Impact assessment:

The price of logistical inefficiencies in the South African citrus value chain

13 February 2025

Citrus Growers' Association

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Introduction

Citrus is South Africa's biggest agricultural export industry. Spanning close to 96 000 hectares across 17 different production regions, production for 2024 is estimated to surpass the 3.5 million tonnes mark. Exports are not only the biggest market outlet from a volume perspective, but also even more important from a value perspective. Against a production volume share of 65% on average, exports were responsible for 94% of the value generated by the industry. Conversely, with limited value add from a grower perspective, the 25% of produce supplied to juice factories generate around 3% of the value of the industry, with the complement (3% of value for 5% of volume) from the local fresh produce markets. With growing volumes, especially in the case of mandarins and lemons, the total industry value for 2023 stood at R33 billion, a value that is estimated to be maintained in 2024. In the process, the industry maintains in excess of 140 000 jobs on farms and in packhouses at a rate of roughly 1 job for every 1 150 export cartons, and make major contributions to forex – to purchase much needed inputs – and upholds many a rural town's economy and the livelihoods of those who live and work there.

Generating this value, especially from exports, and maintaining efficiency in the value chain to ensure producers are adequately compensated to ensure the sustainability of the industry is no easy feat. The industry has been marred by a slew of challenges: a pandemic-related logistical crisis which saw the cost of shipping skyrocketing, increasingly stringent sanitary and phytosanitary (SPS) protocols in export markets, rapidly rising production cost related to the impact of the war in Ukraine, market prices under pressure due to high global inflation rates, severe port inefficiencies in South Africa and loadshedding, to name a few.

Challenges in domestic ports is of particular concern, especially given the projected increase in the export volumes according to the industry's biological model for the coming years. This document presents the findings from an initial quantification of the costs associated with logistical inefficiencies in the South African citrus value chain. The assessment was hindered by a lack of data availability and inconsistencies in the existing data sources. However, through stakeholder engagement, multiple triangulation attempts using limited data points, variable isolation and aggregation, and by applying a good dose of common sense, we believe this report presents an accurate estimate of the cost of the logistical inefficiencies burdening the South African citrus industry.

The report provides a brief, largely qualitative overview, of observations regarding the season's exports and why the performance of domestic ports is deemed part and parcel to the increase in direct expenditure, indirect cost and waste in the citrus value chain. The latter will then be quantified by highlighting key factors contributing to the cost before concluding with a segment on the factors that cannot necessarily be quantified (at this point in time, or ever).

Observations from inspections and exports

In a recent publication, REPORT ON THE STATE OF SOUTHERN AFRICAN CITRUS EXPORT LOGISTICS AND SHIPPING 2024, Mitchell Brooke from the Citrus Growers' Association (CGA) provides a comprehensive overview of the citrus production volumes from the different production regions and how that feeds into export corridors. At port level, cold storage facility and utility, specialised reefer vessels and containerised shipping, en route cold treatment are covered, before concluding with some noteworthy developments in the field of logistics and shipping relevant to the South African citrus industry. The industry export overview in this BFAP report is largely complementary to the report mentioned above. Interested readers can first familiarise themselves with the contents of that report before delving deeper into this study regarding the cost of inefficiencies in the logistics chain.

With citrus cultivation in most of the provinces of South Africa, but ports situated in KwaZulu-Natal (Durban), Eastern Cape (Gqeberha/Coega) and Western Cape (Cape Town), the production volumes for export are predominantly channelled to the closest port, with Maputo also becoming an option to producers in recent years. Although citrus exports through Maputo is currently insignificant (0.7% of total exports), the port is closer than Durban for many producers in the north. Producers in Limpopo, Mpumalanga, North West and KwaZulu-Natal generally make use of the northern corridor – route to export market via Durban, with producers in the Eastern Cape utilising the central corridor that is serviced by different shipping lines from Gqeberha and Coega respectively. Lastly, producers in the Western Cape and Northern Cape production region under normal circumstances would utilise the western corridor, shipping from Cape Town.

As a collective, these three corridors are responsible for the supply of global markets. The value chain typically involves harvesting and packing, after which the cartons undergo the PPECB inspection, trucking and cooling, and finally shipment. **Figure 1** shows the weekly inspection and export volumes for 2023 and 2024. From both years it is clear that export volumes are more volatile than inspection volumes. This is confirmed by a rolling two-weekly standard deviation analysis over the past four years, which returned that inspection volume during the peak season (around week 14-39, or April to September) hovers between 0.5-1 million cartons, whereas the standard deviation for exports varied between 0.5-2.5 million cartons. Thus, while factors affecting production, packing, trucking to port and cooling can play a role in the variability of supply for shipment (e.g., week 22-24 of 2024), it appears that generally it is within the port that most variability in the value chain creeps in.

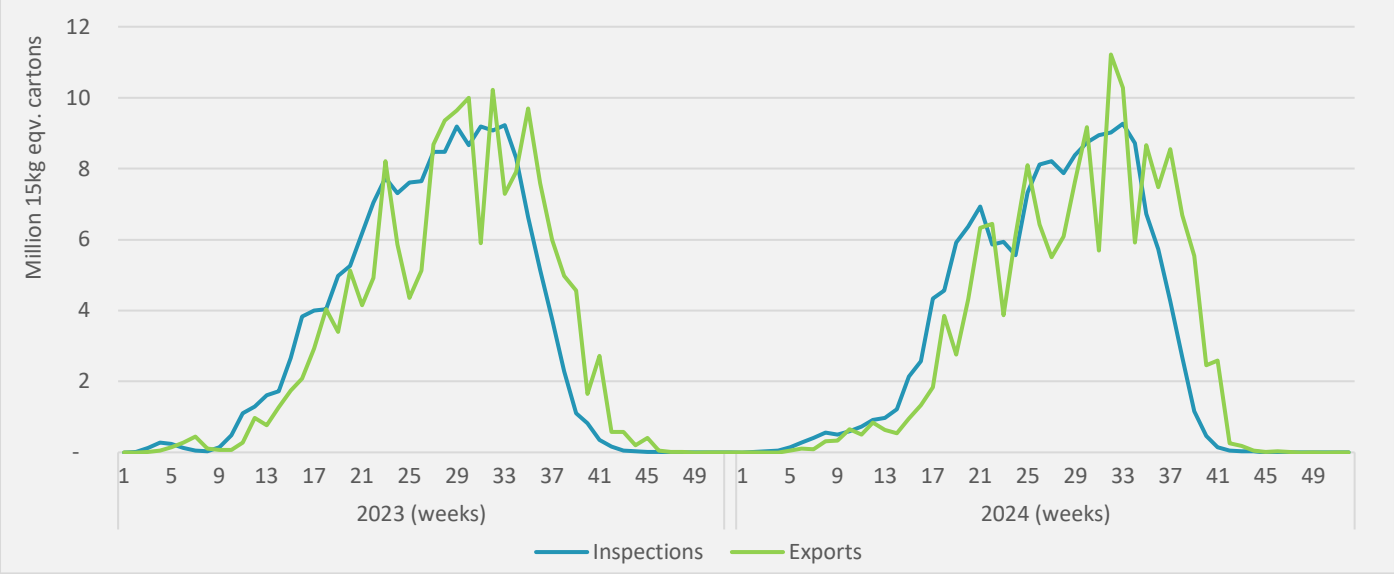

Figure 1: Weekly inspected and exported citrus cartons: 2023-2024
Source: PPECB, 2025 and Agrihub, 2025

Since inspection generally precedes exports by one or more weeks, it is natural for exports to lag slightly behind inspection. As observable in **Figure 1**, 2023 was not an exemplary year, with stock levels on hand reaching 19 million cartons, which is typically more than two weeks' worth of export volumes. In 2024, stock levels in week 31 reached 22 million cartons – 3 million more than the peak of the year before. This was also the start of a unforeseen period for Valencia exports, highlighted in the Brooke (2025) report. However, as seen in **Figure 2**, the weekly and cumulative (year-to-date) inspections for 2024 never exceeded the reported values for the preceding three seasons. This observation supports the finding in **Figure 1**, indicating that inspections following a more consistent and predictable pattern, with abnormal flow in export volumes causing irregularities in the supply to export markets.

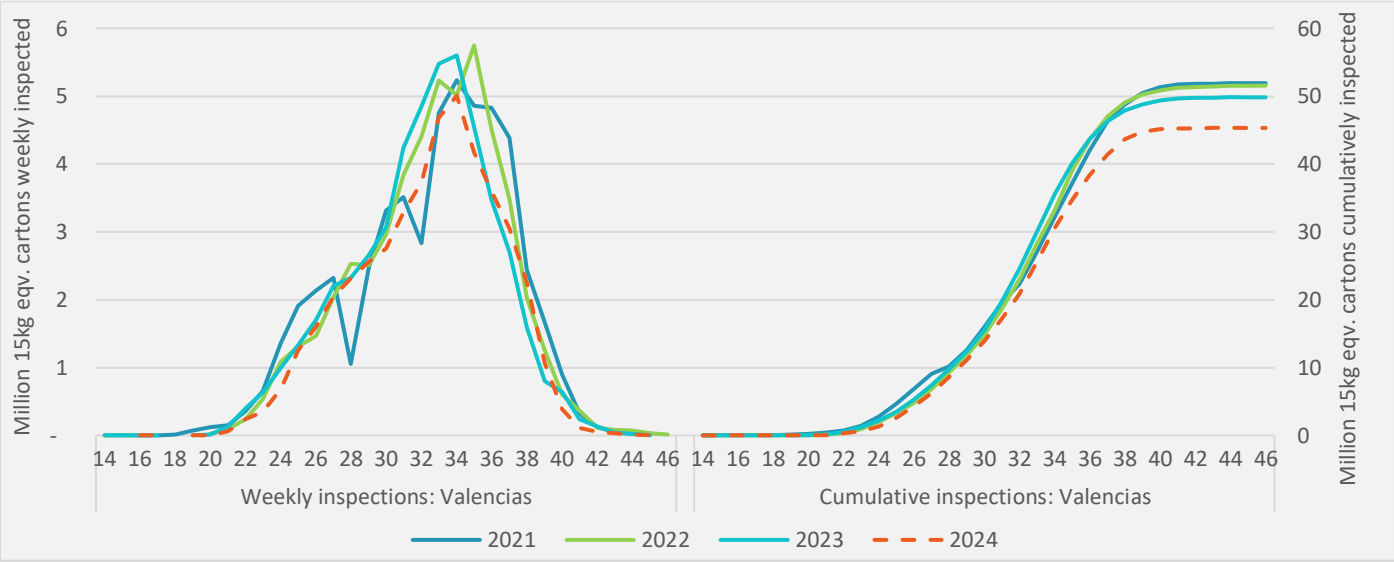

Figure 2: Weekly inspected and cumulative Valencia citrus cartons: 2021-2024
Source: PPECB, 2025

To illustrate the potential impact of export volume on market prices, **Figure 3** highlights the volatility of prices in the top 5 markets (by volume) for mandarins and provides an average export price for all other markets over six seasons. From this figure, one can derive the extent of price volatility, which of the major markets are more volatile (lower price following higher prices) and if there is any indication of lags (price change in one market following a price change in another market), contrasting price movements between markets and/or any other patterns to be observed. Considering the longer-term trend in the figure: as the hike on the reefer container rates (and/or specialised reefer vessels) started to subside in the early parts of 2023, the pressure on FOB prices, especially to the USA, was alleviated. While exports to the USA resumed its pre-crisis price trend, exports to the UAE continued at below-par levels.

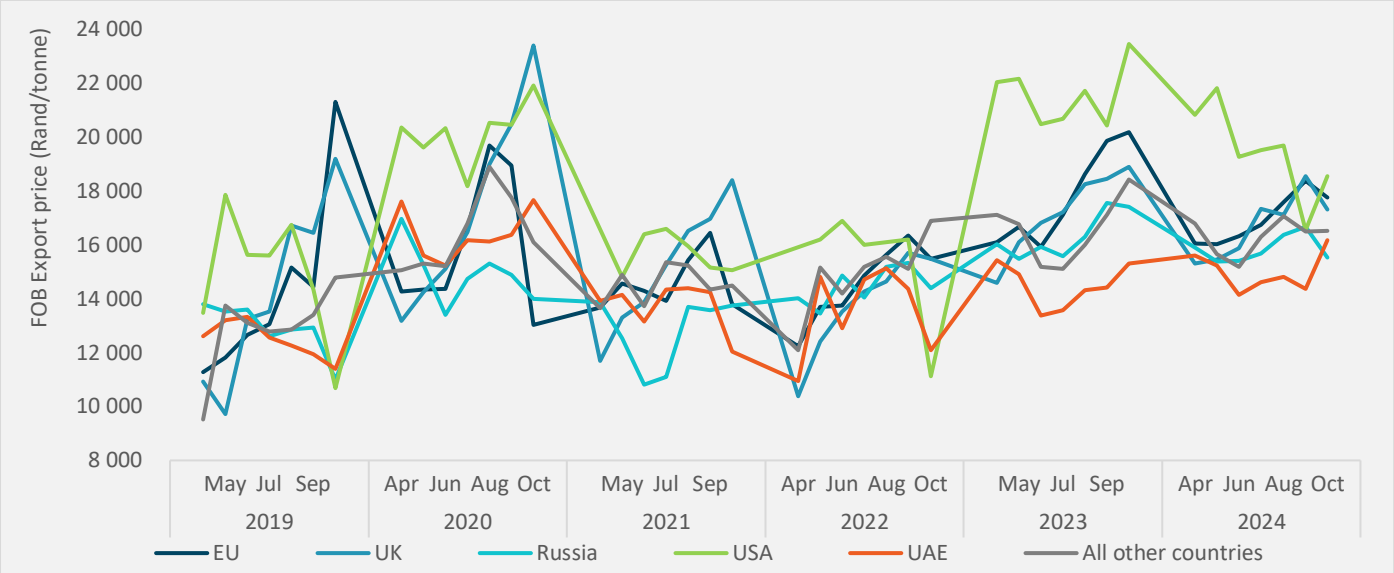

Figure 3: Monthly price movements in major export markets for mandarins: 2019-2024
Source: SARS, 2025

There are a multitude of factors that contribute to this month-to-month variation in export prices per market, including stock levels in the market, world supply, supply from South Africa, cultivar, fruit quality, fruit size and many more. While it is not possible to determine the actual date of arrival of fruit at the destination port from the available data, the export shipping week is the best indicator of South Africa's contribution to world supply in a given period. The extent to which shipping volumes vary per week per corridor, market, commodity and cargo ship can be examined. As part of the justification of the study, a high-level comparison is made between inspection and export volumes per corridor. Where the production and packaging nodes contribute to variation in volumes, this can largely be measured by the inspection figures. Throughput in the ports – measured by shipping volumes – is both a function of operational handling in the port, as well as the availability of vessels and containers per market destination, although the latter is also influenced to some extent by the former[1].

Figure 4, **Figure 5** and **Figure 6** provide a weekly and cumulative summary of the theoretical demand for export services – a 2.5 week rolling average delay in inspections reported at inspection points in the corridor – combined with the loading of export cartons and the shipping of export cartons per corridor. While inconsistencies in the captured data cannot be ruled out, the variability observed is interpreted as follows:

- Despite considering a 2.5 week rolling average delay between inspection and export, lags are still observed, and is especially evident from around week 34, indicating that much of the season was marred by delays. This is reiterated in the cumulative parts of the figures, where the demand of export services year to date was higher than the loaded or shipped volumes for most of the season.
- For the northern corridor, more than for the central and western corridors, loading and shipping did not occur in the same week.
- Both the northern and western corridor concluded the season with less inspections (demand of export services) than total shipments, with the converse observed for the central corridor. To balance the total inspections and shipments, inter-corridor movements (transshipments and trucking) would have to play a role.
- Vessel departure was inconsistent throughout the season, highlighting the contribution of domestic ports performances in the uneven, unreliable and sometimes downright erratic marketing of citrus.

1 **Omitting and/or bypassing of South African ports as well as cut and run scenarios can occur as a result of domestic port inefficiencies and/or as a result of attempts to regain schedule reliability, which was lost due to exogenous factors and where there is a risk for the shipping line that the situation can further aggravated by complying with the port call that was initially planned.**

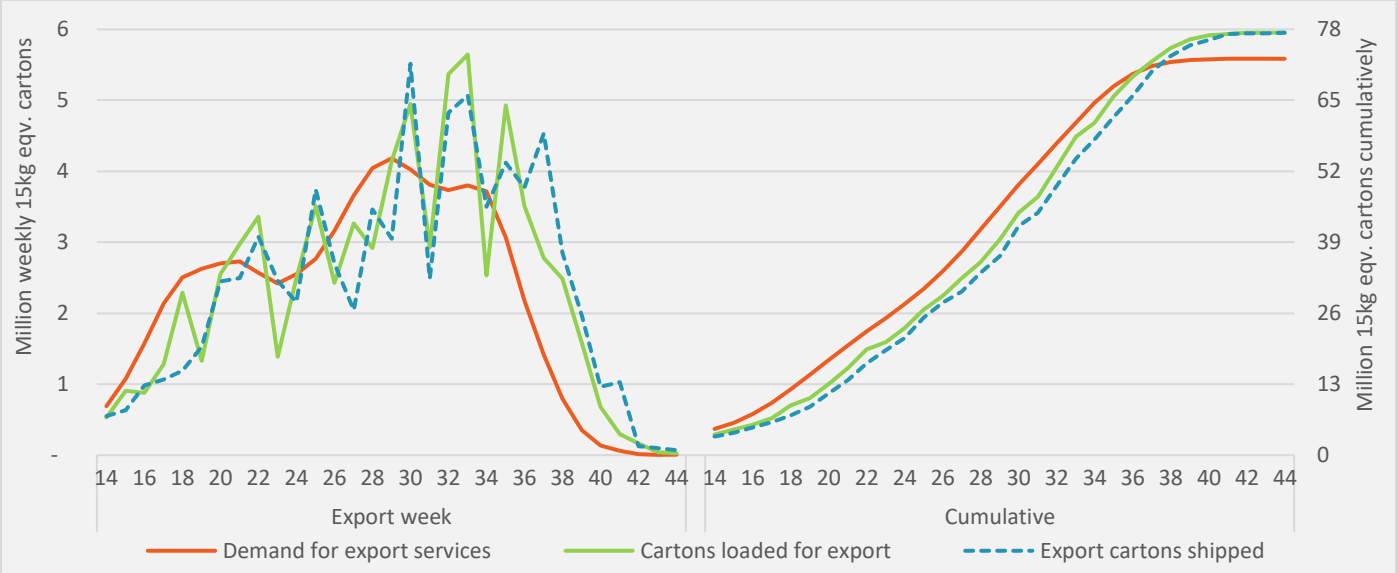

Figure 4: Weekly demand for and supply of export services and cumulative inspections and exports from the northern corridor: 2024
Source: PPECB, 2025 and Agrihub, 2025

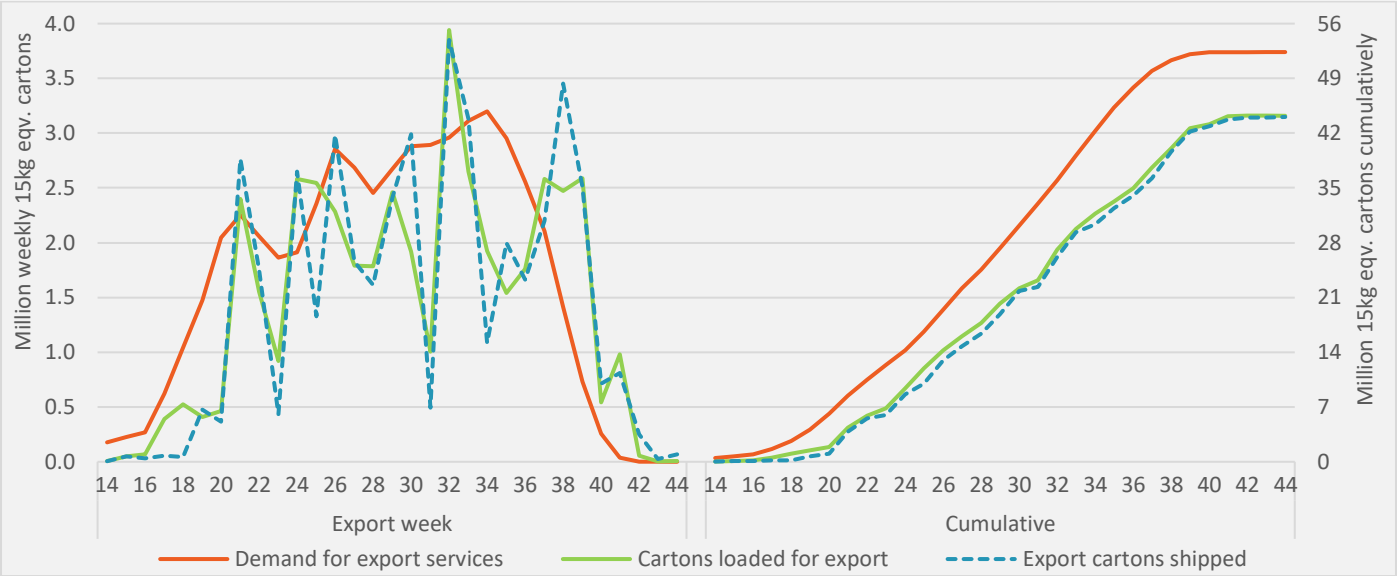

Figure 5: Weekly demand for and supply of export services and cumulative inspections and exports from the central corridor: 2024
Source: PPECB, 2025 and Agrihub, 2025

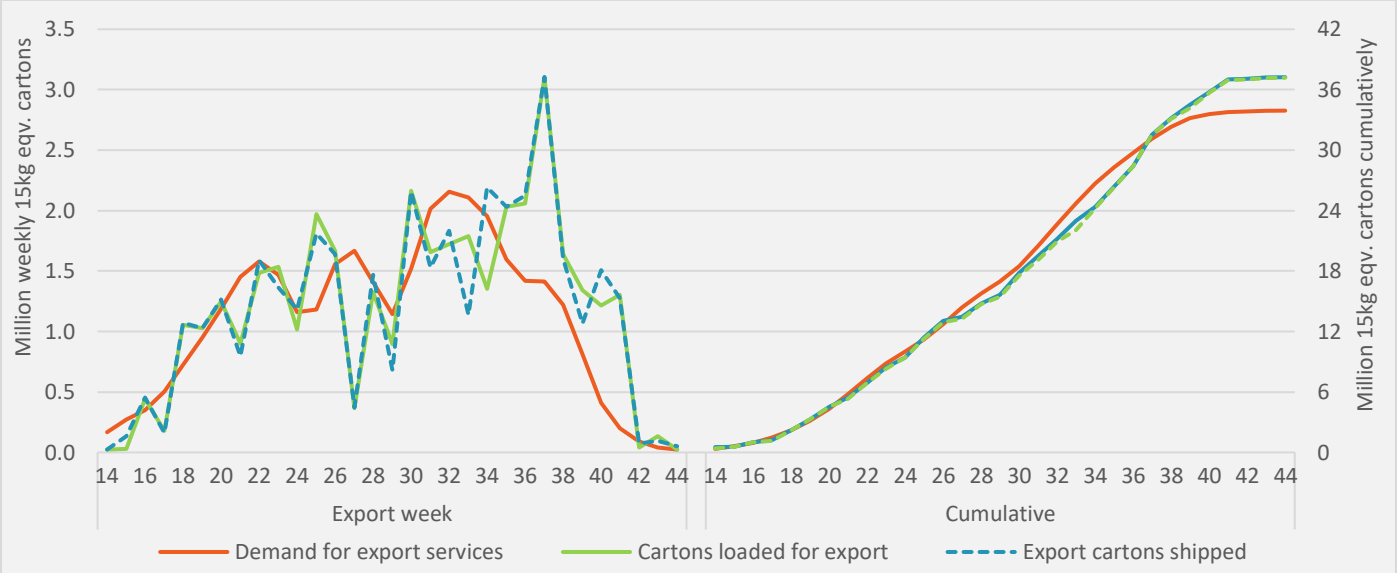

Figure 6: Weekly demand for and supply of export services and cumulative inspections and exports from the western corridor: 2024
Source: PPECB, 2025 and Agrihub, 2025

In **Table 1** and **Figure 7**, the differences between inspected and exported volume by export region and corridor are summarised. Most notable, on aggregate, is the intra-corridor exchanges (inter-regional

movements) resulting in lower exports to the EU and to a much lesser extent South East Asia, as well as the inter-corridor movement resulting in fewer exports than inspections in the central corridor. An assumption was made that cartons inspected for export but not shipped was redirected to the local fresh produce markets. At this aggregated level, a minimum of 15.3 million cartons moved between corridors and/or between market, of which at least 10.8 million cartons moved between markets (from inspection to export destination).

Table 1: Inspected and exported 15kg equivalent cartons by corridor: 2024

Corridor	Region	Inspected cartons	Exported cartons	Difference
Northern Corridor	EU	23 756 935	22 632 836	(1 124 099)
	Middle East	14 923 305	16 068 685	1 145 379
	South East Asia	12 376 709	14 944 877	2 568 167
	North America	2 830 309	3 220 333	390 025
	UK	2 913 020	3 865 539	952 519
	Russia	7 878 863	7 355 081	(523 782)
	Asia	6 659 034	6 721 346	62 312
	Africa & other	2 103 271	2 596 482	493 211
	Local			795 041
Central Corridor	EU	25 240 762	19 646 462	(5 594 300)
	Middle East	13 225 586	13 251 541	25 954
	South East Asia	3 791 348	899 723	(2 891 625)
	North America	2 906 449	2 073 063	(833 386)
	UK	2 874 851	3 689 173	814 322
	Russia	3 356 251	2 937 787	(418 463)
	Asia	1 217 636	1 072 307	(145 329)
	Africa & other	322 741	710 054	387 313
	Local			573 055
Western Corridor	EU	19 849 824	16 062 032	(3 787 792)
	Middle East	2 259 440	2 432 215	172 775
	South East Asia	359 184	398 129	38 945
	North America	7 782 716	9 003 344	1 220 629
	UK	1 984 926	5 727 318	3 742 393
	Russia	1 255 580	2 237 881	982 301
	Asia	427 319	532 659	105 340
	Africa & other	388 365	866 066	477 701
	Local			371 395
Total	EU	68 847 522	58 341 331	(10 506 191)
	Middle East	30 408 332	31 752 440	1 344 109
	South East Asia	16 527 241	16 242 728	(284 513)
	North America	13 519 473	14 296 740	777 267
	UK	7 772 797	13 282 031	5 509 234
	Russia	12 490 694	12 530 750	40 055
	Asia	8 303 989	8 326 312	22 323
	Africa & other	2 814 377	4 172 601	1 358 225
	Local			1 739 490
		160 684 424	**158 944 934**	

Source: PPECB, 2025 and Agrihub, 2025

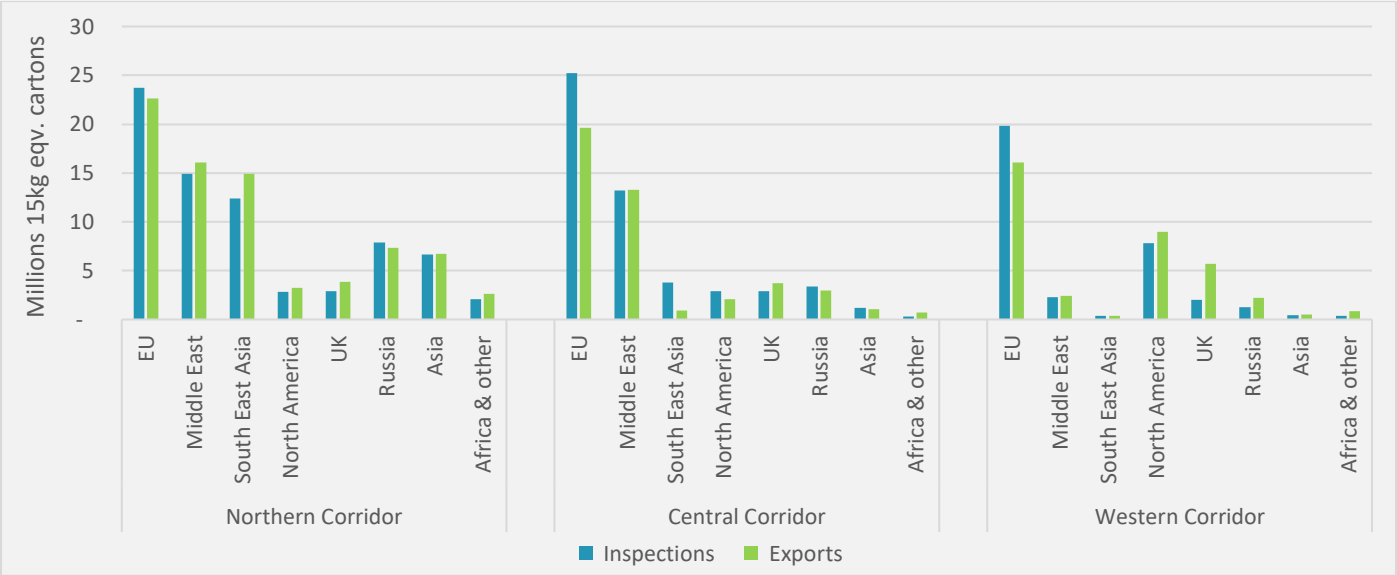

Figure 7: Inspected and exported 15kg equivalent cartons by corridor: 2024
Source: PPECB, 2025 and Agrihub, 2025

Many factors contributed to the differences highlighted in the table and consequent figure above. Three major drivers of the disparity between inter-corridor and inter-regional inspection and export volumes were identified: inter-corridor transport by vessel (transshipment) or road (trucked), inter-regional export movement within the same corridor as a result of logistical challenges to reach intended market or as a result of a marketing decision. In lieu of complete oversight of all the intra-corridor and inter-corridor movements, a simplified and likely underestimation of the movements were projected through a process of triangulation, aggregation and disaggregation, with the incorporation of stakeholder feedback and validation of results with stakeholders, including some that were not interviewed prior to the estimation process. While the values balance at an aggregated level, it is probable that many more intra-corridor and inter-corridor moves, all affecting cost and price, occurred at a disaggregated level. **Table 2** shows the 2024 estimations, amounting to 6.8 million cartons undergoing inter-corridor movements and 10.8 million cartons subject to intra-corridor movements, with 90% thereof estimated to be required movements as a result of logistical challenges, e.g., port congestion, vessel bypass or cut and run, overstocking of market on previous irregular shipments, and more. In a further attempt to cross-validate the number of cartons that triggered inter-corridor and/or intra-corridor movements (as per **Table 1** and **Table 2**), a Venn diagram (**Figure 8**) was constructed, showing how 17.6 million moves was recorded for 15.3 million cartons, of which 10.8 million moves was intra-corridor.

Table 2: Estimated inter-corridor and intra-corridor movements of 15kg equivalent cartons: 2024

	Corridor inspections (actual)	Intra-corridor exports (estimate)	Corridor exports (actual)	Corridor difference: additional (fewer) cartons handled at load port	Inter-corridor transport by vessel (estimate)	Inter-corridor road transport (estimate)	Required inter-regional export movement (estimate)	Elective inter-regional export movement (estimate)
Northern corridor	73 441 447	72 646 406	77 405 180	4 758 774	4 788 722	205 938	3 508 527	389 836
Central corridor	52 935 623	52 362 568	44 280 109	(8 082 459)	(6 153 967)	(683 774)	1 956 854	217 428
Western corridor	34 307 353	33 935 959	37 259 644	3 323 685	1 365 245	477 836	4 246 252	471 806
Total (cartons)	**160 684 424**	**158 944 934**	**158 944 934**	**0**	**6 153 967**	**683 774**	**9 711 634**	**1 079 070**
Inter-corridor movement					**6 837 741**			
Intra-corridor movement / inter-regional movement							**10 790 704**	
Inter-corridor and intra-corridor movement					**17 628 445**			

Source: Author's own calculations from various sources

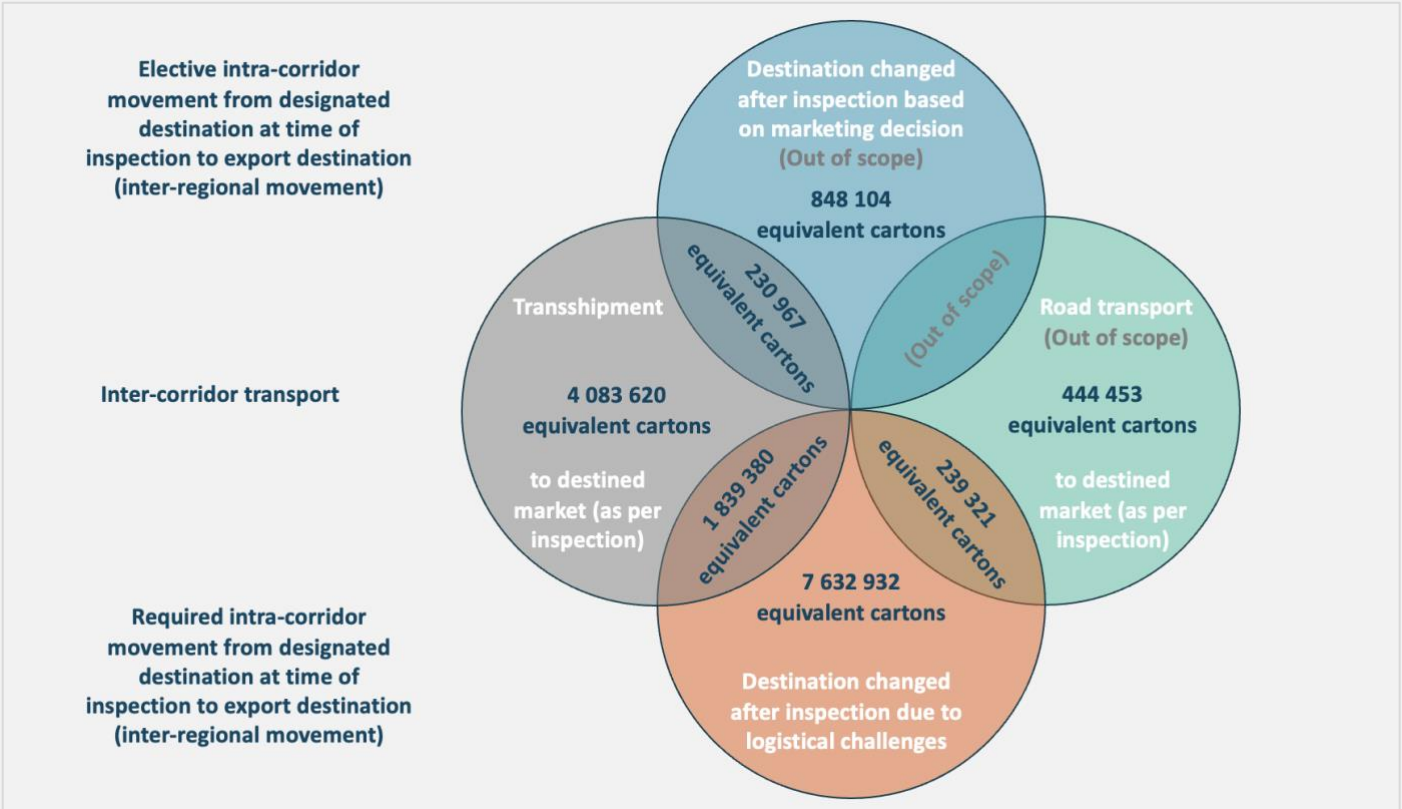

Figure 8: Estimation of the intra-corridor and inter-corridor movements explaining the difference between inspections and exports: 2024
Source: Author's own calculations from various sources

The price of logistical inefficiencies

As indicated in the previous section, a minimum of 17.6 million citrus export cartons underwent intra-corridor and/or inter-corridor movements the past season. The bulk of these can be directly linked to logistical inefficiencies borne from volatility in domestic port throughput. Delays in port affects the timing of delivery, and keeping in mind that citrus is a perishable product with a limited shelf life, which can further be compromised with temperature fluctuations, the impact often extends beyond the load port to the port of destination, and further upstream and downstream in the value chain. In order to quantify the impact of the 2024 citrus export season, using 2023 as a baseline, the additional direct and indirect cost in the value chain is estimated. The increase in waste – a product cultivated, harvested, packed, cooled, shipped and/or repacked – as a cost to the industry is also incorporated. Since the 2023 season was no walk in the park either, as per **Figure 1**, the change in certain cost items (or the volume linked to it) calculated for 2024 is already from a distorted base. The computed impact is therefore a conservative figure, and the true impact on the industry is most likely much bigger.

Data for the calculation of the price of logistical inefficiencies was collected through stakeholder engagement across the different corridors and across different nodes in the values chain – from primary production to logistic services – and combined with the inspection and export figures. Volumes of the inter-corridor and intra-corridor movements, as per **Table 1**, **Table 2** and **Figure 8,** feature strongly in the calculation (**Table 3**).

Table 3: Price of logistical inefficiencies: 2024

	Type	Units	Measure	R/unit	Value
Direct cost	Farm: additional labour cost (overtime, waste harvest)	120 954	tonnes	325.00	39 310 210
	Packhouse: change in schedules (overtime)	6 837 741	cartons	15.58	106 565 898
	Packhouse: re-inspection cost	8 436 637	cartons	0.91	7 677 339
	Loading out: additional personnel cost (overtime)	1 507	containers	714.00	1 075 671
	Cold storage: additional cost for extension of duration beyond initial contract period (7-10 days)	1 986 812	pallets	77.51	153 997 773
	Transport: redirection to different port	239 321	cartons	16.25	3 888 965
	Transport: increase in contacted transport cost due to longer waiting times at port	99 341	containers	2 911.50	289 230 109
	Port cost: additional plug-in cost outside of port awaiting stack (re-)opening	99 341	containers	720.20	71 545 088
	Shipping cost: change in pricing structure/surcharges	99 341	containers	6 045.00	600 513 756
	Shipping cost: reefer vessel vs container cost	9 497	containers	3 197.92	30 369 655
	Handler/distributor: repacking cost	12 951 616	cartons	19.62	254 157 341
	Total: Direct cost				**1 558 331 806**
Indirect cost	Farm: Change in market outlet or class due to post optimum harvesting	75 795	tonnes	3 070.09	232 696 743
	Packhouse: Change in marketable volume due to quality issues as a result of delays	37 526	tonnes	4 998.44	187 570 843
	Market: Redirection to local fresh produce market outlet - fruit component	1 739 490	cartons	60.53	105 285 481
	Market: Redirection to local fresh produce market outlet - transport component	1 739 490	cartons	17.84	31 041 163
	Market: Limited market (country) options due to limited shipping routes available due to omittances of SA ports	9 711 634	cartons	20.71	201 129 363
	Market: Unsound arrivals – increase in claims due to longer shipping / delays in port	5 811 265	cartons	45.78	266 032 001
	Market: Fluctuation in price - irregular supply (oversupply/undersupply/fruit of different age or quality arriving at the same time in the market)	158 944 934	cartons	9.94	1 579 150 139
	Total: Indirect cost				**2 602 905 732**
Waste	Produce not harvested (removed with sanitation)	75 795	tonnes	4 501.31	341 175 520
	Produce not packed (harvested but not packed)	37 526	tonnes	6 429.66	241 278 472
	Produce not marketed (shipped but not sold)	1 942 742	cartons	270.46	525 426 623
	Total: Waste				**1 107 880 614**
	Total impact (Rand)				**5 269 118 153**
	Total impact (Avg. US$ eqv. for Apr-Sep 2024)				$ 289 989 992

Source: Author's own calculations from various sources

Direct cost refers to physical additional cost incurred by the industry (producers and value chain operators) as a result of congestion in the port pushing back into the value chain and/or causing additional repacking cost in the destination market due to quality deterioration. The most appropriate unit of measure was used for each variable, with the number of units apportioned to the volumes directly affected by the logistical inefficiencies. The direct expenditure increase was estimated at R1.56 bn for 2024.

Indirect cost – the revenue not earned as produce is sold at a lesser price (taking the difference between the intended market outlet price and the new price) – amounts to R2.60 bn for 2024. The last line item – fluctuation in market prices – is really hard to quantify as equilibrium prices move according to supply and demand factors, including stock levels. One can therefore argue that a temporary shortage would result in a price hike, which is to the benefit of the producer whose fruit is sold in that empty market. However, monthly trade data affirms that prices tend to remain suppressed for longer when an oversupply situation occur, whereas the price hikes during undersupply situations are move fleeting. Consequently, a downside risk of €0.50 per carton, on average, was incorporated, which equates to R9.94 per carton. In **Table 4**, the equivalent impact, when only considering a portion of the cartons, are shown. The table also considers alternative scenarios: a low estimate, as incorporated in **Table 3**, a high estimate, that correlates with observations from industry for a portion of cartons exported, and a likely estimate. How these different scenarios affect the total impact on the industry is illustrated in **Table 5**.

Table 4: Sensitivity analysis on 'fluctuations in price': 2024

	Market: Fluctuation in price - irregular supply	Units	Measure	R/unit	Value
Low estimate	100% of volume @ €0.50 per carton, on average	158 944 934	cartons	9.94	1 579 150 139
	50% of volume @ €1.00 per carton, on average	79 472 467	cartons	19.87	
	25% of volume @ €2.00 per carton, on average	39 736 233	cartons	39.74	
Likely estimate	100% of volume @ €0.70 per carton, on average	158 944 934	cartons	13.91	2 210 810 194
	50% of volume @ €1.40 per carton, on average	79 472 467	cartons	27.82	
	25% of volume @ €2.80 per carton, on average	39 736 233	cartons	55.64	
High estimate	100% of volume @ €1.00 per carton, on average	158 944 934	cartons	19.87	3 158 300 277
	50% of volume @ €2.00 per carton, on average	79 472 467	cartons	39.74	
	25% of volume @ €4.00 per carton, on average	39 736 233	cartons	79.48	

Source: Author's own calculations from various sources

Table 5: Sensitivity analysis on 'fluctuations in price' effects on total impact of logistical inefficiencies: 2024

Total impact summary	Total impact (as per Table 3)	Total impact (as per Table 3) excl. market price fluctuations	Market price fluctuations impact (Table 4)	Total impact range (based on sensitivity analysis)
Low estimate	5 269 118 153	3 689 968 014	1 579 150 139	**5 269 118 153**
Likely estimate	5 269 118 153	3 689 968 014	2 210 810 194	**5 900 778 208**
High estimate	5 269 118 153	3 689 968 014	3 158 300 277	**6 848 268 291**

Source: Author's own calculations from various sources

Waste in this case encapsulates the total losses in revenue, measured at the point of sale in the value chain where the waste is incurred. If at farm level, the weighted average farm gate price per tonne is used, as all the cost of production has been incurred, but no additional cost in the value chain. Produce supplied to the packhouse but not packed, did not incur packaging material cost, therefore the waste – total loss of revenue of that portion of production – is valued at packhouse level. Losses incurred with product that was produced, packed, cooled, shipped and then discarded during the repacking process – a process instigated by delays in delivery causing quality deterioration – is also quantified. The cost of that repacking is included in the direct cost and the remaining, viable product, is presumed to be sold at its original price and is therefore not included in this calculation. Total waste is estimated at R1.1bn for 2024. Combined with the direct and indirect cost (as per **Table 3**), the industry is R5.27 bn poorer as a result (16% of citrus gross production value). This is a conservative estimate, as an increase in the downside risk of fluctuations in market prices could increase the impact to R5.90 bn (likely estimate) or R6.85 bn (high estimate), as indicated in **Table 5**.

It should be noted that there are some qualitative impacts that is hard to quantify as it typically involves longer term revenue loss. For instance, a retailer abroad may decide to not renew a contract with a South African supplier after a performance appraisal deemed the supplier unreliable in meeting the requirements of the contract, including on time delivery of the correct quantity and/or quality. As a result, the supermarket has to deal with empty shelves and losing out on revenue. These kinds of arrangements are incredibly hard to quantify as the long-term impact is often much greater than the losses incurred in a single season. Another example that is hard to quantify is the long-term revenue loss as a result of reinvestment (timely replacement of older orchards, etc.) that cannot be afforded when the industry suffers losses of this magnitude.

In conclusion

This impact assessment explored the effects of the logistical inefficiencies on the South African citrus value chain. Using 2024 as the basis, this study report attempted to quantify the impact of large variability in the weekly throughput at South African ports. Throughput in the ports – measured by shipping volumes – is both a function of operational handling in the port, as well as the availability of vessels and containers per market destination, although the latter is also influenced to some extent by the former. Delays in port affects delivery timing, and since citrus is a perishable product with a limited shelf life, which can be further compromised by temperature fluctuations, the impact extends beyond the load port to the port of destination and further upstream and downstream in the value chain.

Data for the calculation of the price of logistical inefficiencies was collected through stakeholder engagement across the different corridors and across different nodes in the values chain – from primary production to logistic services – and combined with the inspection and export figures. A minimum of 17.6 million movements were recorded for 15.3 million cartons, with 10.8 million being intra-corridor movements.

The direct expenditure increase was estimated at R1.56 bn for 2024. Indirect cost – the revenue not earned as produce is sold at a lesser price (taking the difference between the intended market outlet price and the new price) – amounts, conservatively, to R2.60 bn for 2024. Total waste is estimated at R1.1bn for 2024. Combined with the direct and indirect cost, the industry is, conservatively, R5.27 bn poorer as a result, which equates to R33/carton for 2024. Losing out on revenue while incurring additional cost threatens the long-term sustainability of the industry and in particular new entrants to the industry. By diminishing value, producers are not able to reinvest and to get back on track and remain aligned with the industry's potential to grow exports as per the projections for 2032 under Vision 260, secure jobs at a rate of 1 job for every additional 1 150 export cartons, contribute to the local economy and positive net trade position.

Thank you

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