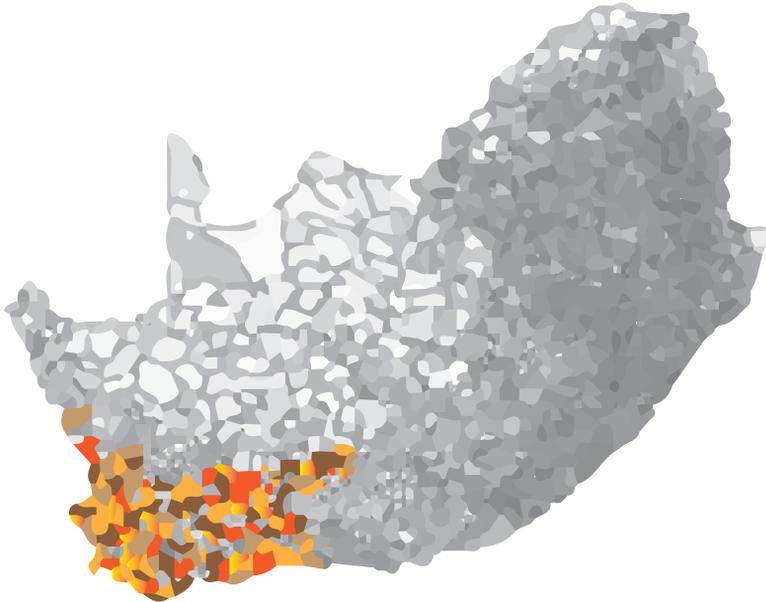


A Review of  
**CLIMATE CHANGE & THE AGRICULTURAL SECTOR**  
IN THE WESTERN CAPE

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EXECUTIVE SUMMARY



BETTER TOGETHER.



BETTER TOGETHER.

# INTRODUCTION

Climate change has the potential to destabilise agriculture and food security and undermine economic and rural development. A co-ordinated and co-operative approach is required for the development of long term resilience to climate change in agriculture. In a first-time collaborative effort, the Western Cape Departments of Agriculture alongside Environmental Affairs & Development Planning launched the Smart Agriculture for Climate Resilience (SmartAgri) project in August 2014. Under the leadership of the University of Cape Town's African Climate and Development Initiative, a consortium is developing a provincial climate change response framework and implementation plan for the agricultural sector of the Western Cape. This draws on what is already happening: shared learning, new insights, joint identification and promotion of effective and practical responses through strong stakeholder engagement.

## POLICY ENVIRONMENT

The fundamental unpredictability of the biophysical and socio-economic environment has driven policy makers to look for ways to use policy to boost resilience, through aligning policy between tiers of government: national, provincial, local. This is further aided by the formation of partnerships between business, private sector, academic institutions and civil society. Despite ongoing efforts, further alignment is needed as well as clarification of national and provincial mandates in areas contributing to a climate change response.



**RESILIENCE:** The capacity of a socio-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain it's essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

# CLIMATE CHANGE

Based on the current understanding of climate processes, climate change will cause shifts in locally important climate systems or processes.

## CURRENT OBSERVATIONS

- rising temperatures
- reduction of rainy days in autumn and summer especially along the south coast
- progressively later start and end to rainy season

## WC PROJECTIONS FOR 2040-2060

(Impacts will differ widely from place to place)

- higher minimum and maximum temperatures, more so inland
- increases in annual temperatures of 1.5°C to 3°C
- more hot days and fewer cold and frost days
- reduced annual rainfall by mid-century
- possibility of increased rainfall particularly along the south coast

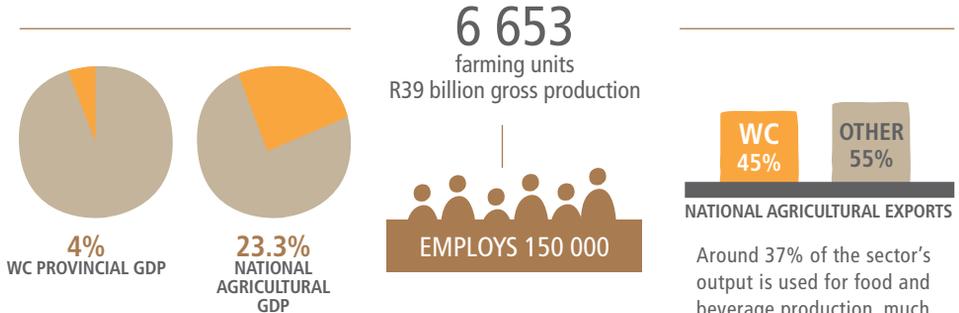


The Western Cape is not unfamiliar with **flooding, droughts and heat waves**. Between 2003 and 2008, direct damage costs associated with climate related events, amounted to **over R3 billion**. The incidence of droughts, floods and heat waves is likely to increase in future.

There is a great need to improve weather stations and other types of observation across the province to enable research and ongoing monitoring of changes.

# AGRICULTURE AND ITS SIGNIFICANCE

Agriculture in the Western Cape is highly developed and forms the backbone of the provincial rural economy and employment. The sector is well diversified with numerous major commodities across field crop, horticultural crop and livestock sub-sectors.



Current strengths in the system, which provide the ability to respond to climate change include high levels of diversification of commodities, farming systems and markets, as well as an organised commercial sector managed by commodity groups with farmer participation, a very strong value chain, and excellent local research and training capacity.

Around 37% of the sector's output is used for food and beverage production, much of which is exported. Steady increases in exports of wine, fruits and livestock products have contributed positively to economic growth and rural incomes.



Areas of development include technological advances and testing under local conditions, market development based on shifting competitive advantages, education and skills transfer at all levels, including strengthened extension, capacity building of input suppliers and others in the value chain.

# OVERVIEW OF THE FOOD SYSTEM

The close relationship between agriculture and the food system is not always understood or acknowledged in policy making. The failure to take a systems approach to the issue of food has meant that inadequate availability and accessibility has been addressed as technological challenges rather than systemic failures. Climate change can further weaken food security for vulnerable groups.

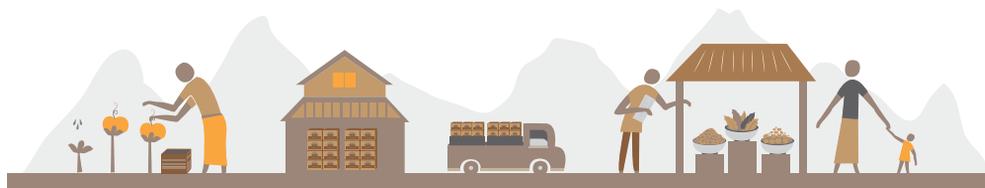
The assessment of risk and impact on the agricultural sector requires an integrated view of the linkages between climate drivers, direct and indirect consequences on crops, livestock and the productive environment, and the social and economic context.

Agriculture is generally highly exposed to, and often highly sensitive to climate variability and climate change, leading to significant impacts. The potential for climate change to disrupt this sector and food security needs to be taken very seriously.



## SA NUTRITION TRANSITION

The majority of low income South Africans do not have access to a healthy diet and are consuming a very limited range of predominantly starchy foods. This pattern has led to a rapid decrease in nutrition and at the same time, increase in obesity.



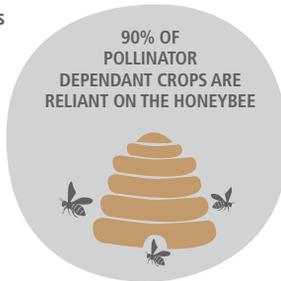
Improved formal and informal food systems and agri-processing can bring resilience under climate driven variability of supply.

# NATURAL RESOURCE BASE

Decreasing water quality, increasing fire risk, invasive plant infestations and biodiversity loss are currently serious threats and set to worsen under climate change. Initiatives to deal with these problems exist and need to be stepped up to support sustainability in agriculture.

**BIODIVERSITY** is of high importance to agriculture. It is a central cog in the provision of invaluable services:

- water catchment & groundwater recharge
- water purification
- maintenance of soil stability & nutrient cycling
- flood and drought attenuation
- control of potential agricultural pests
- provision of useful species & genetic resources
- pollination of crops
- maintenance of nutritious grazing
- predator control
- fire & vegetation regeneration
- carbon sequestration



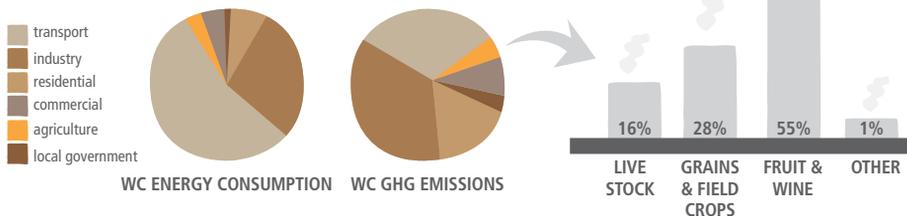
**WATER RESOURCES** are already stressed in much of the province with a low level of assurance for agricultural use. Climate change is likely to increase this stress through increasing demand (rising temperatures) and more variable rainfall. Planning for droughts and protection of catchments and wetlands are particularly important.



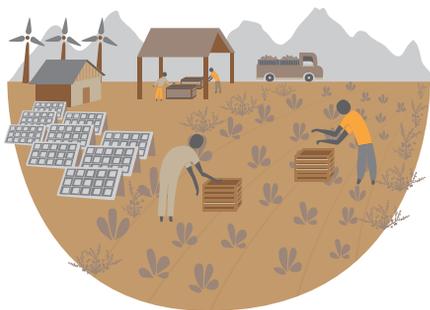
Ecosystem-Based Adaptation (EbA), the establishment of Biodiversity Corridors and the forging of partnerships present a platform for further advances. The Western Cape can draw on its very strong research and knowledge base on natural resources to devise strategies that strengthen linkages with agriculture and its potential into the future. This will require a targeted focus on better understanding and monitoring of such linkages and improved collaboration between the agriculture, water and biodiversity sectors.

# ENERGY & GREENHOUSE EMISSIONS

Energy plays an important role in socio-economic development. Sufficient and clean energy is required for sustainable development. Economic growth is perceived to be unsustainable if it demands a lot of energy, generates significant greenhouse gas emissions and pollutants and negatively affects public health.



The agricultural sector accounts for 2% of energy consumption in the province (excluding transport) and for 5% of the provinces Greenhouse Gas emissions (GHG). Energy sources are used at different stages of agricultural production and processing, particularly in land preparation, irrigation, refrigeration and packaging. The most significant sources of energy for agricultural activities are diesel followed by electricity.



## REDUCING GHG EMISSIONS IN AGRICULTURE

Two approaches which hold promise:

- Reduce energy consumption and switch to renewable energy sources (wind, solar, biogas)
- Sequester carbon through land-based interventions such as the restoration of rangelands, reducing degradation of soils and land cover, and promoting conservation agriculture.

# CLIMATE IMPACTS

While agriculture is highly sensitive to climatic fluctuations, the impacts will differ widely from place to place. The scale of the impacts will depend on local farming systems, commodities, natural resources such as water, and socio-economic situations. Without an adequate and timely response, climate change could constrain the future development of this sector and threaten jobs and livelihoods.

**WINTER GRAINS** - Flexible adaptation approaches, the use of rotational production systems, an increasing shift to conservation agriculture combined with the fertilising effects of rising atmospheric CO<sup>2</sup>, could provide sufficient resilience to warming of up to ~+2°C. The biggest threats of climate change to field crops are likely to lie in changes to the distribution and intensity of pest species, the spread of diseases and growth of weeds.

**IRRIGATED HORTICULTURAL CROPS** - Apart from apples, horticultural crops are unlikely to become affected by moderate warming. However, seasonal shifts in rainfall, temperature and humidity give rise to production and quality problems.

**The biggest threats of climate change to irrigated horticultural crops are insufficient water for irrigation, changing patterns of pests and diseases, and further warming.**

**DRYLAND HORTICULTURAL CROPS** (e.g. rooibos) will experience range shifts in suitable production areas, with warmer and drier areas contracting and new areas becoming suitable which are currently too cool or wet.

**EXTENSIVE LIVESTOCK PRODUCTION** (cattle, sheep, goats and ostriches) will be primarily impacted by rangeland vegetation changes and fodder production. Dairy cattle are at greater risk of experiencing heat stress with reduced milk production and fertility.

**INTENSIVE LIVESTOCK PRODUCTION** (feedlot cattle, pigs, chickens) is likely to be adversely affected by heat stress in warmer regions, feed scarcity, cost increases and diseases.

**GENERIC RISKS** include floods, droughts, hail, frost and fires and damage to agricultural infrastructure.

**ON A PRODUCTION LEVEL**, agriculture in the province shows fairly high levels of adaptive capacity, with only a few commodities likely to come under threat with a moderate warming (until mid-century). However, resilience may be declining because of multiple stressors interacting with climate, a higher frequency of climate events with insufficient time for recovery, and generally more difficult conditions in some of the more marginal regions.

# ADAPTATION RESPONSES

The agricultural sector is adapting by responding to the demands posed by current climate variability and extremes in the context of other equally challenging socio-economic drivers and pressures. Although there are some anticipatory responses, most of the current responses are reactive and focused on the short term. Producers need a wide range of hard and soft technologies and approaches from which to make appropriate choices tailored to their own situation and needs. 'No-regret' measures should be robust to withstand a wide range of future climate possibilities. Adaptation must be aligned with sustainable development and job creation.

**The following approaches are a start and should be further developed:**

## **Planning for climate change and variability**

- Climate monitoring systems
- Weather forecasting and climate change projections
- Disaster Risk Reduction and Management
- Insurance and risk management

## **Sustainable / adapted soil & water management**

- Irrigation technology and scheduling
- Alien tree clearing
- Wetland rehabilitation and restoration
- Conservation Agriculture
- New sources of water for irrigation
- Improve water quality
- Improved land management

## **Sustainable / adapted crop management**

- Crop breeding and cultivar development
- Site specific crop and cultivar choice
- Biotechnology for climate adaptation of crops
- Integrated pest, disease and weed management
- Management of annual crops
- Technologies to manage rising temperatures
- New production areas

## **Sustainable / adapted livestock management**

- Livestock breeding and breed choices
- Livestock management
- Pest and disease management

## **Sustainable / adapted farming systems**

- Mixed farming / diversification
- Integrated production
- Organic production

## **Marketing and retail-led sustainability**

### **Ecosystem-Based Adaptation (EBA)**

### **Community-Based Adaptation (CBA)**

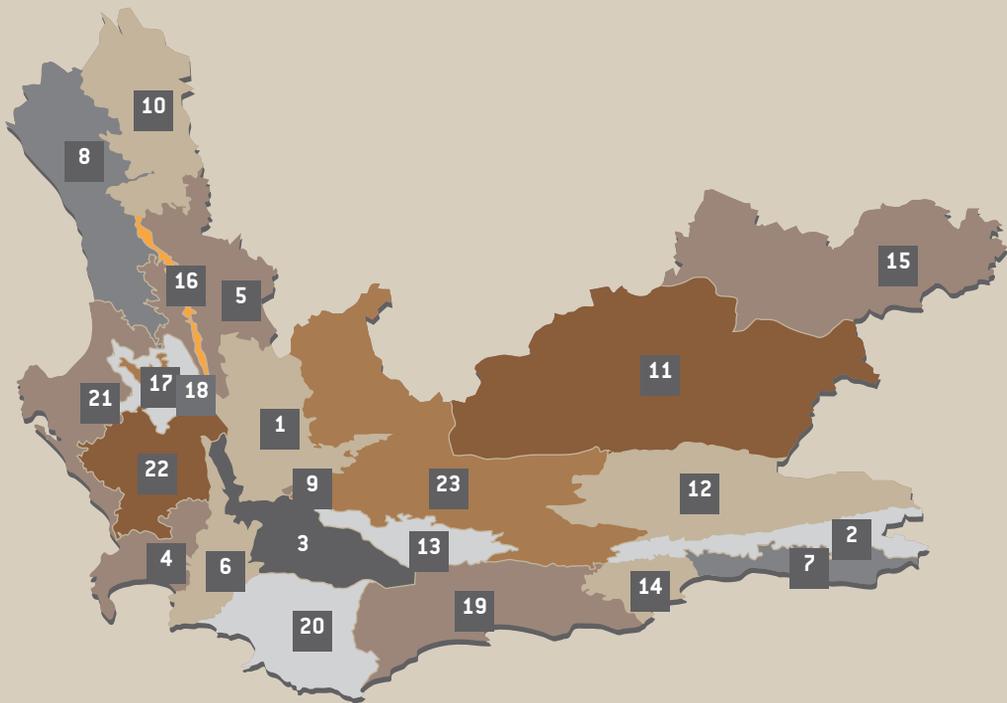
### **Stakeholder organisation and networks**

### **Education and research**

### **Knowledge management**

### **Partnerships**





# AGRO CLIMATIC ZONES

	NAME	MAIN WATER RESOURCES	MAIN COMMODITIES	CLIMATE CHANGE PROJECTIONS *	FUTURE POTENTIAL
1	<b>Bokkeveld</b>	Farm dams, good water resources & large storage capacity	Pome fruit, wheat, stone fruit, onions, potatoes & cattle	Medium range warming	Remains high as long as the dams fill up
2	<b>Bo-Langkloof-Outeniqua</b>	Dams, insufficient storage capacity, use of ground-water	Pome fruit, hops, wheat, cattle, sheep & goats	Low to medium range warming	Increasingly marginal, constrained by water availability and extremes
3	<b>Breede</b>	Breede River, dams, farm dams, very large storage capacity	Wine grapes, wheat, stone fruit, pome fruit, olives, broilers, egg layers	Medium range warming	Remains high as long as dams fill up
4	<b>Cape Town-Winelands</b>	Large dams in supply system, farm dams, rivers, large storage capacity, almost fully committed	Wine and table grapes, wheat, stone fruit, vegetables, olives, canola, berries, broilers, egg layers & pigs	Low range warming	Remains high as long as dams fill up

\* Due to model uncertainties both decreasing and increasing rainfall scenarios should be considered. Warming range for the Western Cape is between 1.5 °C and 3 °C by 2050.

	NAME	MAIN WATER RESOURCES	MAIN COMMODITIES	CLIMATE CHANGE PROJECTIONS *	FUTURE POTENTIAL
5	<b>Cederberg</b>	Rivers, very low storage capacity	Rooibos, wheat, citrus, wine grapes, potatoes, cattle	Medium range warming	Increasingly less productive particularly in the North
6	<b>Grabouw-Villiersdorp-Franschhoek</b>	WCWSS large dams, farm dams, very large storage capacity	Pome fruit, wine grapes, wheat, barley, stone fruit, berries	Low range warming	Remains high as long as dams fill up, but apples become unviable due to warming
7	<b>GrootBrak-Plett</b>	Rivers, low storage capacity	Wheat, barley, vegetables, dairy, cattle, egg layers	Low range warming	Possibly less productive but depends on rainfall shifts
8	<b>Hardeveld/Sandveld-north</b>	Very low storage capacity, use of groundwater	Wheat, wine grapes, rooibos, potatoes	Medium to high range warming	Increasingly marginal
9	<b>Hex</b>	Farm dams, very low storage capacity	Table grapes, citrus	Medium range warming	Remains high as long as dams fill up
10	<b>Knersvlakte</b>	Almost no storage capacity	Wheat, wine and table grapes, rooibos, sheep, cattle, goats	High range warming	Already very marginal becoming worse
11	<b>Koup</b>	Few episodic rivers, medium storage capacity, use of groundwater	Olives, vegetables and vegetable seed	High range warming	Slowly declining productivity, constrained by heat

	NAME	MAIN WATER RESOURCES	MAIN COMMODITIES	CLIMATE CHANGE PROJECTIONS *	FUTURE POTENTIAL
12	Little-Karoo	Farm dams, few seasonal rivers, large storage capacity	Wheat, vegetables, wine grapes, stone fruit, olives, dairy, ostriches, sheep, cattle, goats, pigs	Medium to high range warming	Remains moderately high as long as dams fill up
13	Montagu-Barrydale	Rivers, dams, low storage capacity	Stone fruit, wheat, barley, wine grapes, pome fruit, citrus, olives, sheep	Medium range warming	Remains high as long as dams fill up
14	MosselBay-Herbertsdale	Rivers, low storage capacity	Wheat, barley, canola, berries Dairy, ostrich, pigs, cattle, sheep	Low range warming	Transition area, productivity could improve with more irrigation capacity
15	Nelspoort	Few episodic rivers, low storage capacity, use of groundwater	Cattle, sheep, goats, ostrich	High range warming	Depends on rangeland changes, constrained by heat and water
16	Olifants irrigation	Olifants River, dam, large storage capacity	Citrus, wheat, wine and table grapes, rooibos, tomatoes	Medium to high range warming	Remains viable as long as river flows and dams fill up, but constrained by heat
17	Piketberg	Farm dams, very low storage capacity	Pears, fynbos flowers, stone fruit, wheat, citrus, herbs/essential oils, wine grapes, cape rush, sheep, cattle	Medium range warming	Remains viable as long as farm dams fill up, but changing due to warming

	NAME	MAIN WATER RESOURCES	MAIN COMMODITIES	CLIMATE CHANGE PROJECTIONS *	FUTURE POTENTIAL
18	<b>Rooikaroo-Aurora</b>	Berg River in the south, low storage capacity	Wheat, canola, rooibos, sheep, cattle	Medium range warming	Increasingly marginal for wheat
19	<b>Rûens-East</b>	Farm dams, occasional river, low storage capacity	Wheat, barley, canola, sheep, cattle, dairy, pigs, ostrich	Low range warming	Currently becoming marginal for small grains, but could improve given possible increases in rainfall
20	<b>Rûens-West</b>	Farm dams, occasional river, low storage capacity	Wheat, barley, canola, dairy, sheep, cattle	Low range warming	Remains high for small grains, but with increasing yield variability
21	<b>Sandveld-South</b>	Very low storage capacity, extensive use of groundwater, Berg River	Wheat, potatoes, rooibos, sheep, cattle	Medium range warming	Increasingly marginal
22	<b>Swartland</b>	WCWSS large dams, Berg River, farm dams, large storage capacity	Wheat, wine and table grapes, canola, olives, dairy, pigs, sheep, cattle	Low to medium range warming	Remains high for small grains, but with increasing yield variability
23	<b>Tankwa-van Wyksdorp</b>	Medium storage capacity, use of groundwater	Wheat, stone fruit, wine grapes, sheep, goats, pigs, cattle, game, ostrich, dairy	Medium to high range warming	Slowly declining productivity, constrained by heat and water availability

# CONCLUSION

Climate change will influence agriculture in the context of multiple interacting drivers and pressure points. Adapting to the consequences of climate change and mitigating greenhouse gas emissions from agriculture, thereby building climate resilience, will depend as much on addressing these pressure points as on preparing for a different climatic future.

Agriculture is highly dependent on effective risk management covering all three sustainability components: economic, environmental and social. The capacity to respond to climate change risks depends largely on where individual enterprises are positioned on the economic scale, and access to resources. Economies of scale and diversification across commodities and agro-ecological zones renders larger farming groups more resilient than small and undiversified farming operations. Flexible marketing arrangements and linkages to agri-processing also provide resilience.

The sector must now go beyond response and plan strategically (anticipatory) for the near- and mid-term future. The Western Cape has pockets of increasingly marginal agriculture and these can be identified through research, communication and monitoring. However, some agro-ecological zones will benefit from relatively benign climate changes such as moderate warming with potentially stable or even increased rainfall. In other cases, a shift to more resilient crop and livestock types and farming systems (climate smart agriculture) can buffer agriculture against some aridification without negatively impacting profitability or jobs. Growth opportunities in the value chain should be well assessed against climate change risks and impacts, including the question of limiting resources (water, energy, land) required for these activities.

The transition from measuring to reducing the carbon footprint of agriculture needs to be made, with the correct policy support. Many of the possible mitigation options show either the potential for financial benefits (e.g. carbon credits) or they confer adaptive benefits which lead to greater production potential (e.g. cheaper and more reliable energy, conservation agriculture).

The Western Cape will likely remain a strong agricultural region, at least in the near to medium term, provided that planning takes into account the future climate and appropriate support is provided. The next step of the SmartAgri project will be to develop a Climate Change Response Framework and Implementation Plan. This will provide the mechanisms for such support.

This publication is a summary of the full  
**Status Quo Review of Climate Change and the Agriculture Sector of the Western Cape Province (2015)**

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