



Western Cape
Government

Agriculture

BETTER TOGETHER.



**Post COVID-19 Future of the Western Cape
Agriculture and Agri-Processing Sector
Project Report**

Tanja Hichert | 30 November 2020

The Western Cape agriculture and agri-processing sector and its role-players face a myriad of challenges going into the future, and not just from the post-Covid-19 fallout. Plus it's not so much about 'going into the future', as the future 'coming at' the sector. The future through to 2050 *will* look dramatically different from today.

Some things – like the effects of climate change – are a given, whilst others will come in the shape of unexpected shocks and disruptors. This interplay between steady and sudden change is how the future unfolds, and it cannot be predicted.

But because it is still in the making, the future can be actively influenced or 'made', and this is where strategic foresight and futures thinking comes in.

Strategic foresight is the capability of imagining how we might think, do and govern differently given completely different (post-normal) futures, and it is the capability to generate views of alternative futures – because there isn't one single predictable future – and to then 'use' the future, and 'learn' from the future in order to make better decisions, choices and plans today.

The Western Cape Department of Agriculture, together with a diverse set of stakeholders representing multiple perspectives, engaged in a three month participative strategic foresighting exercise to ultimately identify intervention points that could help lead to a preferred future. This preferred future for the Western Cape agriculture and agri-processing sector is one that is resilient (to further shocks and disruptors), sustainable and equitable.

The output of this strategic foresight exercise – contained in the subsequent project report – contains a number of excellent ideas, suggestions and recommendations. These resulted from different ways of working such as, building an evidence base for driving forces shaping the future, identifying many potential shocks and disruptors, generating scenarios, and importantly; creating a set of 'vicious' and 'virtuous' circles based on key domains of change.

It is these domains of change, that can go either one way or the other, and thus shape the future, that highlight the importance of intervention points that have high leverage, in other words: Things that can be done (because many things are not within control of the sector) and that can make a material difference. They include;

- deploying and 'democratising' 4th industrial revolution technology,
- making large-scale sustainable, 'climate smart' agriculture possible,
- successfully conducting agricultural education and knowledge transfer that leads to, amongst others, resilience (resilience means diversity and the ability to deal with transformative change, not only the ability to withstand shocks), and
- practicing 'Anticipatory Governance'.

Executive summary

The Western Cape agriculture and agri-processing sector (both upstream and downstream), together with its partners, stakeholders and all role-players in it, face multiple complex challenges in their external and transactional environments, e.g., sustainability and environmental issues, market disruption, shifting consumer demand, lightning-speed technology developments, regulatory 'discontents' and specific South African equity issues. On top of which *all* sectors and organisations these days operate in a Volatile, Uncertain, Complex and Ambiguous (VUCA) world.

'Appreciation' and acknowledgement for a VUCA world has become very apparent with the Covid-19 pandemic that hit the Western Cape agricultural and agri-processing sector, as it did the rest of the country in March 2020, and will still be impacting the world for quite some time.

It is in this context that the Western Cape Department of Agriculture (WCDoA) commissioned a strategic foresight project to explore the post-Covid-19 future of the Western Cape agriculture and agri-processing sector. Not only is the immediate impact of the pandemic critical (WCDoA conducted an analysis to this effect), it is the longer-term future that is also regarded as key, because that is where most impact can be had in terms of making changes and choices now – in the present -- that over time may lead to a preferred future.

Strategic foresight is not designed to predict the future nor is it intended to replace traditional forms of analysis and policy-making. Rather, it allows decision-makers and stakeholders to look outside, above and beyond, and have structured strategic conversations about uncertainty, as well as to take uncertainty and its impacts into account. Uncertainty and surprises – such as Covid-19 – cannot be avoided, but WCDoA and its stakeholders can use futures knowledge to anticipate them, to prepare for them, to make them less harmful and to become futures resilient.

This project set out to answer four research questions stipulated by the WCDoA. These included 1) identifying innovations, trends and trend breaks, 2) identifying potential 'black elephants' (aka predictable surprises – the 'elephant in the room' that we don't like talking about), 3) generating a range of possible futures for the sector (including 're-imagining' the sector 30 years from now), and 4) identifying potential interventions for all role-players. The results of this project are ultimately meant to translate into the ability of proposing – and implementing where possible – interventions, and having additional options, that contribute to a long-term sustainable, resilient, equitable and 'future-fit' agriculture and agri-processing sector in the Western Cape.

In a nutshell this project was all about establishing:

What are the factors, both steady and sudden, that cause change and shape the future, which is not set in stone, therefore what does a preferred future look like, and what can possibly be done to start making changes now that help the sector and its players move towards a preferred future (taking multiple views and perspectives into account)?

The project was participatory, involving a range of diverse stakeholders in four interactive workshops, and it was structured according to a generic foresight process framework making use of specialised futures / foresight tools and methodologies such as;

- Horizon Scanning (for driving forces shaping the future, potential shocks and disruptors, and weak signals "pockets of the future in the present"),
- Futures Wheels (brainstorming multiple levels of impact and consequences of market disruption, technology disruption, food system disruption and extreme weather disruption),
- Scenarios (to describe a range of possible and coherent future worlds for the Western Cape agriculture and agri-processing sector),

- Three Horizons Framework (to explore the change in importance of issues over time, and connect the future to the present), and
- Causal Loop Diagrams (which helped identify key variables of change that shape the future of the Western Cape agriculture and agri-processing system).

The outputs and results from this project include:

- The analysis of survey responses from fifty-six respondents and an experts' focus group covering trends that have impacted the sector up to now, driving forces shaping the future, shocks and disruptors, "bright spots" (examples of "pockets of a desired future in the present") and proposed interventions.
- A set of forty-two 'driving forces shaping the future' of the sector. Based on extensive desk research, covering the STEEP-V domains; (S)ocial, (T)echnological, (E)nvironmental, (E)conomic, (P)olitical and (V)alues, and presented as a set of user-friendly cards together with the sources consulted during the research.
- The outputs from each of the stakeholder workshops where participants engaged with the different futures / foresight tools and produced a set of "Key learnings, insights and recommendations" for each workshop. The workshop outputs also served as input for further phases of the project, e.g. prioritised driving forces were further analysed to become 'domains of change' for the Causal Loop Diagramming exercise.
- A list of ranked "Black Elephants" / "Predictable Surprises" – the potential shocks and disruptors that focus attention on blind spots and cognitive biases.
- A set of scenarios inductively built up around critical themes (4th industrial revolution technology, state capacity and regulatory support, the biosphere, knowledge transfer and learning, and demand side shifts / access to markets) and their different outcomes. One of these five scenarios sketches a preferred future – a reimagined Western Cape agriculture and agri-processing sector. This is something that can serve as a vision – and call to action -- of making decisions and choices now that start leading to that future.
- Twelve Causal Loop Diagrams each with a narrative describing the positive and negative loops – 'virtuous' and 'vicious' circles – about six domains of change (Africa's rise, 4th industrial revolution technology, governance, policy (un)certainity, climate change, and agricultural education and knowledge transfer. These domains each have an inflexion point (a.k.a. as a bifurcation point) – this is where things can go either one way or the other moving into the future.

The appendices contain additional output and complementary research on issues such as:

- Anticipatory governance with recommendations on how to start practicing this with regard to the Western Cape agriculture and agri-processing sector.
- An estimate of what happens to competitiveness of the sector under different nearer-term post-Covid-19 scenarios.
- A back-cast from a preferred future, together with a set of implementation recommendations, for 4th industrial revolution technology.
- Resilience; what that looks like, and what it means for organisations and systems.

All of the output, but in particular the Causal Loop Diagrams that interconnect and are linked to one another, served to assist with identifying potential interventions for all role-players that would start shifting the Western Cape agriculture and agri-processing sector towards a preferred longer-term future.

Some of the ‘Causal Loop interventions’ – because they are good leverage points (they can trigger positive loops) *and* Western Cape agriculture and agri-processing sector role-players have some ‘control’ over them – centre around;

- democratising 4th IR technology,
- making sustainable, ‘climate smart’ agriculture possible,
- and successfully conducting agricultural education and knowledge transfer about the topics above, but that also leads to resilience (resilience means diversity and the ability to deal with transformative change, not only the ability to withstand shocks).

In addition the report contains a raft of further recommendations ranging from the general, e.g. ‘enable good governance’, ‘collaborate with civil society’, invest in a ‘just transition’, through to the very specific, e.g. ‘promote / start an artificial meat industry’ and ‘start re-wilding the Karoo’.

The report ends by recommending the following:

1. **Identify the most relevant interventions – those that are feasible, fundable and implementable now.** In other words sift through the myriad of options in this document and its supporting material – many are emphasised -- and decide which become strategic actions; allocate resources to them, **align them to existing initiatives**, and begin implementation so that the journey towards ‘making’ a preferred future can start. Starting this journey will trigger other positive spin-offs in addition to creating change (which needs to be managed where possible – change management really is a thing).
2. **Identify the interventions with the most leverage.** This is clearly illustrated by the Causal Loop Diagram analysis viz. democratising 4th IR technology, making sustainable, ‘climate smart’ agriculture possible, and successfully conducting agricultural education and knowledge transfer. These interventions are particularly potent because they add value, ‘pay-off’ and make sense regardless of what the future holds – they are robust and given the context, ‘must-do’ interventions. Additional generalised high leverage principles are listed in Appendix O. Start planning and working toward making them possible if they are not so now.
3. **Promote – this also means reward and incentivise – new and different ways of working.** Refer to the ‘Anticipatory Governance’ think piece (Appendix A) and the recommendations extracted from it (Appendix P). 21st century challenges cannot be solved with 20th century thinking.
4. **[Do] not discard any of the ideas, suggestions and recommendations** made as a result of this project. Even if not applicable now, ‘un-doable’ and outside the WCDoA and its partners and stakeholders’ control; the future changes, and implementation conditions change. Something that may be the vaguest option now, could turn out to be a killer strategic action in five years’ time. Having a large collection of options does two things; 1) it contributes to resilience and its underlying key principle of diversity and some surplus, and 2) options also serve as contingency plans. When the timing and/or conditions are right (or made right) options can easily become actions.
5. Lastly, it is useful to keep in mind that there are **multiple ways of working**; so even if there is no power to implement or action, there may be power to influence (‘good lobbying’) and / or collaborate towards making a preferred future over time; starting now.

Table of Contents

1.	Introduction.....	1
2.	Project Background.....	1
3.	Objectives.....	3
4.	Methodology.....	3
5.	Research Questions.....	6
6.	Results	7
	i. Driving forces that shape the future.....	8
	ii. Potential shocks, disruptors and “predictable surprises”.....	9
	iii. Range of possible futures	13
	iv. Causal Loop diagrams and potential interventions	20
7.	Recommendations	25
8.	Acknowledgements	26
9.	Appendices.....	27
	Appendix A: Anticipatory Governance think piece	
	Appendix B: Competitiveness of the sector under different post-Covid scenarios.....	
	Appendix C: Workshop objectives and participants.....	
	Appendix D: Table containing methodology matched to research questions	
	Appendix E: Driving forces shaping the future in card format.....	
	Appendix F: Driver card sources and further reading	
	Appendix G: Morphological scenarios: Critical themes and their range of possible outcomes	
	Appendix H: Analysis of survey and focus group results	
	Appendix I: Proposed interventions extracted from the survey	
	Appendix J Workshop template examples	
	Appendix K: 4 th IR technology back-cast from a desirable future	
	Appendix L: Recommendations from 4 th IR technology back-cast	
	Appendix M Resilience think piece	
	Appendix N: Causal Loop Diagrams.....	
	Appendix O: Places to intervene in a system	
	Appendix P: Recommendations from anticipatory governance think piece.....	

1. Introduction

The Western Cape agriculture and agri-processing (both upstream and downstream) sector, together with its partners, stakeholders and all role-players in it, face multiple complex challenges in their external and transactional environments, e.g., sustainability and environmental issues, market disruption, shifting consumer demand, lightning-speed technology developments, regulatory 'discontents' and specific South African equity issues. On top of which *all* sectors and organisations these days operate in a Volatile, Uncertain, Complex and Ambiguous (VUCA¹) world.

- **Volatility** reflects the speed and turbulence of change.
- **Uncertainty** means that outcomes, even from familiar actions, are less predictable.
- **Complexity** indicates the vastness of interdependencies in globally connected economies and societies, and
- **Ambiguity** conveys the multitude of options and potential outcomes resulting from them.

'Appreciation' and acknowledgement for a VUCA world has become very apparent with the Covid-19 pandemic that hit the Western Cape agricultural and agri-processing sector, as it did the rest of the country in March 2020, and is still impacting the world for all of 2020 and long thereafter. As a recent UNDP publication, *Governing in an Age of Emergence*² states: "The pandemic also can be understood as a warning sign, a probe into the structural weaknesses of our existing systems. It shows how futile it is to insist on facing 21st century challenges with the institutions and methods of 20th century global governance."

This is where strategic foresight and futures thinking comes in:

- It is the capability of imagining how we might think, do and govern differently (see Appendix A: Anticipatory Governance think piece) given completely different (post-normal) futures.
- It is the capability to generate views of alternative futures – because there isn't one single predictable future – and to then 'use' the future, and 'learn' from the future to make better decisions, choices and plans today.

It is in this context that the Western Cape Department of Agriculture (WCDoA) commissioned a strategic foresight project to explore the post-Covid-19 future of the Western Cape agriculture and agri-processing sector. Not only is the immediate impact of the pandemic critical (WCDoA conducted its own analysis to this effect), but the near-term aftermath of the pandemic and its fallout is not a given yet. Over the next 2 - 5 years global developments and reactions to the pandemic may affect the competitiveness of the local sector (see Appendix B that shows how competitiveness changes under different generic post-Covid scenarios). On top of the near-term uncertainties it is the longer-term future that is regarded as the most important, and it is also with regard to the longer-term future where most impact can be had in terms of making changes and choices now – in the present -- that over time may lead to a preferred future.

2. Project Background

In response to a WCDoA Request for Proposal issued on 14 August 2020 Hichert and Associates (Pty) Ltd constituted an expert team and submitted a proposal with project plan to deliver a specialised applied Futures / Strategic Foresight service aimed at addressing the practical questions

¹ The term Postnormal Times is also used to convey the idea that when these 21st century challenges and changes come together they create a sense of crisis, as noted by the UN Secretary General, Ban Ki-moon. 'The world' (he declared at the UN General Assembly in 2014) was 'living in an era of unprecedented level of crises'.

² <https://awayforward.undp.org/>

around what the future might hold for the Western Cape agriculture and agri-processing sector – this being the ‘unit of analysis’ – for the project.

Futures Studies / Strategic Foresight is a recognised academic discipline and it is this that governed the methods (see section 4 below) and procedures used to collect and analyse data, as well as the framework that was used to find answers to the research questions. It was furthermore, not an academic or theoretical exercise, but a practical project entailing, amongst others, a survey of stakeholders and experts, an experts’ focus group and a number of online participative workshops (see Appendix C for a list of participants per workshop as well as the objectives for each workshop).

Strategic foresight is not designed to predict the future nor is it intended to replace traditional forms of analysis and policy-making. Rather, it allows decision-makers and stakeholders to look outside, above and beyond, and have structured strategic conversations³ about uncertainty, as well as to take uncertainty and its impacts into account. Uncertainty and surprises – such as Covid-19 – cannot be avoided, but WCDoA and its stakeholders can use futures knowledge to anticipate them, to prepare for them, to make them less harmful and to become futures resilient.

Strategic foresight can thus help to mitigate, but not eliminate, uncertainty and complexity, and when used alongside conventional analytical and policy-making approaches, produce outputs and decisions that are more rigorous, resilient and ‘future fit’.

As the UNDPs Global Centre for Public Service Excellence’s (GCPSE) Foresight Manual⁴ eloquently puts it:

‘The premise of foresight is that the future is still in the making and can be actively influenced or even created, rather than what has already been decided, there only to unearth and discover, and passively accepted as a given. This is an empowering realisation for both governments and citizens.

Foresight permits governments and public administrations to construct contingency plans for undesirable but possible and probable scenarios, while creating policies that capitalise the transformational possibilities of preferred futures, moving from foresight and insight to strategy and action.

At the same time, practical application of government foresight in strategic planning and policy development can also be empowering for citizens. Participatory and inclusive foresight methods create spaces for dialogue and negotiations between a broad spectrum of stakeholders, perspectives and futures and taps into the distributed, often tacit, knowledge ‘in the room’.

This project set out to answer research questions (see section 5 below) stipulated by the WCDoA. These include identifying innovations, trend and trend breaks, identifying potential ‘black elephants’ (aka predictable surprises) and generating a range of possible futures for the sector, including ‘re-imagining’ the sector 30 years from now.

For WCDoA this would ultimately translate into the ability of proposing – and implementing where possible – interventions, and having additional options, that contribute to a long-term sustainable, resilient, equitable and ‘future-fit’ agriculture and agri-processing sector in the Western Cape.

³ Structured strategic conversations, especially ones ‘using’ the future, are a primary means by which multiple stakeholders with multiple perspectives can come to a common understanding of, and shared mental models about, complex intractable problems.

⁴ <https://www.undp.org/content/undp/en/home/librarypage/capacity-building/global-centre-for-public-service-excellence/ForesightManual2018.html>

3. Objectives

The purpose for this project, quoting from the document commissioning, is:

“...to explore the future of the Western Cape Agricultural Sector. A range of studies have demonstrated that a number of disruptors will be at the core of the fundamental change that will shape the future of farming. To this end, a “reimagining” process needs to be followed. The subsequent report will be used to shape government actions in all three spheres of government and it will be used as a guide for the actions to be taken by industry role players.”

The commissioning document also refers to the need for capacity building as it relates to strategic foresight in the public-, private- and civil society sectors – on the one hand for civil servants in the WCDoA and related institutions, and on the other hand for a range of stakeholders and role-players involved with the project, either as Steering Committee members and/or workshop participants.

The entire project was designed around a participative, co-creative approach, which is the hallmark of best practice futures⁵ work because the participatory nature of (some) foresight tools allows learning to emerge by tapping into multiple views and perspectives. These interactive, participative ways of working (and methodologies) promote learning by doing⁶ – typically in a workshop set-up -- where the process is designed to, amongst others, specifically deliver this. Workshop participants (see Appendix C for a list of participants per workshop as well as the objectives for each workshop) were supplied with summary explanations of the tools, as well as user-friendly templates for further use and/or distribution⁷.

4. Methodology

All good futures / foresight work should be based on a theory of change and stability. In this case it is punctuated equilibrium, which means that **change happens slowly and then rapidly in alternating cycles**. Slow change, also called continuous or incremental change, has large effects over long periods of time, e.g. the impacts of climate change. Rapid change, also called discontinuous or disruptive change, has large effects in short periods of time, e.g. the impact of Covid-19. Slow change is a trend; rapid change is an event. Together they create an alternating cycle called punctuated equilibrium -- relative calm and equilibrium within eras, disruptions and punctuations between eras.

This project, because it looks ahead to 2050, and because it specifically references the shock of Covid-19, will work with both slow change and rapid change and the interplay and interconnections between them -- this is what typically underlies tipping points and/or cascading events. It is important to note, though, that it is impossible to *predict* tipping points and shocks, as well as exact impacts of mega trends (because we constantly adapt to them), however, as mentioned above:

Foresight permits governments and public administrations to construct contingency plans for undesirable but possible and probable scenarios, while creating policies that capitalise the transformational possibilities of preferred futures, moving from foresight and insight to strategy and action.

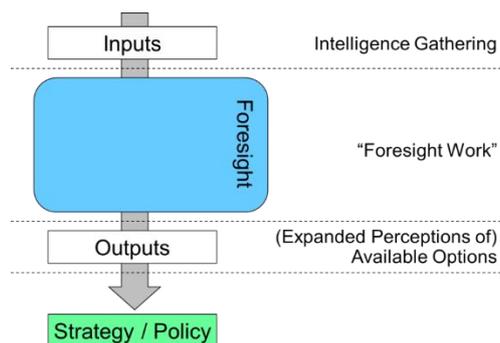
⁵ See here https://media.nesta.org.uk/documents/Our_futures_by_the_people_for_the_people_WEB_v5.pdf for an excellent piece on participatory futures and its benefits.

⁶ Reese, H.W., 2011. The learning-by-doing principle. *Behavioral development bulletin*, 17(1), p.1.

⁷ All source material and workshop content will also be available on a shared drive for workshop participants and stakeholders to access by the end of the project.

The project was structured according to a generic foresight process framework as illustrated in the diagram⁸ below. This framework approaches strategic foresight as a broad sequence of 'knowledge-seeking activities' that moves through 'phases'. These phases are best considered as over-lapping 'foci of activity' rather than rigidly-separated 'steps'.

These phases typically range from the gathering of information as *Inputs*, then *Analysis*, towards critical *Interpretation* of these inputs, to the actual generation of 'forward views' or 'images of the future'— what is sometimes called '*Prospection*'— and then to the generation of specific **Outputs that may themselves become inputs to further strategy-creation, projects, product development, analyses and/or planning processes.**



Using such a foresight process approach means that certain types of methods are naturally 'situated' within the overall 'flow' of the broad process, whilst remaining open to an informed choice by the foresight practitioner, subject to the specific requirements of the particular foresight engagement or analysis. This flexibility within the general framework ensures that a highly customised process can be created – as was the case for this project -- for the unique needs of any specific foresight engagement or analysis, rather than simply re-using a singular standard approach.

The table and descriptions in Appendix D contain more detail of which specific Futures / Foresight methods (and tools) were deployed in relation to the project's research questions and the generic foresight process mentioned above.

Short descriptions of some of the specific futures / foresight tools and methodologies utilised for this project include:

- **Horizon scanning**, which focuses on identifying new and emerging issues, typically called 'weak signals', as well as existing trends. Horizon scanning entails a systematic information / intelligence gathering and analysing activity. Output from a horizon scanning exercise often serves as input for scenarios, with the objective of systematically looking for the 'driving forces' that shape the future of the topic / issue being examined. Horizon scanning usually covers a wide range of domains, including social, technological, economic, environmental and political. Methodologically there are different modes⁹ of scanning, with 'formal search' being the most applicable for this project as it is a systematic targeted exercise requiring high effort looking at many different sources, as opposed to 'conditioned viewing', which is an on-going tracking type activity.

⁸ The diagram appears to portray this process as a simple linear one, there are—both conceptually and in practice—very many feedback loops from the later phases to the earlier ones; and therefore also many feed-forward effects as the loop pathways are re-traversed, perhaps more than once, e.g. scenario construction may necessitate a return to scanning, but on a different topic area not initially considered.

⁹ Choo, C.W., 1999. The art of scanning the environment. *Bulletin of the American Society for information Science and Technology*, 25(3), pp.21-24.

- **Drivers, Trends, and Mega-trends** are essential components of applied futures and foresight work. They have a strong influence on the type of plausible futures being explored. Drivers are forces or factors of change that have the potential to drive a future in a particular direction. Drivers may have an immediate effect on the system, in this case the Western Cape agriculture and agri-processing sector, or may have a more diffuse impact on a number of direct drivers. Trends are measurable, and based on fact; indicating clear and steady change. Mega-trends are developments resulting from several trends coming together. Mega-trends should still be relevant in 10 years or more, multinational, and cross multiple industries. The drivers, trends and mega-trends for this project were based on horizon scanning, the survey and an experts' focus group, and they are presented as a set of cards that were used in a workshop setting, see Appendix E. There is also a list of sources and further reading in Appendix F pertaining to the cards.
- **Driver Mapping** identifies drivers that will have high impact and high uncertainty (that is, they demonstrate a degree of variability, or lack of predictability, as to how they will manifest in the future) or 'critical uncertainties'. These high impact, high uncertainty drivers are often used to help explore uncertainty through scenarios. In this case, prioritised drivers – six of them – were used to generate Causal Loop Diagrams, both positive and negative, so that plausible interventions could be identified.
- **Black Elephants / disruptors / shocks** aka Predictable Surprises, Wild Cards, Grey Swans and Tipping Points. These are the so-called 'known unknowns' (whereas Black Swans are unknown unknowns). The concepts are sometimes used in reference to things that are predicted by experts and likely to have a significant impact, but which we are either reluctant to discuss (the "elephant in the room") or pay insufficient attention to as a result of our cognitive biases. Black Elephants are sometimes extremely likely and widely predicted events that are usually ignored either by many or society as a whole. Alternative concepts relating to the same phenomenon include 'Predictable Surprises' based on the work of Watkins & Bazerman¹⁰, and 'Wilful Blindness' based on the work of Heffernan¹¹. Black Elephants are often passed off as a Black Swan when it finally happens.
- **Futures Wheels** is a group brainstorming method that explores and maps multiple levels of consequences of trends, events, emerging issues and/or future possible decisions. In this case selected Black Elephants / Predictable Surprises / Tipping Points / trend breaks (BE-PS-TP) relating to agriculture in the Western Cape. It is a graphic visualization of direct and indirect, positive and negative future consequences of a particular change or development.
- **Scenarios**, which are the most well-known futures / foresight tool. At their most basic, scenarios are a group of stories, often called narratives, which together describe a range of possible and coherent future worlds for a given system – in this case the Western Cape agriculture and agri-processing sector. Central to scenario development is the concept of exploring multiple, alternative futures. Scenario development never attempts to predict the future, and scenarios never offer a single view of the future. Scenarios do, however, help us prepare for a future no one can predict, and clarify the potential implications of our choices. Importantly for this project; scenarios helped to 're-imagine' the future of the sector.

This project engaged with different types of scenarios methodology. The well-known 2 x 2 uncertainty matrix; the Deloitte scenarios framework in the post-Covid competitiveness section (see Appendix B) as well as the WCDoA's own 2 x 2 framework, and the morphological method, which was used to generate a set of scenarios specifically for this project. The morphological

¹⁰ <https://hbr.org/2003/04/predictable-surprises-the-disasters-you-should-have-seen-coming>

¹¹ <http://www.mheffernan.com/book-wilfulblindness.php#modal-close>

method is inductive and was chosen for this project because it utilises a structured framework and is a technical method, as opposed to a more intuitive one. It also works well for complex systems.

The morphological method centres around identifying critical themes that describe the system landscape and identifying the range of possible outcomes for each theme. Then it is a matter of combining one outcome per theme with others to build credible and coherent stories (see Appendix G for the scenario building blocks; critical themes and their outcomes). The morphological method;

- lets you live with complexity without drowning in it,
 - lets you build the scenarios up from the underlying data (inductive),
 - generates distinctive scenarios within a set,
 - lets you work with qualitative factors as well as quantitative, and
 - also helps you to model -- at least at the level of soft systems analysis, and this is where the scenarios complement the Causal Loop Diagrams as both engage with the critical factors (domains of change) shaping the future of the Western Cape agriculture and agri-processing sector.
- **Three Horizons Framework** is a conceptual model to aid peoples' thinking about current assumptions, emerging changes, and possible and desired futures. It is a graphical approach developed to explore the change in importance of issues over time, and connect the future to the present. It is an adaptable tool, and is often used as an intuitive, accessible introduction to futures thinking, as well as to make sense of emerging changes. At its most basic it is a systems model about the way things change over time.
 - **Causal Loop Diagrams** is a method used to understand and analyse complex systems. It helps identify key variables in a system, and shows the cause and effect relationships between the variables. It is a type of modelling that is designed to reveal the underlying interrelationships and causal structure of a complex system, or sub-system. This type of system map is a powerful visualization tool that can help describe and diagnose the current (and future) state of the Western Cape agriculture and agri-processing system; and understand how system structure creates the observable outcomes through causal interactions. Causal Loop Diagrams can also be very effectively used to create a shared vision of the system and gain consensus about the problems in it and identify opportunities.

5. Research Questions

The four research question commissioned for this project were:

1. What are the innovations, trends and trend breaks (technological, social, environmental, business and economic) that could impact the WC agriculture and agri-processing sector?
2. What are the "Black Elephants" / "Predictable Surprises" (we should see them coming, but choose not to) that could impact the WC agriculture and agri-processing sector?
3. What could a range of possible futures (with a 30 year horizon - 2050) look like for the WC agriculture and agri-processing sector? "Imagine and map the future shape of farming in the Western Cape."
4. What are recommend plausible interventions for all role-players (that would help produce a preferred future)?

Not only are the research questions connected to one another, they also flow into one another, wanting to answer the following for the unit of analysis (the Western Cape agriculture and agri-processing sector):

What are the factors, both steady and sudden, that cause change and shape the future, which is not set in stone, therefore what does a preferred future look like, and what can possibly be done to start making changes now that help the sector and its players move towards a preferred future (taking multiple views and perspectives into account)?

6. Results

The results from this project have a similar characteristic to the research questions; they are connected to one another and flow into one another. In some cases issues raised towards the end of the project loop back to questions posed right at the beginning, and issues identified at the beginning are used to generate interventions right at the end.

Therefore, the most practical, straightforward way of presenting the results is sequentially as per the project plan – this is done in the sub-headings below. This also largely matches the order in which the research questions were posed. The four sub-headings below contain the bulk of the results and output, including content from the participative workshops. Because the research questions and results do not ‘build up’ towards presenting a recommended set of interventions right at the end, but rather rely on feeding forward, as well as backward, and looking at the issues from different angles with different tools, each sub-heading also contains a set of “Key learnings, insights and recommendations” as a result of engaging with that that part of the project. These must be read in conjunction with the final ‘recommendations’ section, and vice versa.

There is, however, a separate table in the Recommendations section at the end that contains a solid set of recommended interventions based on the Causal Loop Diagram exercise as initially proposed.

The results of the survey and experts’ focus group are not presented separately in a sub-heading below due to them largely serving as a) input to the entire project and b) as a form of probing to elicit knowledge and information from a wide variety of perspectives.

The survey and experts’ focus group posed five questions looking for; 1) the trends over the last 20 years that have led to where we are now, 2) the driving forces shaping the future, 3) any “predictable surprises” / shocks in the pipeline, 4) any examples of ‘bright spots’, where things are working, e.g. examples of a desirable future that already exist in the present, and 5) what respondents think could be done.

Fifty-six people responded to the survey and these responses were analysed together with the output from the expert’s focus group. The results of question 1 (trends), question 4 (bright spots) and question 5 (interventions) are presented in Appendix H, and Appendix I contains a list of interventions suggested by survey respondents. It is recommended that this analysis is looked at in more detail as it contains interesting content, e.g. nearly 70% of respondents see economic factors as having shaped the sector up to now, and then the majority call for governance and knowledge transfer type interventions.

There is also a fascinating list of not only the *type* of bright spots (“pockets of the future in the present”), but also some brilliant examples (with references) of these bright spots that point towards a preferred future already manifesting in the present (see also the Three Horizons methodology below). Strategic foresight then entails scaling, growing and/or connecting these ‘seeds’ and innovations so that they start shifting from the niche and marginal to the dominant and mainstream.

The analysed content of responses to question 2 (driving forces shaping the future) and question 3 (“predictable surprises” and shocks) were incorporated into the first and second workshops. This is reported on in the sections below.

i. Driving forces that shape the future

Based on the ‘formal search’ mode of horizon scanning – essentially desk based research, but also referring to the survey and experts’ focus group – forty-two ‘driving forces shaping the future’ of Western Cape agriculture and agri-processing sector were identified. These ‘drivers’ also contained some trends and mega-trends¹², and covered all of the STEEP-V domains; (S)ocial, (T)echnological, (E)nvironmental, (E)conomic, (P)olitical and (V)alues. The drivers were presented in the format of cards (see Appendix E) so that participants could engage with them in an online workshop setting and so that they are easy to work with and share in other settings.

As is typical of futures / foresight work (because it takes a systems perspective) most of the drivers are connected to one another and impact / influence / cause one another. Workshop participants were encouraged take these connections and interlinkages into account in a session designed to prioritise high impact, highly uncertain drivers (see Appendix J for an example of the workshop template).

Prioritised drivers and their interlinkages with one another (the output of Workshop 1) became ‘domains of change’ – these are a way of understanding the possible emerging future landscape and are also the feedstock for Causal Loop Diagrams (see section iv below). For this project, they helped build an evidence-based picture (see Appendix F for a list of sources and further reading) of what the WC agriculture and agri-processing sector might be shaped by in 2050. The insights from the domains were also used as input for scenarios (see section iii below).

Key learnings, insights and recommendations as a result of engaging with the driving forces shaping the future include:

- Water received the most support for the most uncertain, highest impact driver. Two issues are important about water: 1) Will there be enough rain? 2) Will there be enough infrastructure investment in supplying and keeping sufficient stock of water? This is linked to energy. There will also be competition for water for uses other than agriculture – this is linked to urbanisation.
- Urbanisation rates and demographics are a given – there is a degree of certainty about these, and we know urbanisation will have a high impact.
- The energy issue, which is critical now is resolvable and will resolve regardless of politics.
- Sustainable production will have an impact on biodiversity, and is linked to climate change – it is one of the ways to mitigate climate change.
- There is a very strong relationship / nexus between climate change, water and sustainable development (as a ‘countermeasure’).
- 4th Industrial Revolution (4th IR) technology¹³ has to be a key driver because it is the source of what the fifth and sixth waves of technology may be. That is what will impact the 30 year future. [The role of 4th IR technology in the Western Cape agriculture and agri-processing sector is so key that an aspect of this project looked specifically at what that may look like if back-cast from a

¹² In a way, drivers are similar to, yet slightly different from trends. In futures / foresight work, the term ‘driver’ is preferred because drivers can cause one or more effects. The aim is often to identify drivers that will have high impact and high uncertainty (that is, they demonstrate a degree of variability, or lack of predictability, as to how they will manifest in the future). These high impact, high uncertainty drivers are often used to help explore uncertainty through scenarios. A trend meanwhile is a general tendency or direction of a development or change over time. It can be called a megatrend if it occurs at global or large scale. A trend may be strong or weak, increasing, decreasing or stable. There is no guarantee that some trends observed in the past will continue in the future – and that is precisely when a trend sometimes gets ‘classified’ as a driver.

¹³ The term 4th IR was coined by World Economic Forum (WEF) in 2015 and is now widely used to refer to “... the ongoing automation of traditional manufacturing and industrial practices, using modern smart technology”.
https://en.wikipedia.org/wiki/Fourth_Industrial_Revolution

preferred¹⁴ future (see Appendix K for the back-cast and Appendix L for a list of recommendations based on the back-cast.))

- Technology is also important because it allows agricultural production to be divorced from the land.
- E-commerce and digital trading is a high impact driver because it causes disintermediation and is one of the ways smaller farmers and businesses can thrive. It is part of the 4th IR technology domain.
- Global demographic changes (generally aging in the developed world, young and growing on the African continent) determine the export market – this is key for WC agriculture. It is the market side.
- Protectionism is a short-term reaction. New economic thinking may eventually lead to a different kind of (re)globalisation.
- Short-term political uncertainties are a symptom of leadership in crisis.
- Social transition is also as a result of demographic change, and it will change demand in everything not least food choices, e.g. the growth of veganism and alternative forms of protein (insect based, artificial meat, etc.) This also drives attitude re animal welfare. “In 2050 we will not be killing animals for meat anymore.”
- Africa’s rise is a standalone, separate driver of change and demand from Africa will be a consumer force in its own right. The Africa FTA is dependent on Africa rising.
- If food choices is the pull, then the growth in socially responsible business is the push.
- Supermarkets and large company concentration is linked to demand and supply.

ii. Potential shocks, disruptors and “predictable surprises”

Horizon scanning, the survey and the experts’ focus group also produced content on potential shocks, disruptors and predictable surprises (see Black Elephants in the methods section above). This is sudden change that can have massive impact even whilst one is planning for expected change as discussed in the driver section above. For the purposes of this project these shocks are collectively referred to as “Black Elephants” / “Predictable Surprises” / “Tipping Points” (BE-PS-TPs).

The value of trying to identify BE-PS-TPs and working with them is that it focusses our attention on our blind spots and cognitive biases -- on the way in which our assumptions about the world obscure us to parts of it which don’t fit with our worldview, or with our self-interest. On a more practical level it is also about risk management and contingency planning. Thinking about “risk” almost always involves thinking about the familiar, and in familiar ways, whereas what is needed is thinking about (wilful) ignorance and the things that we tend not to want to know. Never mind the things we don’t know that we don’t know¹⁵.

The point is to try and acknowledge the ever increasing systemic¹⁶ possibility of disastrous events and attempt to reduce vulnerability to them: in other words, to increase resilience in the Western Cape agriculture and agri-processing sector and ‘mainstream’ the ‘unthinkable’¹⁷.

¹⁴ Back-casting is a futures / foresight tool / method that works backward from the preferred future to the present. It is a set of imaginary steps detailing how a preferred future was reached or brought about. These steps then form the basis of actions to be taken, decisions and policies to be made and resources needed to create that preferred future

¹⁵ This article <https://www.sussex.ac.uk/webteam/gateway/file.php?name=stirling-article-in-nature-on-uncertainty.pdf&site=25> offers a good explanation of the value of engaging with uncertainty.

¹⁶ Here is a good piece that describes ‘Critical Crisis Convergences’ <https://designdialogues.com/critical-crisiscon/>

¹⁷ This article explains it well <https://deloitte.wsj.com/cfo/2020/10/14/anticipate-test-what-if-scenarios-with-analytics/>

The list below, which was ranked by the project team in order of importance, contains 30 BE-PS-TPs that may impact the Western Cape agriculture and agri-processing sector. The ones highlighted in purple were explored during the second workshop.

1. Drought: Water scarcity, major decline in rainfall, inadequate infrastructure and fierce competition for water from urban areas
2. **Cannot export (due to variety of reasons, e.g. protectionism, prohibition on any fossil fuel transport, non-tariff barriers, pests & diseases)**
3. **Constant destructive extreme weather due to climate change, e.g. drought, storm damage, late frosts, floods, fires, etc. "Constant El Niño"**
4. The shadow economy and crimes associated with it grows out of control, e.g. corruption, gangsterism, smuggling, violence
5. **Unprecedented hunger – SA badly food insecure / food unaffordable for the masses**
6. Soil fertility collapse (due to build up & unrestrained use of salt- and petroleum based fertilisers and weed killers)
7. Collapse of markets / Financial crisis; a prolonged world-wide economic slump
8. Few large corporations capture the sector – smaller farms/businesses cannot survive
9. **4th IR technology creates massive inequalities and divides**
10. Exponential growth of alternative proteins
11. More pandemics / zoonosis, e.g. bird flu that crosses over to humans (like 1918 Spanish flu)
12. Loss of biodiversity, e.g. insect pollinators
13. Shortage of skilled labour and lack of technical skills
14. Electricity scarce, unstable and unaffordable
15. Antibiotic use for livestock farming leads to anti-biotic resistance in humans
16. Diminishing resources allocated by National and Provincial government
17. Labour unrest and persistent strikes; wage demands linked to racial oppression
18. Phosphorous runs out
19. Wholescale change in packaging, e.g. only sustainable and/or ban on plastics
20. Land seizure & farm invasions
21. Irreversible pesticide and chemical pollution
22. Increased, intensive human migration into province
23. The fallout of mechanisation and automation
24. Infrastructure bottlenecks, e.g. ports, rail & road cannot handle freight
25. Unmanageable pests and/or diseases
26. Wine industry phased out as farms become places of leisure, residence and tourism. "Cosmetic farming"
27. Exponential growth in consumer demand for sustainable, ethical products
28. Measuring success in terms of GDP growth and exports as the expense of ecological and social wellbeing
29. Too powerful supermarkets have total control over prices
30. Agricultural land is taken over for other purposes, e.g. urban and peri-urban sprawl

Workshop participants (see Appendix C for a list) used Future Wheels, which produce cascading waves of change from a shock, (see methods section above and the workshop template in Appendix J) to explore the impacts and implications / consequences of four selected BE-PS-TPs on the Western Cape agriculture and agri-processing system. The technique was to pretend that the shock had happened and then coming up with some novel (and sometimes not so novel) innovative ideas of things that can be done to better manage (or prevent!) these BE-PS-TP issues proactively. All 30 BE-PS-TPs can be explored in this way as Future Wheels are a straightforward and accessible tool to use without the need for futures / foresight expertise.

Key learnings, insights and recommendations as a result of engaging with the BE-PS-TPs and Future Wheels include:

For market disruption

- If export markets aren't accessible there are market opportunities locally and regionally, and opportunities for regional integration – this is something that may happen over time anyway.
- A surprising level of adaptation is possible (e.g. change crops, market focus, etc.), but the rate of change will matter.
- “Don't neglect the local market even while you still have the international one.” Try to protect the domestic market by means of regulatory framework”
- There is a need to consider socio-economic impacts and how quickly they can be addressed – develop the ability to ‘pivot’ quickly.
- “Rethinking development” (social justice) and the role land reform is critical

For technology disruption

- Democratise the 4th IR: reduce data costs, support access for smaller players etc.
- Government has a critical role – it must be deliberate about policies to ensure inclusivity, equity, etc. Stimulate entrepreneurship (especially small entrepreneurs) and open trade,
- SMEs can create jobs but need support to do so. Examples from China ([Taobao villages](#)) and the Netherlands (where there are lots of SMMEs in agriculture and agri-processing sector).
- There is goodwill from government, but it needs to be able to implement
- Make it easy for new types of entrepreneurs incl. people who are not traditionally from farming families (or even South Africa) to enter the market – they will emerge anyway.
- Make agriculture sexy again. In peoples' minds link farming to the bigger food system and value chain – it is also good for the sector to see itself this way
- Training and skills at universities, colleges etc. is a critical factor

For food system disruption

- Stimulate innovation in food processing -- use of less fresh food to shift to more processed / dry food
- Stimulate innovation in producing cheaper sources of protein
- Stimulate innovation in affordability and re-design distribution. Western Cape can be innovative and produce enough food, but farming practices might need to change to produce higher intensity
- Create new policies for regulating export: first feed local population, before export

- Values of compassion can overcome division between rich and poor and racial divides to work against anarchy (sometimes referred to as the “Blitz spirit” meaning people come together during crisis instead of competing against one another)
- Audit land use and production. Change from wine to staple food crops and horticulture for local consumption
- More regional collaboration to exchange resources
- Strengthen and work with community based organisations (local distribution). Health and education interventions need to be supported.

For weather disruption

- Develop local expertise modelling ability to track and forecast microclimates – there can be extreme variability. Utilise science to access and manage additional resources like underground water.
- Manage the different levels of government much better – managing tensions at local level are critical. There is not a level playing ground in terms of political action and funding. Build capacity at local level so that “bylaws muddling” doesn’t interfere and contradict, and there is less conflict at local level.
- Vulnerable people are always worse off – they lose everything and responses are asymmetrical. Address this.
- Severe weather and climate might stimulate conservation / ethical / sustainable approach to farming (has probably done so already). Be pro-active about this.
- Figure out how people can come together in time of crisis (see point about “Blitz spirit” above)
- Enable Civil Society- and Non-governmental organisations CSO / NGOs to play a role – government does not have enough capacity on its own and is ‘inefficient’ in some aspects – organisations such as [Western Cape Economic Development Partnership \(EDP\)](#) practice ‘facilitative leadership’ and know how all parties can work together.
- Create a first responder integrated emergency response
- Audit land use and production, e.g. drier conditions are for good for wine, but currently ‘plastic pollution’ is used for produce in the Boland.
- Key issue is: Can farmers adapt / change fast enough? It’s all about RESILIENCE (see Appendix M for a Resilience think piece)

In conclusion the following (lots of which repeats in the sections below) was deemed important when it comes to the Western Cape agriculture and agri-processing sector dealing with BE-PS-TPs:

- **Governance**; the type of, and capacity at local level really matters – fix it!.
- **Good, working relationships** between all spheres of government, even international (so be proactive with links to global partners) and relationships between government and society is critical for resilience
- **The role of NGOs and Civil Society Organisations** may be critical – **collaborate** now already, not only when it becomes a necessity
- **Technology is a game changer** – can we develop it fast enough? It will either unite or divide us
- **Shocks can (and will) overlap**, viz Covid-19 leading to economic fallout – coordination at all levels of governance is needed

- Figure out how **social solidarity** can be nurtured and encouraged
- The **education system** must be able to meet future and BE-PS-TPs challenges
- Quickly **change and pivot** agricultural production if needed
- **Alignment and integration of plans** – they really do need to link up, be aligned and have a coordination system in place
- Shocks and crises all have **opportunities** as a flip side: What are they?

iii. Range of possible futures

For this project five scenarios (range of possible futures) were constructed using the morphological method; two of them “Dystopia” and “Utopia” by the project team, and the other three collectively by workshop participants (see Appendix C for a list and Appendix J for the template). All five are presented below, and the three participative ones include key learnings, insights and potential interventions generated during the workshop. Some benefits – many of them intangible -- of using scenarios are listed at the end of the section.

The building blocks for the scenarios (see Appendix G) consist of a) a set of critical themes that shape the future – there five of them for the Western Cape agriculture and agri-processing sector, namely:

1. 4th IR technology
2. State capacity and regulatory support
3. The biosphere
4. Knowledge transfer and learning, and
5. Demand side shifts (access to markets)

... and b) having a range of different outcomes for each of the themes.

A future one would not like to see:

“Dystopia”

Governance at all levels is incompetent, bad and corrupt. Even where policy is eventually made, it tends to be ideologically driven and is often not implemented or implementable. The uncertainties around everything ranging from land expropriation to water provision result in capital flight and zero new investment in either the sector, or at farm level. Failed land reform and transformation efforts only serve to worsen the corruption in the face of extremely bleak macro-economic fundamentals.

Climate change impact is harsh and relentless. Despite vague forecasts and warnings, agriculture did not change or adapt its practices in time and as a result the sector is constantly in reactive-panic mode and on the back foot. Inputs are scarce, infrastructure is crumbling and ecosystems are collapsing beyond rescue. Meanwhile the sector keeps adding to carbon emissions and environmental degradation.

There is an overall lack of uptake in new and/or 4th IR technology due to cost exceeding any perceived benefit. It could also be because of de-globalisation / protectionism / trade wars. Production modes, methods and patterns remain mostly unchanged, and consumers hope for the best whilst the sector gets left further and further behind its international competitors. This leads to job losses, even amongst semi-skilled workers. And it's not just production, the sector also lags when it comes to the technology needed to face the looming ecological challenges.

De-globalisation', protectionism, trade wars, neo-Cold Wars and proxy wars are the order of the day. This, combined with a groundswell of 'buy local' due to climate change and carbon emission issues, has resulted in a very narrow export scope for the sector. The few lucrative opportunities also tend to suffer some of the more creative non-tariff barriers thought up by officialdom. The extreme bifurcation of the South African remains in place and as a result it is very difficult to plan and decide what to produce for whom and how to deliver it.

Knowledge transfer is either non-existent or misdirected and irrelevant; learning takes place too late or not at all. There is no change in agricultural production structures, patterns and behaviour, resulting in the sector becoming super fragile, vulnerable to a variety of shocks and dependent on (unaffordable) bailouts.

The self-evident implications of this scenario are dreadful for all, and not just limited to the sector, but will impact the wider South African socio-economic context. To see how some of these issues may play out, refer to the 'negative' Causal Loop Diagrams in Appendix N.

Participants in small working groups took part in an online workshop to combine one outcome for each theme to build credible and coherent stories of what the futures of the Western Cape agriculture and agri-processing sector could look like over the next 20-30 years.

Scenario from Workgroup 1:

"Climate adapted self-reliant big business agriculture"

*N*ational & provincial government is aligned but not in the interest of agriculture – there are just too many other crises triggered by a long-term post-Covid collapse of the economy. Climate change impact is foreseeable and the sector manages to plan and mitigate to the extent that it is possible. The Western Cape agriculture and agri-processing sector is a resilient sector -- one that contributes to sustainability. There is a large-scale rollout of 4th IR technology – it can be achieved -- but it is mismatched to the local context, and it reinforces the strong divide between the 'haves' and 'have-nots'. The tech rollout and application is driven by large companies with the 'privileged few' incorporating cutting edge knowledge and innovation, thereby becoming more privileged. The big get bigger and there is massive consolidation and optimization in the sector. Government and the private sector do work together a bit, but it is an elite enterprise and only to enable the few remaining trade agreements because market access is extremely volatile and inconsistent creating the need for agents and intermediaries

Key learnings, insights and recommendations as a result of engaging with this scenario include:

- **Find and/or create intensive technology transfer and implementation examples** - to show it can be achieved. The issue of more equitable technology access and rollout (to the smaller players and emerging farmers) is certainly addressable
- Similarly with **knowledge transfer – it can be done**. The relative affordability of technology makes it possible and the more technology is used, the more affordable it becomes in terms of knowledge transfer. As for content, there must be a strong focus on tech transfer and implementation.
- **The funding, growth and development of agriculture should be prioritised by government right now** -- despite all the focus being on Covid -- **because there may not be money for this later**. Fund, ringfence and prioritise agriculture given its importance for food security – it is a national issue.

- **Initiate a strong drive between industry and government to ensure markets are open** to allow free movement of products between alternative market – prioritising the flexibility to be able to move between different markets. Improve collaboration within the sector as well as government / private collaboration.

Scenario from a combination of Workgroups 2 and 3:

“Techno-smart Africa on top of the world”

Markets are changing dramatically. De-globalisation and trade shifts have refocused the industry, and that focus is Africa. In 2045 it is THE focus, not just another alternative. Africa’s economies are growing and its middle class is flourishing. There are highly profitable markets for Western Cape produce and agri-processed products. Plus the infrastructure (road, rail and ports) is in place to deliver. The other factor that enhances delivery is the overall impacts of technology, such as digitization and e-commerce. Technology is the ultimate enabler and has moved successfully from being utilised by the “privileged few” to the “privileged many”. It is a great equaliser. Climate and environmental shocks are a reality. We can foresee some of the impacts, but not all e.g. “Acts of God” are difficult to predict. Regulation and governance remain a challenge (both in terms of integrated, good governance and the role government should play).

Key learnings, insights and recommendations as a result of engaging with this scenario include:

- How the sector responds pro-actively to changes in the market is key, including the potential of ‘Africa rising’, but the response is also tech driven (digitization, e-commerce), as well as due to ideological and geopolitical shifts (e.g. de-globalisation). The sector must manage to capitalise on opportunities. The current example is citrus.
- Although there are other crises and priorities, integrated (national to provincial to local), good governance key. Something like this requires a rethink of government’s role: The focus should be on creating an enabling environment for the private sector, cutting red tape etc. As focus shifts to urban areas, the **agriculture sector must be empowered for greater self-reliance**. Transformation remains an imperative.
- The role of middlemen and agents is key: Supporting and enabling ‘**good**’ middlemen vs. limiting the ‘bad’ ones (monopolists, manipulators of contracts etc.) This will require a regulatory function, including certification, environmental and food safety regulations. Technology can assist with governance too, e.g. blockchain for transparent governance of supply chains.
- The private companies will need to be equipped for this future because the sector will increasingly need to be more self-reliant and responsive. It is also important for the sector to have some kind of a capacity to deal with the environmental pressures and shocks: “plan for those we can plan for and be resilient in face of all.” There are some examples already e.g. the wine sector is experimenting with new, drought-resistant cultivars. Technology can also assist in adaptation, e.g. through precise, locally relevant climate modelling.
- **Technology is an overall enabler:** 1) Technology for all: Start with access to internet (link to education and knowledge transfer). Even a mobile phone opens possibilities to be part of the future (so not only super high tech), 2) Technology for environmental adaptation (e.g. climate modelling, new cultivars), 3) Technology for regulation and governance (e.g. blockchain). 4)

Green (clean) Tech: direct large-scale investment toward it and enable the energy sector to get on board.

- Agri-processing needs to be demand-led and market / consumer driven. Support responsive diversification to ensure a wider range of products to serve a broader market so that consumers can buy from a wider range of farmers, this includes many more emerging farmers.

Scenario from Workgroup 4:

“Private sector shapes the future”

A rift – political and otherwise -- exists between national and provincial government, but the Western Cape agriculture and agri-processing sector has managed to create a framework whereby the private sector operates smoothly and successfully – it has the means to ensure that the technocrats do the right thing. The private sector is in control and is shaping the future of food and agriculture. Climate change induced drought is foreseeable, and planned for, but the constant extreme weather is not. It causes major damage and expense, and the impact of the biosphere is harsh and relentless. Drastic measures are taken to mitigate the effects of ecosystem collapse. The sector is not sustainable and technology is deployed by the big businesses to keep going in the face of environmental challenges. As a result the digital divide deepens. As for markets; they are nearly as volatile and inconsistent as the weather, but with an army of agents, brokers and intermediaries the African market at least is accessible and profitable.

Key learnings, insights and recommendations as a result of engaging with this scenario include:

- There may be a need for a strong lobbying / support function from the private sector. “Lobbying” means “developing a common cause” – NOT bribery and it is the civil servants and technocrats that will be lobbied, not the politicians.
- In this scenario there will be a **need for a social safety net**, e.g. a Universal Basic Income (UBI), health care provision and more.
- Re-focus agriculture (e.g. plant sweet potatoes) and exports on African markets - our governance issues are replicated there -- they are the real ‘experts’ and we can learn how to operate in those markets. **The role of infrastructure to access African markets becomes key.**
- Who can be a **good interlocuter between government and the private sector** in this scenario? A previous version of the Development Bank could have done it -- who can it be now?
- **Create an agricultural export agency** in Western Cape and work at building diplomatic relations – the foreign missions are in Cape Town already
- In preparation of biosphere disaster and/or to try and mitigate it; **promote / start an artificial meat industry and decide on “Re-wilding the Karoo” as policy.**

In overview of the three workgroup scenarios some golden threads/themes were identified that run through all of them. This includes the role of the private sector, 4th IR technology as a critical issue and the potential of Africa as a long-term future market. In future Africa seems to be a desired and inevitable market – this would mean a shift (in time) of the portfolio of products. There is currently a disconnect between the public and private sectors, but the private sector features heavily in each of the scenarios. The Western Cape agriculture and agri-processing sector has to nurture and grow the

ability to trade – this will be a combined effort between public and private and require expertise in trade relations.

Early action (pro-active policy-making) can have big pay-offs. Some things, e.g. laboratory meat and re-wilding the Karoo may just be inevitable given consumer value shifts, choices and trends, and the breakdown of the biosphere.

Pre-emptive funding of the sector may also be necessary – one group’s opinion was that there would not be funds available for agriculture in the future – agriculture’s needs should be made explicit early on. It will be a long and hard road for government to create the ideal enabling environment and government should perhaps re-think its regulatory function. “Political will” and investing in education were seen as critical as was the necessary shift to clean energy production.

A preferred, ideal future:

“Utopia”

*N*ational and provincial governance is technocratic, transparent, co-ordinated, aligned, competent and above all honest! This good governance filters through to the local level. Policy-making is long-term oriented, pragmatic, fair and to the benefit of all role-players in the sector. Land reform has been, and is, accomplished in a consistent, equitable manner by means of a transparent, collaborative process between organised agriculture and government in a way that benefits all role-players. Policy certainty leads to positive macro-economic fundamentals, which in turn creates an attractive investment environment for the sector.

The impact of climate change and its accompanying extreme weather events is foreseeable, and there is reliable, precise science to assist the sector with risk management and contingency planning. The sector is also able to respond proactively. Inputs such as water and land are used sustainably and the agriculture sector, with its small ecological and carbon footprint, also contributes significantly to bio-diversity conservation – it is rewarded for this stewardship. “Clean-tech” contributes significantly to sustainable growth in the sector.

Successful, timely, affordable and appropriate transfer and application of 4th IR technologies in the majority of the sector, including for smallholder farmers and small family farms. All consumers benefit from traceability and healthy products, and many new tech-enabled jobs are created in the sector. Unskilled workers are retrained or benefit from a universal basic income.

Knowledge transfer is targeted, relevant – much of it is homegrown - pro-active and “user-friendly”. As a result production structures, patterns and behaviours change, and farms and agri-processing businesses become more resilient, long-term oriented and innovative. The majority of role-players in the sector, but in particular the farmers, are very adaptable and flexible, and able to change faster than what the external environment changes. There are incentive systems in place to share this knowledge with all players.

A diverse range of markets (various export and local ones) can be easily and affordably accessed by all players who are producing what the sustainability- and environmentally conscious market wants – from basics to ultra-niche products. Some continental Africa markets are particularly lucrative. The sector is in direct contact with its customers having cut out the remaining middle-men a while ago. Government at all levels is very supportive with regard to trade agreements and navigating the few remaining trade barriers -- even the EU farming subsidies can be dealt with, especially now that it’s possible to ship products over long distances with net zero carbon emissions.

The self-evident implications of this scenario are marvellous for all, and rather than being seen as 'utopian' this scenario can serve as a vision – and call to action -- of a preferred future for the sector. To see how some of these issues may play out and what all they could affect, refer to the 'positive' Causal Loop Diagrams in Appendix N.

Engaging with alternative futures – scenarios – enables all role-players to adjust, amend and instigate decisions and choices in the present that may affect the future.

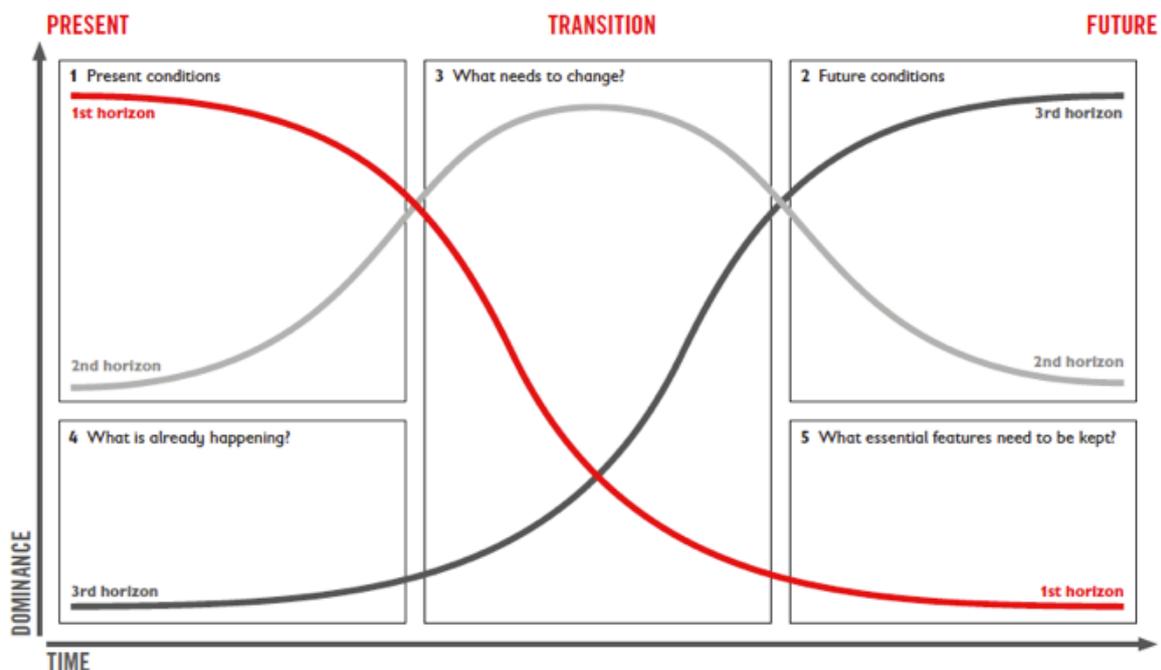
Furthermore, building scenarios helps us to:

- Challenge established views and organisational “groupthink”
- Stimulate creativity and innovation – encourages the opening of minds to new possibilities and promotes learning
- Enhance perception – become more insightful, recognise/understand change and uncertainty
- Communicate alternative views, which are intrinsic and valued
- Build a “memory of the future” – check for milestones, develop strategic flexibility and an adaptive culture
- Understand what can be done to build a pathway to a preferred future

It is also useful to keep in mind that scenarios may be used in a number of different ways. This includes, but is not limited to;

- road test or stress test existing goals and strategies against alternative futures,
- identify unintended consequences and outcomes of current actions and choices,
- plan for future uncertainties and/or identify emerging risks and opportunities,
- imagine the future in order to improve today's decision making, and
- serve as an advocacy tool, whether for an individual organisation or the wider system.

The preceding scenarios were not the only engagement with imaginary futures. Workshop participants (see Appendix C for a list of participants and Appendix J for the template) also collectively populated **Three Horizons Frameworks**, illustrated in the figure below. Three Horizons Frameworks are particularly good for working with complexity, developing future consciousness, and recognising transformative change, whilst exploring how to manage transitions.



Workshop participants articulated a desired future – one of a sustainable, resilient, equitable Western Cape agriculture and agri-processing sector -- then identified ‘pockets of the future in the present’ (like the ‘bright spots’ identified in the survey; Appendix H) that are niche and marginal, but represent a different system. Then they engaged around what needs to happen in the ‘transition’ zone shifting from one system to another. The Three Horizons Framework. session was also used to generate potential interventions for the ‘transition’ zone.

Key learnings, insights and recommendations as a result of engaging with the Three Horizons Framework include:

- Coordination, between sectors, levels of government, and the needs of various groups (people, industry, etc) is critical. What has become apparent is that while the issues are known - and to some extent the desired future is also ‘known’, these individual **issues cannot be solved without coordinating between different parties**. It is also **a matter of collaboration** between government, industry and citizens.
- **Market choices really matter**, e.g. niche, high-value and the mass market for affordable food.
- A big challenge is how to **enable small-holder farmers / small-scale producers to harness opportunities of the future** through collaboration, embracing technology etc.
- **Disintermediation** of few, larger players. Can industry organisations take over agri service operations currently supplied by Department of Agriculture, Land Reform and Rural Development (DALRRD)?
- How do we ensure **a just transition** (in terms of impact on labour relations, role of unions, employment and skills for the future)? There will be lessons from the pending (un)just energy transition. Those who cannot manage the transition – the “agri-renaissance” -- face a “valley of desolation”.
- **Engineering expertise is needed** to turn the new sciences and innovation into technology for mass application.
- **Look for opportunities** (and govern for opportunities) **to leapfrog**. Skip wasteful / damaging practices and technology e.g. use electric farming equipment vs diesel. Use 5G to operate in remote locations with additional remote technical support (drones, remote operation of vehicles, etc.)
- **Increased investment** (e.g. infrastructure and climate smart agricultural production methods) and support for land ownership changes and labour transition and reskilling -- these are also investments -- **is needed for (a just) transition phase**.
- An **enabling environment** is needed for the transition phase, e.g. to sort out mis-matches, manage water competition and counter lack of coordination and fragmentation. There is a clear picture of the challenges and obstacles ahead and the opportunity to move towards a good future is there, but the biggest obstacle is ‘political will’.
- A **mechanism for managing ‘contradictions’** is needed, e.g. structure of farming and size of farms, opportunities for small-scale production, exports vs. the need for nutritious food locally. Instead of self-interest vs. social justice, enable self-interest AND social justice.
- **Diversification** is important, as is co-ordinated governance within different resilient value chains. In future agriculture will provide more than food – can ‘life-style’ farming expand so that it is not just for the rich?
- The **green agriculture economy** can be a high growth area and help shift systems.
- Start working NOW on **‘mainstreaming’ circular economy / closed loop farming**.
- **A social compact is needed**.

- Finally four transition themes were posed as questions:
 1. What if farming is less resource dependent?
 2. What if land is a multi-use resource?
 3. What if the nature of capital changes, e.g. it is not just financial anymore?
 4. What if capital goods can be divided e.g. many small drones vs. one place-based combine harvester?

iv. Causal Loop diagrams and potential interventions

For this project Causal Loop Diagrams (with narratives describing the positive and negative loops all shown in Appendix N) were built around six domains of change, some of which are similar to the scenarios' critical themes;

1. Africa's rise
2. 4th IR Technology
3. governance
4. policy (un)certainty
5. climate change, and
6. agricultural education and knowledge transfer

These domains each have an inflexion¹⁸ point (a.k.a. as a bifurcation point) – this is where things can go either one way or the other moving into the future. These inflexion points serve as the start for positive and negative loops. Each domain tells a story about the future, with both positive and negative angles.

The domains were identified from a mix of desk research, expert interviews, and workshoping analysis, in particular the first workshop that dealt with high impact, highly uncertain drivers of the future Western Cape agriculture and agri-processing system.

The post workshop analysis comprised the following: High impact, high uncertainty drivers (prioritised by workshop participants) were clustered and scored to establish how strongly each of them influenced other factors (an active score), and in turn how strongly they were influenced *by* other factors (a passive score). A high active and high passive score (such as the case of climate change and Africa's rise) indicates a 'critical factor', and it is these that often form either virtuous or vicious circles – the positive and negative loops. A factor that has a high active and low passive score, such as 4th IR technology often makes an effective lever.

As can be seen from the Causal Loop Diagrams and their descriptive positive and negative stories the Western Cape agriculture and upstream and downstream agri-processing sector role-players do not have very many system level intervention (leverage¹⁹) points - the national level governance and policy uncertainty loops are a case in point -- but where they do, these interventions can – over time – make a big difference.

To illustrate the point some Causal Loops are shown below together with their stories. The ones shown are those where WCDoA and its partners and stakeholders can have some influence and intervene. Hence the importance of concentrating resources (time, money and effort) on 'triggering' the positive loops where there is the possibility of intervention and leverage, e.g. the positive loop for 4th IR technology is:

¹⁸ An inflexion point is also a mathematical term indicating a change of curvature from convex to concave at a particular point on a curve, e.g. a bell-shaped curve.

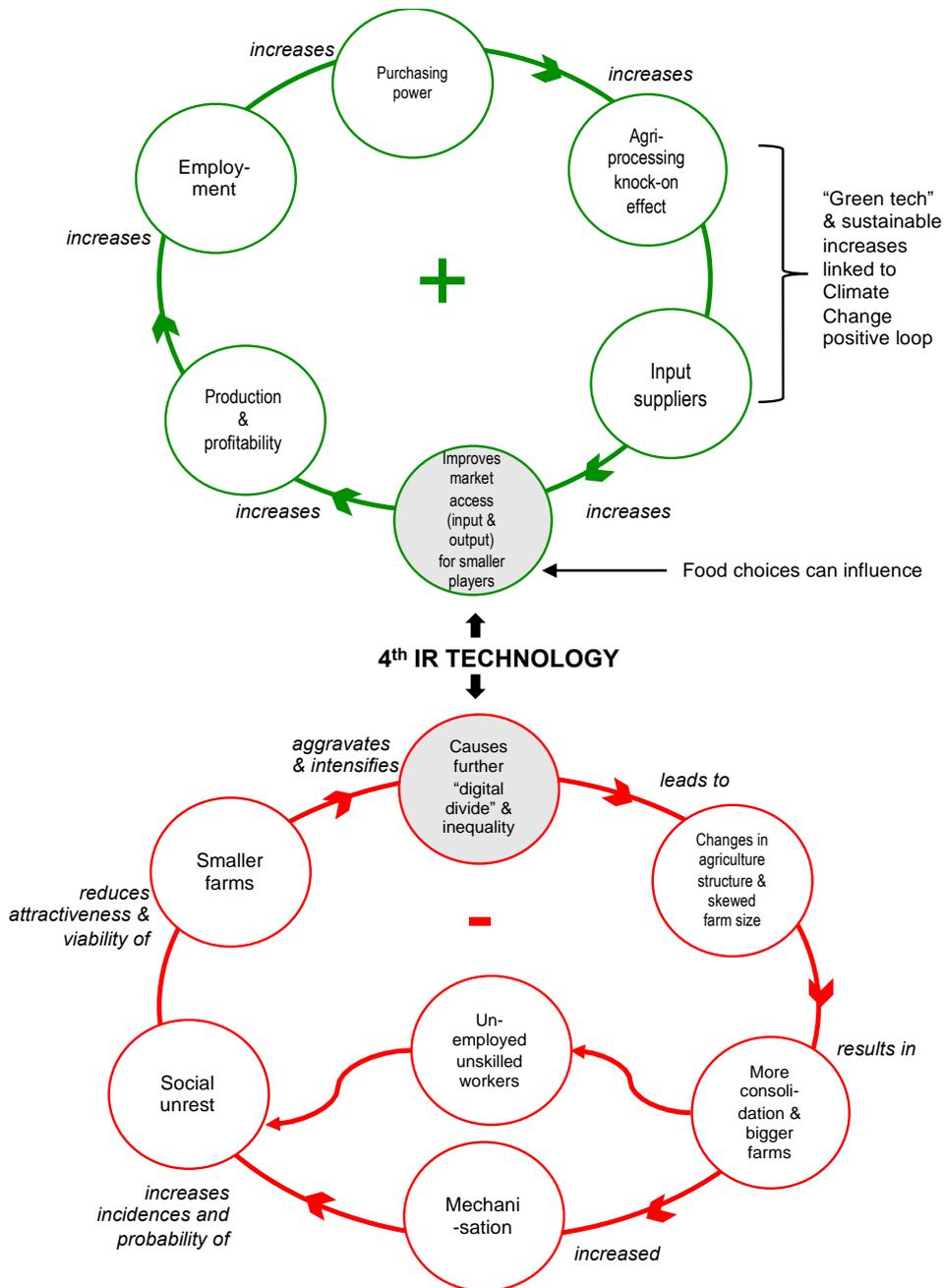
¹⁹ A leverage point is a place within a complex system where a "small shift in one thing can produce big changes in everything." See Donella Meadows, 'Leverage Points: Places to Intervene in a System', 1999 http://donellameadows.org/wp-content/userfiles/Leverage_Points.pdf as well as a helpful graphic checklist in [Appendix O](#)

Access to affordable, appropriate 4th IR technology enables smaller farmers and producers to better access markets (both input and output). This increases their production and profitability – never mind better serving consumers and customers – and leads them to employing more workers, especially skilled ones.

Rising employment levels result in increased consumer purchasing power, which has an agri-processing knock-on effect leading to an increase of input suppliers, which loops back to better servicing the farmers and producers – smaller ones included.

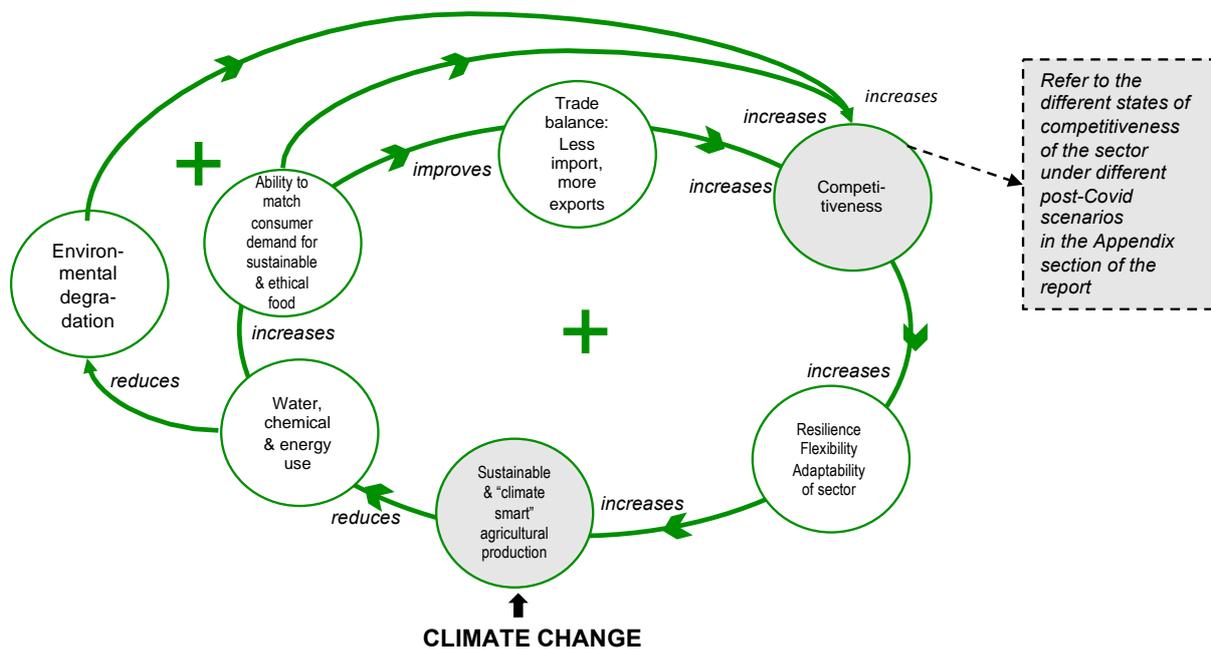
On top of which; if agri-processing production increases sustainably using ‘green tech’ and input suppliers multiply as a result of ‘green tech’, this growth will be linked to, and feed into, the Climate Change ‘positive loop’.

Both 4th IR technology loops are illustrated below.



'More diverse, smaller farmers and producers' also feature in the climate change positive loop – they represent an increased resilience and flexibility in the system, and they also lead to increased competitiveness – a critical component of Western Cape agriculture and agri-processing sector. A diversified agricultural sector structure, where we see many smaller farms and niche operators, is also more likely to keep the vested interests of 'bad governance' in check, plus successful smaller farmers are a potential indicator for successful land reform (see the policy uncertainty loop in Appendix N) .

The climate change positive loop clearly shows the win-win-win if farmers and agri-processors are pro-actively encouraged / incentivised / regulated / supported to engage in sustainable, 'climate smart' production. Thus, reducing water, chemical and energy use has huge future pay-offs and leads not only to increased competitiveness, but also increased resilience, flexibility and adaptability of the sector, which is ultimately the way of dealing with future shock and disruptors (PS-BE-TS as per section 6.ii of this report).



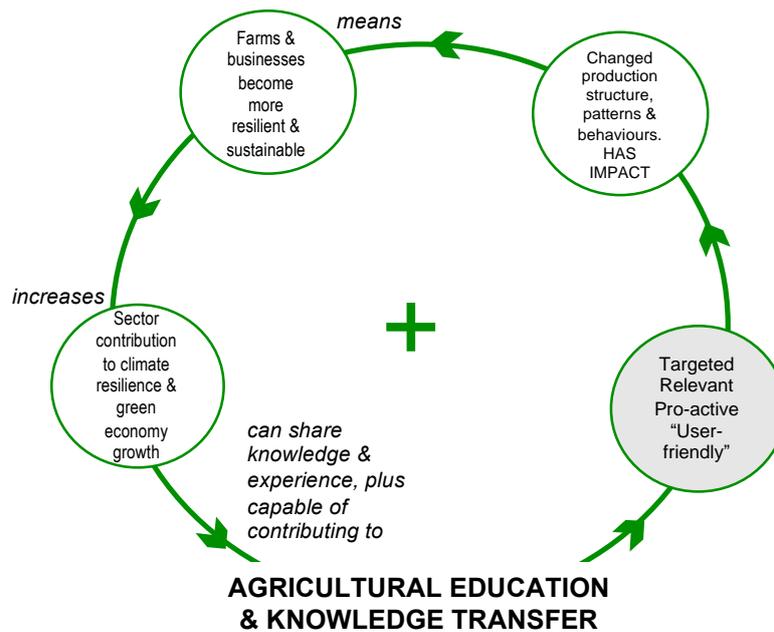
Arguably the strongest potential intervention point for WCDa and its partners and stakeholders is: Agricultural education and knowledge transfer.

Kickstarting a positive loop that leverages 'agricultural education and knowledge transfer' is one of the most powerful potential interventions points available to WCDa, its partners and stakeholders.

Targeted, relevant, pro-active and "user-friendly" education and knowledge results in changed production structure, patterns and behaviours. The 'right' kind of education and knowledge transfer has impact and drives pro-active change.

This means farms and agri-processing businesses become more resilient, sustainable and competitive, which increases the contribution this sector makes to climate resilience and green economy growth.

A successful resilient and sustainable sector in the Western Cape can then share its experience, learnings and best practices and in that way contribute to further agricultural education and knowledge transfer – further fuelling the virtuous circle.



Agricultural education and knowledge transfer is definitely something WCDoA and its partners and stakeholders has control over and it has far-reaching consequences, *plus* it is linked to the climate change and 4th IR technology positive loops. The positive Agricultural educational and knowledge transfer loop can trigger RESILIENCE (see Appendix M) which is key for navigating the VUCA context and future that the Western Cape agriculture and agri-processing sector needs to operate in.

All of the Causal Loop Diagrams and their descriptive narratives were then used to identify potential intervention points. The interventions listed in the table below concentrate on triggering positive loops and/or tapping into the parts of the inflexion/bifurcation points that lean towards the positive systems and ‘virtuous circles’. A whole set of recommended interventions can also be made to mitigate against, or prevent, negative loops (‘vicious circles’), but because these are usually the direct opposite of what is proposed and recommended in the table below, they are not listed here.

DOMAIN OF CHANGE: Inflexion / Bifurcation	Recommendations and comments about interventions
<p>AFRICA: Middle class rises vs. Stalled / ‘stolen’ growth</p>	<p>No direct intervention and/or leverage is possible from the unit of analysis perspective; however, some indirect and pro-active options and actions include:</p> <p>Scan and monitor for (early) signs and leading indicators of where middle-class demand may be rising, plus open market, free trade opportunities may be evolving: WCDoA and related institutions, e.g. Wesgro, WOSA and industry associations for export-oriented commodities and products.</p> <p>Motivate to / prevail on (“lobby”) national level institutions, e.g. Department of Trade, Industry and Competition (DTIC) to advance and speed up trade, trade agreements, cross-border infrastructure and technical co-operation to access promising African markets: WCDoA and related institutions as above.</p> <p>Where there are promising signs based on scanning, implement multi-party, multi-pronged product placement and marketing programmes to pro-actively introduce products to target markets: WCDoA and related institutions as above.</p> <p>Pro-actively audit, analyse and conduct feasibility exercises of what infrastructure (hard and soft) is required to successfully and profitably export to the various African markets. Liaise with and lobby those parties that can realise this</p>

	<p>infrastructure : WCDoA and related institutions, e.g. Wesgro, WOSA and industry associations.</p> <p>Ensure that farmers and producers can pivot and adjust quickly and effectively as and when demand manifests and opportunities become accessible: Farmers and agri-processing producers together with support programmes from WCDoA and industry associations.</p>
<p>4th IR TECHNOLOGY:</p> <p>Improves market access (input & output) for smaller players</p> <p>vs.</p> <p>Causes further “digital divide” & inequality</p>	<p>In collaboration with the private sector and/or education institutions (as well as with partners and stakeholders – in other words a collective effort) launch a 4th IR Tech programme (set of projects) specifically designed to improve production and market access of smaller players. ‘Democratise’ agricultural 4th IR technology for want of a better word. The 4th IR Technology positive loop clearly shows the benefit of this, in addition to its positive outcome linked to resilience in the sector, and ultimately a diverse set of smaller players being more associated with good, ethical governance.</p> <p>Appendix M contains a detailed list of recommendations from the 4th IR back-cast exercise, including what to do about:</p> <ul style="list-style-type: none"> - Providing infrastructure and training - Creating an enabling regulatory environment - Catalysing innovation and entrepreneurship, and - Facilitating partnerships and ecosystems
<p>GOVERNANCE:</p> <p>Ethical, collaborative, competent and aligned</p> <p>vs.</p> <p>Poor, bad and corrupt</p> <p>Leading to:</p> <p>POLICY CERTAINTY</p> <p>vs.</p> <p>POLICY UNCERTAINTY</p>	<p>As mentioned above, the WCDoA and its partners and stakeholders do not have much control over the national level governance inflexion point; instituting good, ethical governance and/or preventing corrupt bad governance. This inflexion point leads directly to another: Policy certainty vs. Policy uncertainty. It is in these realms where such critical issues such as successful land reform efforts and macro-economy performance play out. .The Causal Loop Diagrams illustrating Governance and Policy(un)certainty (see Appendix N) trigger a range of issues fundamentally affecting the future of the Western Cape agriculture and agri-processing sector.</p> <p>Even though WCDoA and its partners and stakeholders cannot directly intervene, it doesn’t mean they must do nothing. The following, especially if some resources are allocated and if done strategically, can pay off in terms of ‘bending the path’ that the future takes:</p> <p>Motivate to / prevail on (“lobby”) and actively communicate to national level institutions and stakeholders the benefits of good governance and policy certainty vis-à-vis the costs of bad governance and policy uncertainty. If possible more so from a public servant’s / civil service / farmers’ perspective than a political one.</p> <p>Clearly identify which aspects / factors / elements of governance and policy-making fall in the ambit of the provincial government and ensure that this is designed to benefit the sector over the long run – start practicing Anticipatory Governance, see Appendix A and Appendix P.</p> <p>Create an enabling environment which make it easier for Western Cape agriculture and agri-processing sector players to navigate bad governance and policy uncertainty and their negative loop consequences.</p>
<p>CLIMATE CHANGE:</p> <p>Sustainable & “climate smart” agriculture</p> <p>vs.</p> <p>Production does not change</p>	<p>When it comes to climate change, which is a ‘critical factor’ (it has a high active and high passive score) there is considerable scope for intervention and considerable benefits and opportunities to be had from pro-actively triggering the positive loop. The virtuous circle potentially pays off in a multitude of ways, including increased competitiveness and higher levels of resilience, which is how to withstand shocks and surprises. Interventions centre around:</p> <p>Use a variety of means and methods to encourage, incentivise, regulate (‘force’) and support all farmers and producers to switch to sustainable, ‘climate smart’ production.</p> <p>This will also include the provision of ‘climate smart’ infrastructure in the province (renewable energy, technology, transport modes, packaging, etc.) that will shore up and accentuate any on-farm and in-factory efforts.</p>

<p>AGRICULTURAL EDUCATION & KNOWLEDGE TRANSFER:</p> <p>Targeted, relevant, proactive and 'user-friendly'</p> <p>vs.</p> <p>Misdirected, not relevant and not timely (lagging)</p>	<p>As with the climate change inflexion point, and as illustrated above, this is a domain of change entirely within the control of WCDoA (think Elsenburg!) and its partners and stakeholders. Deciding who to educate, how, when, where and with what can trigger a positive loop with immense payoff – a classical example of 'small shifts in one thing can produce big changes in everything'.</p> <p>Using a futures and systems thinking approach, together with the Causal Loop Diagram showing cause and effect, makes it clear that getting this right, and combining it with the 4th IR technology and climate change leverage points can trigger a pathway to a preferred future where the Western Cape agriculture and agri-processing sector is resilient, sustainable and equitable (with regard to a diversity of smaller players in the system) over the long run. And it is important to note that resilience means diversity and the ability to deal with transformative change, not only the ability to withstand shocks.</p> <p>The intervention is thus; educate and transfer knowledge strategically, emphasising 1) sustainable and "climate smart" production methods, 2) 4th IR technology 3) resilience and 4) navigating VUCA conditions.</p>
--	---

7. Recommendations

The central – key – recommendation coming out of this work is that the WCDoA and its partners and stakeholders should take time out to properly review and interrogate this document, together with ALL its supporting material in order to:

6. **Identify the most relevant interventions – those that are feasible, fundable and implementable now.** In other words sift through the myriad of options in this document and its supporting material – many are emphasised -- and decide which become strategic actions; allocate resources to them, **align them to existing initiatives**, and begin implementation so that the journey towards 'making' a preferred future can start. Starting this journey will trigger other positive spin-offs in addition to creating change (which needs to be managed where possible – change management really is a thing).
7. **Identify the interventions with the most leverage.** This is clearly illustrated by the Causal Loop Diagram analysis viz. democratising 4th IR technology, making sustainable, 'climate smart' agriculture possible, and successfully conducting agricultural education and knowledge transfer. These interventions are particularly potent because they add value, 'pay-off' and make sense regardless of what the future holds – they are robust and given the context, 'must-do' interventions. Additional generalised high leverage principles are listed in Appendix O. Start planning and working toward making them possible if they are not so now.
8. **Promote – this also means reward and incentivise – new and different ways of working.** Refer to the 'Anticipatory Governance' think piece (Appendix A) and the recommendations extracted from it (Appendix P). 21st century challenges cannot be solved with 20th century thinking.
9. **[Do] not discard any of the ideas, suggestions and recommendations** made as a result of this project. Even if not applicable now, 'un-doable' and outside the WCDoA and its partners and stakeholders' control; the future changes, and implementation conditions change. Something that may be the vaguest option now, could turn out to be a killer strategic action in five years' time. Having a large collection of options does two things; 1) it contributes to resilience and its underlying key principle of diversity and some surplus, and 2) options also serve as contingency plans. When the timing and/or conditions are right (or made right) options can easily become actions.
10. Lastly, it is useful to keep in mind that there are **multiple ways of working**; so even if there is no power to implement or action, there may be power to influence ('good lobbying') and / or collaborate towards making a preferred future over time; starting now.

8. Acknowledgements

All of the work presented in this report and its appendices is a collective effort based on the valuable knowledge, experience and contributions by the workshop participants (see them all in Appendix C) and the team involved. THANK YOU! to all. As for the team, WCDoA personnel included, in alphabetical order, they are:

- Dr Dirk Troskie
- Prof Johan van Rooyen
- Dr Linda Luvuno
- Ms Mari-Lise du Preez
- Prof Nick Vink
- Dr Odirilwe Selomane
- Dr Rika Preiser, and
- Mr Shelton Mandondo

It was a huge privilege – and great fun – working with you all. Thank you also to Dr Charmaine Manyani for helping out so impressively with the survey analysis, and an extra special shout out to Dr Paul Clüver for, amongst others, co-ordinating the experts' focus group. Your knowledge, interest, time and commitment is appreciated way beyond the 'thank you' logged here.

May all your preferred futures be realised.

9. Appendices

Appendix A: Anticipatory Governance think piece

Appendix B: Competitiveness of the sector under different post-Covid scenarios

Appendix C: Workshop objectives and participants

Appendix D: Table containing methodology matched to research questions

Appendix E: Driving forces shaping the future in card format

Appendix F: Driver card sources and further reading

Appendix G: Morphological scenarios: Critical themes and their range of possible outcomes

Appendix H: Analysis of survey and focus group results

Appendix I: Proposed interventions extracted from the survey

Appendix J Workshop template examples

Appendix K: 4th IR technology back-cast from a desirable future

Appendix L: Recommendations from 4th IR technology back-cast

Appendix M Resilience think piece

Appendix N: Causal Loop Diagrams

Appendix O: Places to intervene in a system

Appendix P: Recommendations from anticipatory governance think piece