intra-regional trade

[4] Note that almost 80% of South Africa's agricultural exports into the rest of Africa are transported by road. Because imports into South Africa are only a third of this, two thirds of returning trucks are empty.

The impact of infrastructure limitations

Dewberry (2020) demonstrated that improved logistics performance can significantly enhance intra-African agricultural trade. In this section we present two further case studies to quantify this impact, using partial equilibrium models. The first is focussed on maize trade across five Southern African countries and the second on citrus in South Africa. Both models are dynamic and recursive in nature, based on balance sheet principles and specified in line with partial equilibrium modelling principles. The primary difference is the method of closure, designed in each instance to provide the best possible replication of market structure and price formation principles. The use of a simulation model enables *ex ante* analysis, while the choice of model structure represents a trade-off between broad sector coverage and the level of detail required to replicate the unique price formation mechanisms for the commodity in question.

The modelling analysis was conducted in two phases, starting with the simulation of a forward-looking baseline, based on macro-economic assumptions contained in the International Monetary Fund's World Economic Outlook and a set of other assumptions related to technological advancement over time and stable weather conditions. The baseline presents a benchmark against which the alternative scenarios can be measured.

High trade costs affect affordability of core food staples

Maize is the core food staple commodity in southern Africa. The analysis was prepared using the multi-market model first specified in Davids *et al.* (2018). The model covers 13 countries across Southern, East and West Africa, with differences in commodity coverage across the countries. Maize is included in all countries.

Model specification is based on a combination of econometric assessment, economic theory and specialist input, in line with supply and demand responses. Its novelty rests in the trade specification and market closure, which enables multiple simultaneous market interactions across various trade regimes (Davids *et al.*, 2018). Prices represent an equilibrium where total supply in each country is equal to total demand, with trade providing dynamic influence between markets based on arbitrage opportunities in a spatial equilibrium specification, but with finite elasticities. Trade is influenced not only by relative prices, but also trade related costs, including tariffs and transport rates. When arbitrage opportunities initiate trade, associated market interactions occur. This representation was developed to capture multiple dynamic price relationships between maize markets. Apart from South Africa, which has a well-developed yellow maize sector, these markets bear limited influence from global dynamics, given the predominance of non-GM white maize. While no single county is large enough to move global markets, there is significant influence between markets within the region, particularly when trade occurs (Davids *et al.* 2017).

In evaluating the impact of transport connectivity on food security in Africa, Kunaka *et al.* (2025) suggest that long supply chains and inefficient distribution systems increase regional trade costs by up to 25%. Transport expenses can account for up to 45% of the cost of lower value commodities, while the cost of trade is 20% higher between African countries than between them and external trade partners. This perpetuates food insecurity, raising the cost of food in net importing countries and limiting potential revenues in net exporting countries.

To illustrate the impact of high transport costs on maize markets in Southern Africa, a 25% reduction in freight rates is modelled. Figure 3 presents a summary of the key results, measured as the average difference between the "business as usual" and the reduced cost scenario between 2026 and 2030.

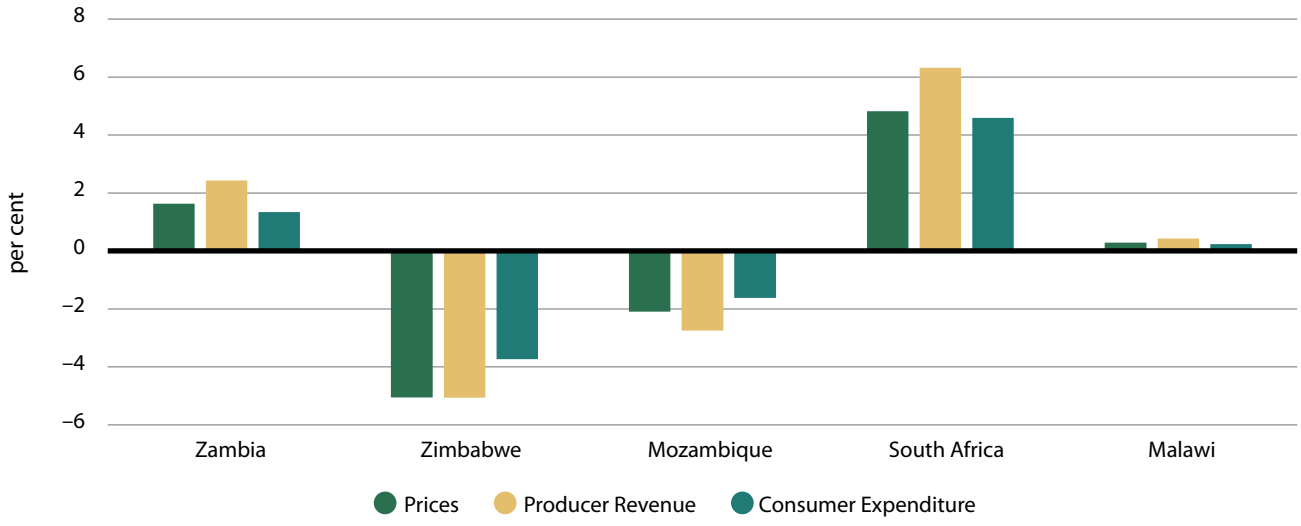

Figure 3: The impact of reduced transport costs.
Source: own composition

There are two key points worth noting:

- In surplus producing South Africa and Zambia, the reduction results in higher prices on average, as prices do not have to fall as far for arbitrage opportunities to initiate trade. This suggests that more products can be exported, but at a higher average price. The price increase ranged from 0.3% to 4.8%. Producer revenue in these countries also increased, from the higher price as well as higher production volumes as producers respond to improved prices.
- In deficit countries that typically import maize to supplement domestically produced volumes (such as Zimbabwe and Mozambique), prices declined, as imports became more affordable due to reduced trade costs. The decline ranged from 2.1% to 5.1%. Despite higher volumes consumed, consumer expenditure on maize in deficit countries declined due to improvements in affordability, bolstering food security.

While the impacts may seem small, a 25% reduction is conservative, given the high share of trade costs in total revenue. Further, while the simulation model quantifies impact just on the maize sector, all of agriculture will benefit from reduced trade costs, hence total impact will be substantially higher.

Cost of port delays affects profitability in South Africa

To illustrate the impact of high trade costs oriented to exports, the second case study considers South Africa's citrus industry (BFAP, 2025). Citrus is the biggest contributor to agricultural exports in South Africa, with most production shipped through Durban, whose port has experienced severe congestion challenges in recent years.

Given South Africa's position as the largest exporter of citrus from the Southern hemisphere, logistical delays evidently result in price impacts in destination markets. In this case study, the cost of inefficiencies was represented in direct costs, indirect costs and waste, where indirect costs refer to market impacts and lower prices resulting from volume fluctuations and the need to redirect products to alternative markets as a result of delays and subsequent quality impacts. Waste refers to products not harvested, not packed or not shipped due to quality implications.

Direct costs (including additional costs on farm, in the packhouse, cold storage facilities, transportation, stacking in port and additional handling, and re-packing costs at destination on affected cartons) are estimated at R1.56 billion in 2024, amounting to R654 per tonne exported, or 8.8% of the export price. Indirect costs are tougher to quantify, thus this scenario focusses on direct costs, making it conservative, but still illustrating the potential producer response to improved returns on exports as a result of improved logistical efficiency.

The model disaggregates oranges, soft citrus, lemons and grapefruit. Supply responds to changes in export revenue, domestic fresh sales and fruit sent for processing, whereas demand, both domestically and in key export markets, is driven by changes in consumer income, price and population dynamics. Producers supply into any one of the three market segments, responding to relative price changes – hence if export prices increase relative to alternative market segments, additional produce will be exported, considering that quality differentials mean that a share of produce will always be destined for domestic fresh and processing sales. The simulation accounts for reduced revenue in other market segments should more produce be shifted into exports. It also considers the impact that additional volumes from South Africa would have on prices, which will offset some of the benefit of the revenue gains from cost savings.

After simulating the baseline, an alternative scenario is presented, where returns from exports are increased by 8.8% in the event that inefficiencies from port congestion can be overcome. While substantial investment in capacity will be required, along with operational improvements, it remains a conservative estimate given that indirect impacts are not considered. The adjustment is phased in over a three-year period starting in 2026. Results are presented as an impact relative to the baseline by 2034, as the long-term nature of the industry, where trees take time to establish and reach full production, requires time for the production response.

Figure 4 presents the results. The greatest benefit is attained in oranges and lemons, both of which currently comprise a substantial share of fruit produced for processing

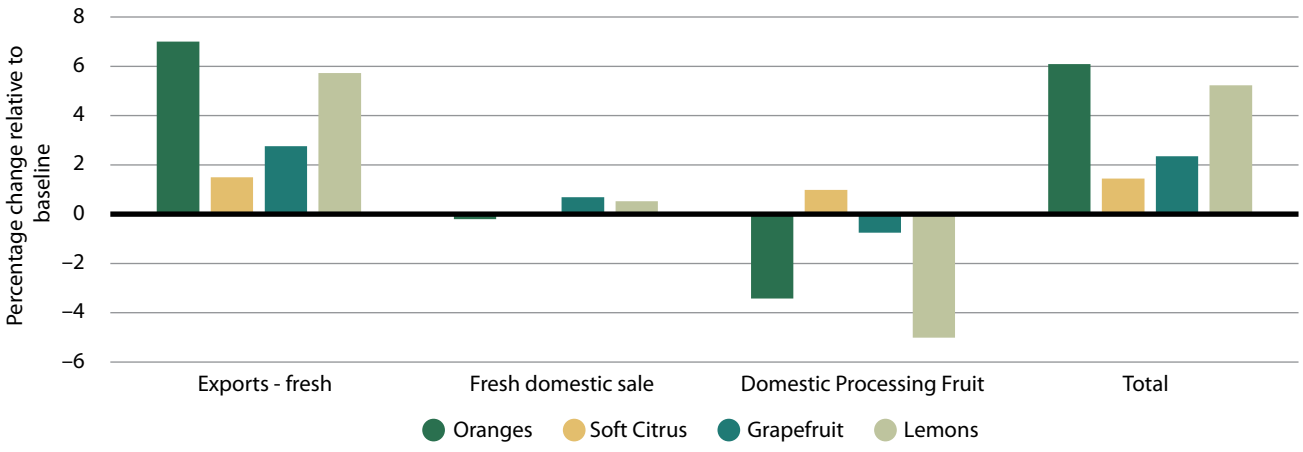

Figure 4: Percentage change in revenue in 2034.

Source: own composition

that could be diverted to exports. This is also reflected in the reduction in revenue from processed fruit. In the case of grapefruit, the potential benefit is smaller. For both grapefruit and lemons, revenues from domestic fresh sales also increase marginally.

The additional revenue attained from soft citrus is the smallest amongst the different products. In this case the expectation of significant additional volumes from already established orchards brings prices under pressure, limiting further expansion. The expected additional volumes raise additional revenue in both the export and processing markets, with limited impact on fresh market revenues, as volume and price movements are largely offsetting.

In total, across all 4 products, in all 3 market segments, the additional revenue generated amounts to R2.3 billion per year by 2034, equal to a 4.1% gain in producer revenues, from a reduction of 8.8% in total logistical costs. The fact that the full benefit of 8.8% does not accrue to producers reflects the impact that additional export volumes from South Africa has on prices, as South Africa is the biggest exporter of fresh citrus during the Southern Hemisphere season.

Conclusions

Agricultural trade in the southern African region is dominated by South African exports into and imports from the region. Deepening, expanding and balancing these trade patterns requires institutional and infrastructural investments that have to compete with other country and regional priorities such as expenditure on poverty alleviation and adaptation to and mitigation of the effects of climate change. Trade challenges revolve largely around the institutional and physical infrastructure required to facilitate trade, including regional integration mechanisms, closer cooperation in problem solving, and roads, ports, railways, and energy supply for cold chain logistics. Social aspects encompass political stability, policy certainty and poverty alleviation, while adaptation and mitigation require attention to almost all aspects of agricultural production, distribution and processing at all levels of the supply chain.

Our purpose was to identify these challenges and to emphasise the constraints to government action. As a result, we argue that arguments for expenditure on trade facilitation and on trade infrastructure need to be evidence-based. In this article we have provided an overview of the wide range of challenges facing the region, then presented two case studies that illustrate the benefits of such investment. These represent important arguments in favour of investments needed to support regional trade in agricultural products.

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