SATI
SOUTH AFRICAN TABLE GRAPE INDUSTRY

PRESCRIPTIVE LOGISTICS MODEL FOR THE SOUTH AFRICAN TABLE GRAPE INDUSTRY

An overview of the prescriptive logistics model and outcomes achieved during phases 1 and 2 of the project.

WHY DID SATI EMBARK ON THIS PROJECT?

As a proactive response to challenges experienced, SATI explored an alternative approach to help improve future logistics scenarios. The development of a prescriptive logistics model was commissioned in April 2024. The model creates a digital twin of the table grape supply chain, enabling industry to apply scenarios, see results and make informed decisions. One of the primary objectives is to reduce stock levels during peak weeks of the table grape export season.

BACKGROUND

During the 2023/24 South African table grape export season, severe constraints at the Cape Town Container Terminal (CTCT) – exacerbated by extended periods of bad weather – led to significantly longer transit times. As a result, the average age of grapes upon arrival at market increased, creating downstream challenges for storage facilities and packhouses. These disruptions drove up costs due to higher claims, reliance on alternative ports, and prolonged storage periods, ultimately adding an estimated R300 million in additional expenses for SATI producers.

Insights provided by the model are intended to guide industry decisions in the interest of upholding grape quality during peak export weeks. The planning and implementation of the model has been a collaborative effort between various industry stakeholders.

PHASE 1 — MODEL BUILD AND BASELINE ANALYSIS

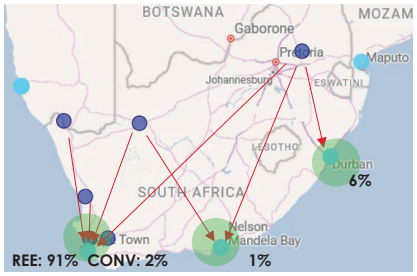
In Phase 1 of the project, SATI developed a prescriptive logistics model using digital twin technology. The primary objective was to provide industry stakeholders – including producers, exporters, freight forwarders, and national ports – with **data-driven insights** into the **impact of the 2023/24 season's constraints by generating high-level national and season views**. The model was also designed to **provide alternate solutions** to these constraints and identify optimal strategies for mitigating these challenges.

The port utilisation maps generated by the model, as shown below, illustrate historic and actual 2023/24 season route to market data that was used to generate a baseline scenario given constraints experienced in the 2023/24.

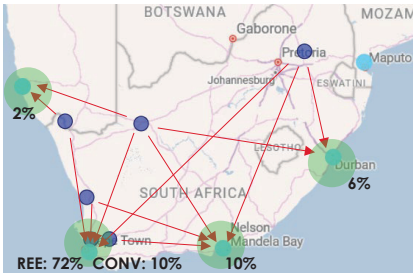
This information was used to pose the question:

"What would an optimal scenario look like?"

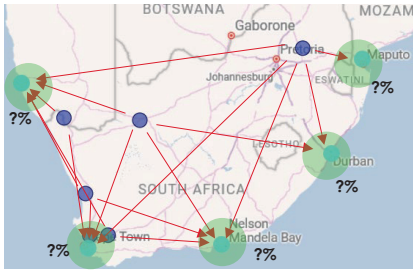
HISTORICAL



2023/24



OPTIMAL?



KEY OBJECTIVES ACHIEVED

- Build a prescriptive logistics model
- Generate a baseline using actual 2023/24 season data
- Identify an optimal plan given the constraints
- Identify the impact of the constraints
- Provide an initial 2024/25 season plan, should similar constraints arise

MODEL OUTCOMES

- Created visibility of the table grape supply chain
- Estimated R300 - R450 mil additional cost impact identified
- Provided optimal plan that would yield:
  - Reduction in avg. age of product by ±5 days
  - Estimated reduction of R300 mil in claims
  - Estimated reduction of R150 mil in logistics costs

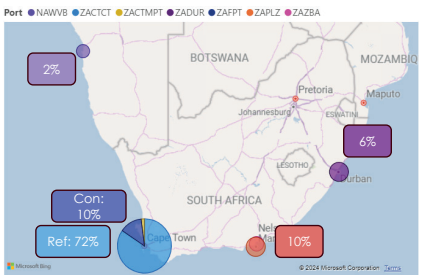
SCENARIO COMPARISON

PHASE 1 SCENARIO SUMMARY: By generating baseline, optimised baseline and optimised network scenarios the **model suggested alternative port utilisation strategies** that would allow for more efficient port usage and yield opportunity cost savings of R300 mil on claims while also getting grapes to market 5 days earlier compared with the baseline scenario. This enabled industry to have sight of viable alternatives, that could yield quantifiable benefits, for exporting fruit when there are contraints at certain ports.

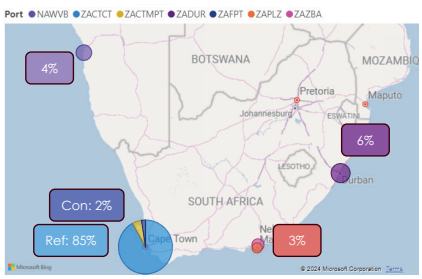
BASELINE
Used to validate model behaviour

OPTIMISED BASELINE
Evaluate opportunities and impact of varying CTCT capacity

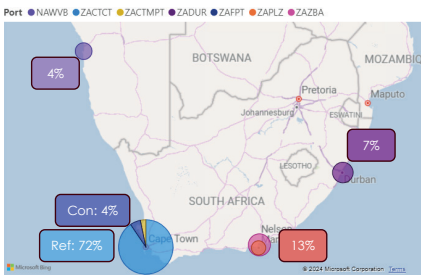
OPTIMISED NETWORK
Evaluate best options given 2023/24 season CTCT capacity



37 days age at market **R1.6bn** claims **17m** max inventory



32 days age at market **R1.3bn** claims **12m** max inventory



32 days age at market **R1.3bn** claims **13m** max inventory

PHASE 2 — TACTICAL MODEL RUN FOR THE 2024/25 SEASON

In Phase 2, the prescriptive logistics model was deployed as a **tactical planning tool** for the 2024/25 season. The model was run fortnightly, with results presented at the JGMF sessions, offering insights and **scenario-based planning recommendations, and regional-level insights** to industry stakeholders.

KEY OBJECTIVES ACHIEVED

- Provide tactical plan per farming region, identifying best route to market given assumed port constraints
- Present future port utilisation plans given most likely scenarios
- Provide regional level insights and vessel targeting planning based on various scenarios
- Season Planned vs Actual Reporting

MODEL OUTCOMES

- Regional specific plans providing detailed container allocations per vessel berthing presented at 10 JGMF sessions
- Scenario plan provided for delays experienced at CTCT
- Improved stakeholder engagements driven by clear visibility

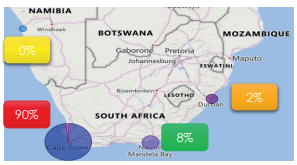
EXAMPLES OF REPORTS PROVIDING REGIONAL LEVEL INSIGHTS

This high-level plan for the **Orange River region** showed that if there was a 12 day-delay at CTCT starting in Week 01, the region could save R14.6 mil by exporting 43% of its grapes via PE-ports, and 3% via Walvis Bay, with product arriving in market less than 1 day later.

This high-level plan for the **Berg and Hex River regions** showed that if there was a 12-day delay at CTCT starting in Week 01 these regions could save R1.1 mil by exporting 22% of their grapes via PE-ports, and 4% via Walvis Bay, with product arriving in market only 1 day later.

Orange River High-Level Plan Weeks 52-03

Baseline CTCT

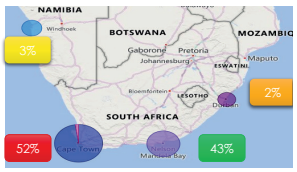


Port	Container Quantity	Port Utilisation
ZACTCT	2 763	90%
ZAFPT	0	0%
ZADUR	53	2%
ZAPLZ/ZBA	243	8%
NAWVB	0	0%

28.7 days Avg. days at market — **8.4M** Max inventory — **3059** Containers exported

12 day delay at CT starting week 1

High Impact Delay



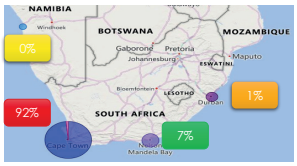
Port	Container Quantity	Port Utilisation
ZACTCT	1 565	50%
ZAFPT	84	2%
ZADUR	53	2%
ZAPLZ/ZBA	1 358	43%
NAWVB	97	3%

29.2 days Avg. days at market — **9.0M** Max Inventory — **3156** Containers exported

47M Cost increase — **14.6M** Est opportunity cost

Berg & Hex River High-Level Plan Weeks 07-10

Baseline CTCT

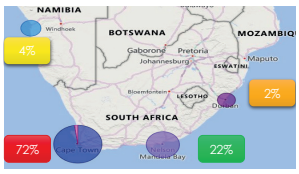


Port	Container Quantity	Port Utilisation
ZACTCT	4 183	90%
ZAFPT	36	0%
ZACTMPT	103	2%
ZADUR	50	1%
ZAPLZ/ZBA	288	7%
NAWVB	0	0%

28.1 days Avg. days at market — **6.9M** Max inventory — **4660** Containers exported

12 day delay at CT starting week 1

High Impact Delay



Port	Container Quantity	Port Utilisation
ZACTCT	3 220	69%
ZAFPT	32	1%
ZACTMPT	103	2%
ZADUR	135	2%
ZAPLZ/ZBA	1 005	22%
NAWVB	166	4%

29.1 days Avg. days at market — **6.3M** Max Inventory — **4662** Containers exported

72M Cost increase — **1.1M** Est opportunity cost

EXAMPLE OF SEASON PLANNED VS ACTUAL TRACKING AS AT WEEK 12 (SEE ILLUSTRATION BELOW):

The similarities between actual and planned volumes observed during the greater part of the season suggest that the 2024/25 season closely followed the ideal planning scenario, which was possible due to limited delays at CTCT.

	Containers Exported	Estimated Transport & Shipping Costs	Estimated Revenue Realised	Estimated Gross Profit Margin/ Container Exported
2023/24 Actual	21 054	R2 395 533 266	R12 771 239 556	81.24%
2024/25 Baseline +30%*	21 000	R2 333 242 072	R13 859 733 587	83.20%
2024/25 Actual	21 537	R2 533 040 754	R13 834 345 234	81.70%

* The baseline capacity used by the model for CTCT was adjusted to improve the accuracy of planned results versus actuals in response to sustained improvement in port performance.

Take-aways and Opportunities

- The logistics model provides a comprehensive view of capacity constraints in the table grape supply chain, which can facilitate strategic planning and commercial decision-making with the aim of optimising logistical solutions and reducing costs.
- One of the major benefits of having access to the model data is that it provides the industry with an additional tool to support proactive planning.
- The model can be further leveraged to incorporate additional fruit types, which could provide more holistic supply chain insights.
- If more granular data throughout the value-chain can be made available in future, it will enable the model to generate even more detailed scenario outcomes.
- Data provided is intended to inform on-farm and commercial decisions, which remain the prerogative of the producer/exporter.

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