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REPORT

ZA

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WORKING TOGETHER TO PROMOTE SUSTAINABLE FOOD AND AGRICULTURE IN SOUTH AFRICA

NEDBANK

Farming Facts and Futures:

Reconnecting South Africa's food systems to its ecosystems

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Chapter authors and reviewers

Inge Kotze and Tatjana von Bormann (Context and Call to action)
James Reeler and Vaughan Koopman (Land and soil)
Mark Botha and Jessica Cockburn (Biodiversity and ecosystems)
Christine Colvin (Water)
Manisha Gulati (Socio-economic context; Energy)

Main reviewers

Inge Kotze, Wendy Engel and Sindiswa Nobula

External reviewers

Leonie Joubert, Simphiwe Mngomezulu and Colleen Chennells

Text editing

Barbara Elion (first concept) and Marlene Rose

Photographs

Peter Chadwick, Inge Kotze and Helen Gordon

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WWF is one of the world's largest and most experienced independent conservation organisations, with over 6 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

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FOREWORD

The word ‘agriculture’ is derived from the Latin *agricultura*, from *ager* meaning ‘field’ and *cultūra* meaning ‘cultivation’.

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If you go one step further and break the word down to simply *ag*, as it is so often referred to in shorthand, it acquires a completely different Latin root. *Ag* means ‘to do, to move, to drive’ and, while this is taking some licence with the etymology of the word, it is nevertheless instructive in the current context.

The practice of growing crops, raising livestock or tending trees – producing the food and fibre vital for humanity’s survival – has never before faced the multitude and diversity of challenges that now beset the sector. In the face of rising input costs, increasingly erratic weather patterns and social and political complexity this is not only an industry on the move; it is also one faced with the urgent need to adapt to the changing context, or otherwise slide into irreversible decline.

This report is a snapshot of the state of play of the agricultural context in South Africa, from an ecological and social perspective. As such, it is intended to be a supporting tool to those in agriculture who are, cognisant of the changing context, doing what is necessary to shift towards a resilient future. It should be noted that much of the available agricultural statistics are still largely outdated, with little consensus on up-to-date, accurate and consistent data, particularly with regard to the number of growers (commercial and small-scale household farming) and land holdings. This highlights the need and urgency for increased investment and research in this sector to support and inform well-directed and effective policy decisions and implementation.

Farming Facts and Futures is aimed at serving a sector interested in what to do, how to move and how to drive a sustainable agenda that will underpin the ability of South Africa, not just to put food on the table but also to create a flourishing rural economy and ecology.

Inge Kotze
Senior Manager: Sustainable Agriculture Programme: WWF South Africa

‘We live in an interconnected, and interdependent, world. Food, water, energy – and the biodiversity and ecosystems upon which they depend – are closely intertwined, and fundamental for human existence.’

~ WWF Living Planet Index (2014)

THE CONTEXT

Twenty-one years after democracy, South Africa's agricultural sector is at a crossroads.

Like many developing countries, farming is a cornerstone of the South African economy: it boosts Gross Domestic Product (GDP) (Figure 1), creates jobs, supports social welfare, encourages ecotourism and provides raw materials for agri-linked manufacture and processing.

At the same time, farmers must ensure that they produce enough basic calories to keep up with the needs of our growing population, and must do so within the limits of nature's increasingly constrained and over-used resources.

'The steady rise in food prices and often associated social unrest in a large number of countries show how important the agricultural sector is for social and economic stability.'

The pressure is on: more people, more food

In 1960, then US senator John F Kennedy famously said of his country's farmers, that they buy at retail prices, sell at wholesale prices, and pay for the shipping both ways. It's much the same these days, and one of the reasons why farming is a risky business.

Today's farmers are subject to volatility in international oil prices, rising local input costs, uncertainty about land reform and increasing labour discontent. Increasingly scarce arable land and water amplified by climate change will only increase their risk and vulnerability.

The steady rise in food prices and often associated social unrest in a large number of countries show how important the agricultural sector is for social and economic stability.

Yet South Africa's farmers are meeting the challenge of keeping enough calories on the country's national plate. The country is self-sufficient in virtually all major agricultural products and produces more than half of southern Africa's maize needs. It exports wine, sugar, fruit, wool, forestry products and more to the world.

At the same time, farmers are under pressure to intensify their agricultural outputs to meet increasing food demands from a population that has grown by 25% between 2000 and 2013. Rising wealth, urbanisation and a fast-growing middle class means South Africans are eating more processed and high-protein foods, especially meat and dairy products. These foods are more land- and water-intensive than fruit, vegetable and grain crops, and further stress existing resources.

With farmers already having to deal with increasing resource scarcity and limited direct investment in the agricultural sector, they are not keeping up. This means the country has recently become a net importer of key food items, including wheat and meat.

Rice, sugar and poultry, which are part of the national food basket, are among the top seven products imported in terms of quantity. The country also imports considerable amounts of processed foods.

Agriculture faces the challenges of shifting land reform policy in a country where two 'economies' operate side by side: large commercial farmers who produce most of South Africa's food, and subsistence farmers who struggle to survive and often abandon their farms for life in the city. There is also the interplay of the food-water-energy nexus, where a change in one system has dramatic repercussions for the others.

SA FARMING AT A GLANCE

1%

Running on rain: Only 1% of SA has the right climate and soil combinations for rain-fed crops.

3%

Good soil: Only 3% of the country has truly fertile soils.

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13%

Arable land:
Only 13% of the land is good for cultivation.

69%

Good for grazing:
Most of the land surface (69%) is only good for grazing, making livestock farming the largest agricultural sector.

Sustainable farming is about meeting the needs of South Africans today and in the future. This requires the use of farming methods that can strike a balance between the social and economic needs of society, the security of the natural resource base and the protection of the long-term productivity of the land.

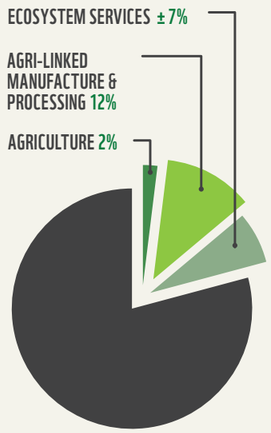
To summarise, future agricultural growth will be dependent on the following:

- improving and sustaining the optimal productivity and yield of South Africa's existing food footprint through improving production practices, reducing food waste and maximising resource efficiency
- improving spatial land-use planning and integrated resource mapping
- better compliance with regulations and policies
- investment in research and development (R&D)
- technology and knowledge transfer
- skills development through extension services
- direct investment in agriculture.

The hungry poor

A country is food secure when everyone has access to a sufficient quantity of affordable and nutritious food. South Africa is considered a food secure state nationally. However, a recent study by Oxfam (2014) highlights the level of household food insecurity and malnutrition. It shows that South Africa produces enough calories to feed every one of its 53 million people, yet the reality is that one in four people currently suffers hunger on a regular basis. More than half of the population live in such precarious circumstances that they are at risk of going hungry (Oxfam, 2014).

Figure 1: CONTRIBUTION TO GDP



Nature vs farming: the two footprints

Agriculture is dependent on the very natural landscapes into which it tends to spread as farmlands expand.

In 2000, agriculture was responsible for 94% of total water consumption in South Africa when abstraction of soil water is considered, for 66% for dryland production and 16% for forestry (Statistics South Africa, 2010). When soil water was excluded, agriculture was the main consumer (62%) followed by urban domestic use (14%).

Agriculture boosts the Gross Domestic Product (GDP) directly by 2%, and by another 12% from related manufacturing and processing.

The flow of benefits or ecosystem services from biodiversity (such as clean, regular water supply, protection against floods, pollination and grazing) contributes about 7% to the GDP every year (Molewa, 2013).

95%
OF THE COUNTRY'S LOCALLY PRODUCED FOOD IS PRODUCED BY COMMERCIAL FARMERS

Jobs, food and land equity

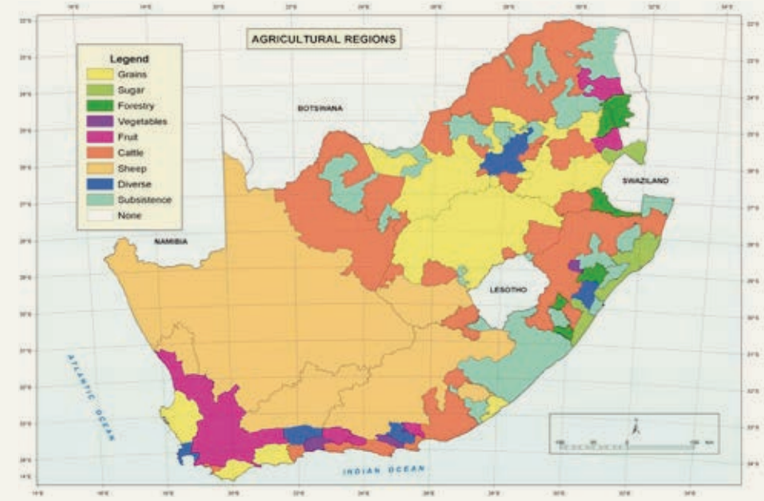
Agriculture has the potential to create a significant number of jobs for the country's largely unskilled workforce. This will support the government to deliver on its poverty reduction and job creation targets, as laid out in Vision 2030 of the National Development Plan (NDP), and shrink the divide between rich and poor.

The sector needs to be restructured in a way that allows for the redistribution of land and creates some fairness in the access to, and ownership of, resources. This needs to be done in a way that does not erode the food outputs of the country's farmers. As mentioned above, 3% of the country's farmers, all commercial, produce 95% of the country's formal-sector food. If any of this land falls out of large-scale production, this could have a serious impact on the country's food security.

The dual economy

A handful of farmers feed the country: it is estimated that 20% of South Africa's farms supply 80% of the food in the formal retail chain (Cousins, 2014). Commercial farmers, according to the Minister of Economic Development, account for 95% of the country's locally produced food. Although accurate data is slim, this suggests that the remaining 5% of food is produced by the 220 000 emerging farmers and the 2 million subsistence farmers in the country (Institute of Race Relations, 2012).

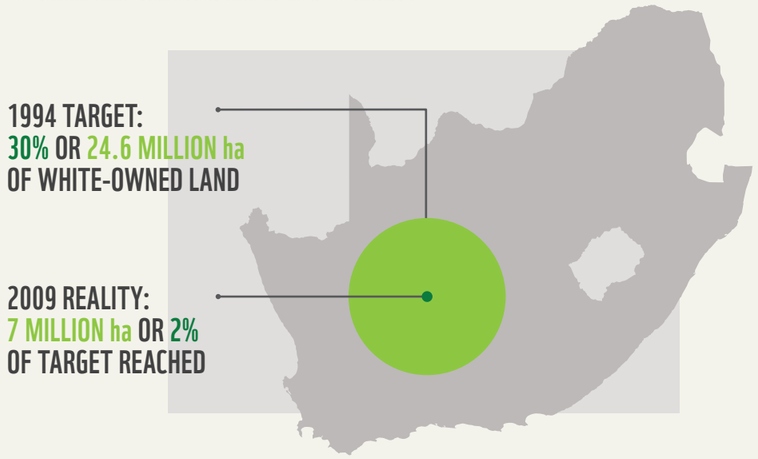
Figure 2: AGRICULTURAL REGIONS OF SOUTH AFRICA



Source: FAO Corporate Document Repository

Uncertainty about land reform policy is threatening to further destabilise the farming sector. The proposed Land Reform Bill of 2015 calls for a possible ceiling on the size of land a farmer can own (capping it at 12 000 ha per farmer). According to a rapid calculation done by organised agriculture (AgriSA in 2015) it is estimated that more than 1 200 current farms are larger than 12 000 ha.

Figure 3: 1994 LAND REDISTRIBUTION TARGET VS 2009 REALITY



Many of these farms are producing most of South Africa's food. According to a review of land reform by the Department of Rural Development and Land Reform (DRDLR) in 2009, '90% of land reform projects had failed', meaning the government has spent almost R30 billion on a process that has transferred less than '7 (million) hectares of commercial farmland (constituting only 2% of white owned, commercial agricultural land), most of which is now operating sub-optimally or no longer in productive use' (Figure 3). Another round of failed redistribution would have a significant impact on the country's ability to produce sufficient food.

Achieving the objectives of the NDP requires the country's economic development paradigm to recognise the increasing pressure on natural resources and shift towards a more balanced approach based on the interlinked management of these resources. Looking beyond the risk, we are presented with an opportunity: if we can improve the integrated management of water, energy and food production, South Africa will be able to absorb or better manage the shocks to the economy from climate change and economic volatility.

FOR EVERY
$100
SPENT ON
AGRICULTURAL INPUT
$2
IS INVESTED IN
AGRICULTURAL R&D

Money for science

Funding for agricultural R&D has not seen a significant increase since 1992. Investment has fluctuated since 1997 and the intensity of investment has stagnated. South Africa has lost a number of experienced scientists.

In 2008, for every $100 of agricultural output, South Africa invested just over $2 in agricultural R&D, which is one of the lowest ratios reported since the 1980s. Levels have not kept up with the government's 3% target.

The 'nexus': where food, water and energy connect and collide

The food-energy-water 'nexus' refers to the interconnectedness of these three systems (rather than just the resources themselves) and how they push and pull one another. For instance, the cost of one can force efficiency in another system, or

demand in one area can drive up demand in another (Carter & Gulati, 2013). This nexus is central to the ongoing sustainability of South Africa as a whole.

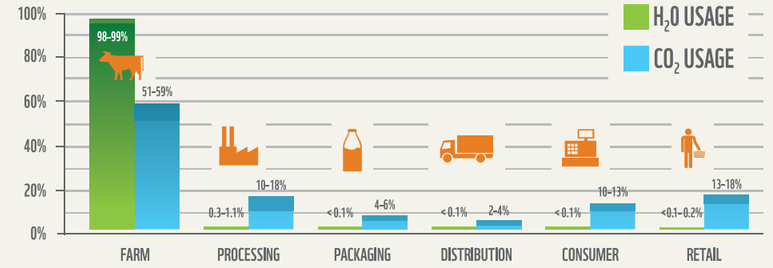
'For the economy and communities to flourish, all three systems in the nexus – food, energy and water – must be in balance.'

For the economy and communities to flourish, all three systems in the nexus – food, energy and water – must be in balance. Security of supply in these three resources forms the basis of a self-sufficient economy, and resilient ecosystems are the bedrock of this stability. However, we now face a system that is alarmingly out of balance, and the sustainable supply of water, food and energy is becoming ever less certain. Averting a crisis effectively requires better information, co-ordinated planning and adaptation to a resource-scarce future.

Agriculture is heavily dependent on water: its availability, cost, how it is managed, how clean it is, and so on. Farmers are also sensitive to what goes on in the energy sector: everything from the impact of international oil prices on the cost of a tank of diesel, to how Eskom's failing power grid and unpredictable rolling blackouts impact on irrigation, harvesting, dairy farming and the storage of yields.

Because farming outputs need to keep up with the growing demand for food, farmers are forced to increase fertiliser inputs and water (Figure 4). Pumping more water will push up the farm's energy bill, while adding more fertiliser could jeopardise the farm's water quality and in turn push up the need for water purification. How we produce food, use water and generate energy impact on the biosphere that supports these needs, as shown in Figure 5.

Figure 4: WATER, CARBON AND WASTE FOOTPRINT FOR DAIRY



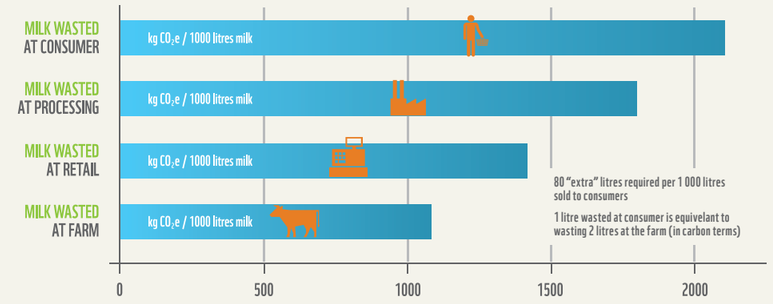
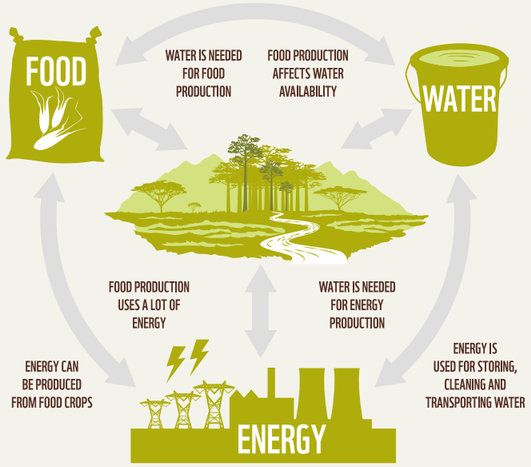


Figure 5: THE WEB OF INTERDEPENDENCE BETWEEN THE BIOSPHERE, FOOD, ENERGY AND WATER SECURITY



Source: WWF Living Planet Report (2014)

'Climate change will amplify the water, energy and food production challenges.'

Climate change implications

Climate change will redraw the agricultural map of the world in terms of what we can grow, and when. It will also impact on yields.

South Africa is a semi-arid, water-scarce country with a high degree of natural variability in its weather systems and regular extreme events like droughts and flooding. Climate change will amplify the water, energy and food production challenges.

Rising emissions, climbing regional temperatures and the associated shifts in climatic patterns are already altering rainfall and temperature patterns, increasing atmospheric carbon dioxide levels, shrinking arable land and shifting available water supply.

The impact on agricultural production, on the raising of livestock and on sustaining fisheries will be positive in some agricultural systems and regions and negative in others. These effects will vary over time. Direct effects on crop production could include:

- changes in yield
- proliferation of weeds, plant diseases and pests
- a shift in growing seasons
- restricted availability of irrigation.

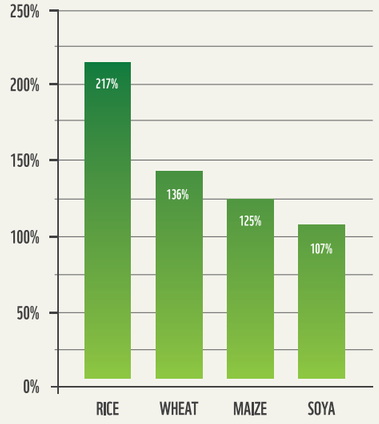
Indirectly, these could result in:

- impacts on the supply-chain infrastructure
- higher food prices (Figure 6)
- volatility in supply and demand
- higher production risk
- livelihood vulnerability in the agricultural sector.

The Citrus Growers' Association of South Africa lists a volatile climate and the increased frequency and intensity of extreme weather events as among the top five factors that will shape the citrus industry, a key labour-intensive, high-value export sector, in the next five to ten years.

Potatoes South Africa echoes this concern and has initiated research into the impact of climate change on potato production in the country.

Figure 6: AVERAGE WORLD PRICE INCREASE 2006–2008



Global food prices and local political instability

The rise of international food prices since 2002 and the volatility of prices of agricultural commodities have affected food prices in South Africa.

The past decade has seen the longest sustained cyclical rise in real food prices in 50 years. Although the price increases in South Africa were much lower than those in many other countries, domestic food prices still rose by 25 to 39% of the global rise in food prices.

There is growing concern that these rising global food prices are linked to social unrest in many countries. The Marikana mining riots in August 2012 to demand better pay coincided with record prices for maize and other basic food items.

LAND AND SOIL

Healthy, fertile soils are the product of millions of years of geological processes and form the bedrock of a thriving farming sector.

South Africa's soils are relatively 'young' and not all that fertile, compared to those of some countries further north. This limits the size of the farming footprint and restricts where farmers can grow high-yield crops. It also means farmers must invest heavily in improving, maintaining or restoring fertility in their soils, particularly as many crops strip the soil of nutrients.

KEY FACTS

- Approximately 13% of South Africa has arable soil, with only 3% considered to be high-potential agricultural land.
- About 260 000 ha of irrigated land is affected by salinisation.
- 25% of South Africa's soils are highly susceptible to wind erosion.

KEY TRENDS

- More than 5 million ha of cultivated land have already been seriously acidified in South Africa.
- Poorly managed fertilisation reduces long-term productivity and increases erosion and water run-off.
- Fertilising and irrigating non-arable land to improve grazing is costly and not a viable option for most farmers.

FARMING FACTS: SETTING THE SCENE

'Each time one of us touches the soil of this land, we feel a sense of personal renewal.'

~ Nelson Mandela during his inauguration as President of South Africa on 10 May 1994.

Changing land management practices

Synthetic fertilisers are the product of modern industrial processes. Mass production of these fertilisers took off after World War I and became the foundation of the Green Revolution in the 1960s. They have replaced the organic fertilisers farmers used for thousands of years to improve soils, such as manure, urea, plant matter, bones, shells and lime.

If used correctly, fertilisers can improve soil fertility and plant growth. They can also keep existing farmlands productive, thus protecting the natural environment from agricultural expansion.

However, if they are overused, organic and synthetic fertilisers alike can severely damage the environment. They cause chemical run-off into rivers and pollute surface and groundwater. When applied in single large doses, nitrogen is released into the atmosphere as nitrous oxide, a greenhouse gas 300 times more potent than carbon dioxide.

Poorly applied, synthetic fertilisers can have the opposite effect to what they are intended to achieve and actually reduce soil fertility (Mulvaney et al., 2009) by killing the organic matter and life in the soil. Devoid of life, the soil then only gives physical support to plant growth. At this stage the farmer is completely reliant on fertiliser and may increase applications to sustain yields and compensate for the

5 MILLION ha
OF CULTIVATED LAND HAVE ALREADY BEEN SERIOUSLY ACIDIFIED

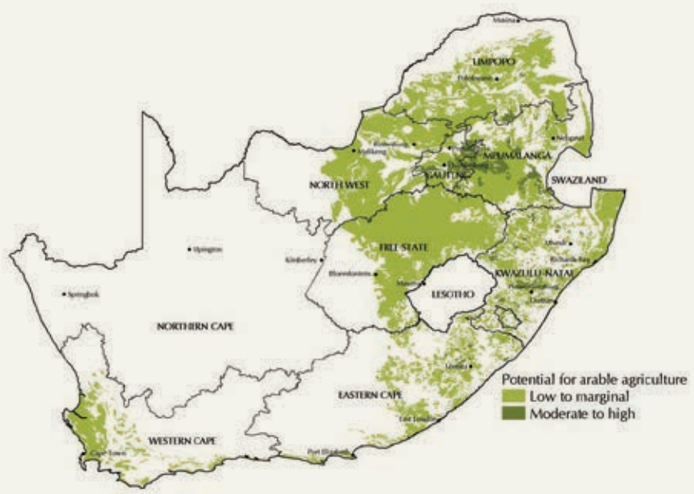
reduced soil fertility. If this practice continues, it results in acidic and salty soils which, in some cases, contain high levels of toxic metals and radioactive elements.

More than 5 million ha (more than double the size of Kruger National Park) of cultivated land have already been seriously acidified in South Africa (Department of Communications, 2014). This degraded soil is prone to erosion, and the subsurface soil layers that remain are significantly less fertile and less absorbent.

Global food prices and local political instability

About a third of South Africa receives enough rain for crop production. Most of this area is marginal for crop production. Only 3% of South Africa is considered to be high-potential agricultural land, as indicated by the dark green area in Figure 7.

Figure 7: POTENTIAL ARABLE LAND FOR AGRICULTURE IN SOUTH AFRICA



Source: Department of Environmental Affairs (2006)

260 000 ha
OF IRRIGATED LAND ARE CURRENTLY AFFECTED BY SALINISATION

Salty soils

With so few areas able to rely on rainfall to feed croplands, irrigation is critical for expanding crop production in South Africa. Poor irrigation practices can reduce soil fertility by building up salts in the soil (salinisation). This is particularly true in arid areas, where evaporation rates are high and rainfall is too low to leach salts from the soil.

Irrigating with salty water dramatically worsens the problem. For example, in coastal areas the overexploitation of groundwater lowers the water table, causing the intrusion of sea water. It is estimated that an area of 260 000 ha of irrigated land is currently salinated, with 15 000 ha so seriously affected as to limit the choice of crops to salt-tolerant species only. These areas would require costly rehabilitation.

Ploughing the land

Ploughing is one of the oldest methods of preparing the soil for planting and controlling weeds. It is also one of the most abused methods. The mouldboard plough originated in Europe to turn over, dry out and warm up cold, water-logged soil in the spring of the northern hemisphere. In the South African context, the use of this imported practice results in ploughing dry, sun-baked soil, further reducing much needed soil moisture. This makes little sense.

Poorly managed tillage can damage soils. It can compact the soil, creating a hard 'plough pan' beneath the plough level, which may stop water filtering down and cause the topsoil to erode. The increased use of heavy machinery also causes compaction layers on top of many soils, making these areas prone to erosion. Excessive ploughing stimulates the breakdown of organic matter in the soil, diminishing this precious soil resource and releasing carbon dioxide into the atmosphere. This contributes to climate change.

Minimum or 'no-till' farming helps to prevent soil erosion and retains the soil's organic matter, water and nutrients. Crops can be grown for several years like this, without ploughing. Reduced ploughing also saves fuel costs on the farm. Between plantings, the soil should be planted with cover crops to reduce soil surface temperatures, protect it from wind and rain erosion, increase soil organic matter and maintain healthy populations of soil microbes. Legumes are beneficial as they increase soil nitrogen.

25%
OF SOUTH AFRICA'S SOILS ARE HIGHLY SUSCEPTIBLE TO WIND EROSION

Our fragile soils

Most soils in South Africa are extremely vulnerable to degradation and do not recover well. Even small mistakes in land management can be devastating, with little chance of recovery.

About 25% of South Africa's soils are highly susceptible to wind erosion, including the sandy soils of the North West and the Free State, where 75% of the country's maize is grown.

Livestock

Most of South Africa (about 69%) is ideal for grazing livestock, making this the largest agricultural sector in the country. The national cattle herd has increased by about 6 million head since the 1970s and was close to 14 million by the mid-2000s (Palmer & Ainslie, 2006). This increase has almost met the increased protein demand in South Africa. Interestingly, though, consumption of chicken is on the rise, exceeding red meat consumption, while the per capita consumption of beef has declined since the 1970s (Figure 8).

In terms of animal products, chicken, tinned fish and fresh fish are considered necessities by consumers, while beef, mutton, pork and eggs are viewed as luxury goods, with rice considered a staple (Agbola et al., 2002).

Livestock 'carrying capacity' and overstocking

As the rainfall increases in the eastern part of the country, so the livestock carrying capacity of land increases. Livestock production involves the breeding of beef cattle, sheep, poultry, pork, goats and other small stock.

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'Much of South Africa's grazing land is stocked beyond its long-term carrying capacity.'

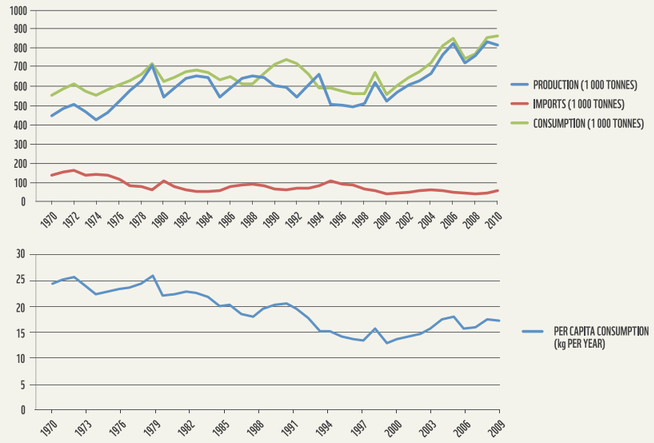
Beef cattle are concentrated in the eastern, wetter regions of the country and in the North West and Northern Cape provinces.

Sheep are largely farmed in the drier western and central areas of the country, such as the Karoo.

The total area available for grazing has declined over time due to expanding human settlements (urbanisation), increased area under crop farming and forestry, and increased mining (Figure 9).

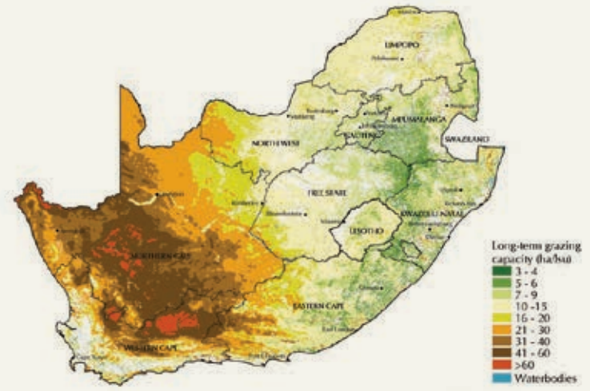
Much of South Africa's grazing land is stocked beyond its long-term carrying capacity. Overstocking is most evident in the communal rangelands of Limpopo, KwaZulu-Natal and the Eastern Cape, which support more than half of South Africa's cattle. The carrying capacity of South Africa is graphically illustrated in Figure 9.

Figure 8: SOUTH AFRICAN BEEF



Source: Statistics South Africa (2011)

Figure 9: LONG-TERM GRAZING CAPACITY IN SOUTH AFRICA (ha/LARGE LIVESTOCK UNIT)



Source: DEA. SOER Maps (2006)

Overstocking can cause trampling and crusting of the soil and denude the veld of vegetation. This leads to reduced productivity, reduced soil fertility and large-scale erosion. Because as much as 91% of South Africa is defined as arid or semi-arid, it is in these areas that land degradation (compounded by climate change) can lead to desertification and the irreversible loss of productive land (Gbetibouo & Ringler, 2009). The results of overstocking in the Karoo is illustrated in Figure 10.

Figure 10: OBSERVED DEGRADATION IN THE SEMI-ARID KAROO CAUSED BY OVERSTOCKING

Source: Reyers et al. (2009)

Improving pastures

'Poorly managed, fertilisation can change the species composition and decrease the grass cover of the veld.'

Some commercial farmers increase the carrying capacity of their land by adding fertilisers, planting additional palatable species (called 'reinforcement'), and planting pastures. All these techniques need the application of fertilisers, which are costly and can pollute the environment.

Poorly managed, fertilisation can change the species composition and decrease the grass cover of the veld. This reduces productivity and increases water run-off and erosion. In most areas irrigation is needed for veld reinforcement, which may result in the salinisation of soils. Furthermore, pasture cultivation is limited by a lack of water.

In general, fertilising and irrigating non-arable land is costly and not a viable option for most farmers. 'Improved' pastures appear to have a significant negative impact on sensitive grassland bird and insect species because these pastures alter not only the structure of the habitat but also nutrient regimes and animal populations.

FARMING FUTURES: WHERE WE COULD GO

The health of an agricultural ecosystem depends largely on the way the land is used, the quality of the soil, and the input and output of nutrients (Figure 11).

What does healthy soil look like?

To a farmer, healthy soil is rich in organic matter, has the right balance of plant nutrients and the right pH, contains a diversity of beneficial soil micro-organisms

'Organic farmers try to simulate nature, since they cannot use synthetic fertilisers. They work hard to build healthy soil that feeds crops naturally.'

and is well aerated and moist. Organic matter in the soil retains water and nutrients for slow release to plants and provides good soil structure for root penetration.

Small and microscopic soil animals and fungi:

- hold the soil together, preventing erosion
- aerate the soil
- provide sustained breakdown and release of plant nutrients from organic matter
- control soil-borne diseases.

Organic farmers try to simulate nature, since they cannot use synthetic fertilisers. They work hard to build healthy soil that feeds crops naturally. Imitating natural systems can help to produce maximum, sustainable yield, reducing the need for inputs such as fertilisers. The biggest benefit is that it reduces detrimental effects on the surrounding environment.

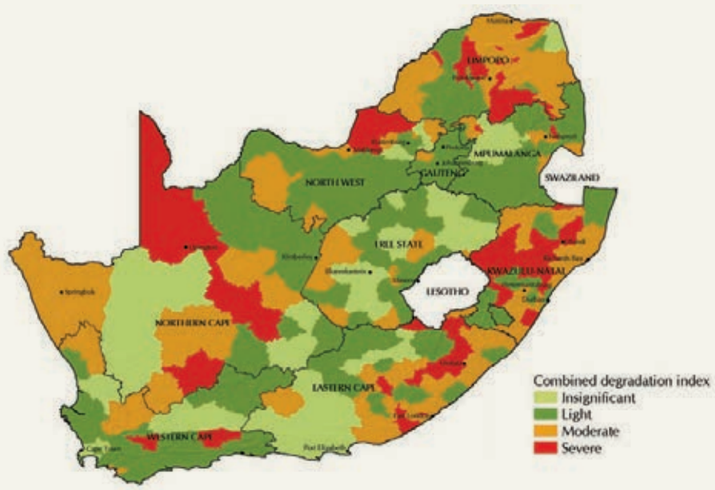
The topsoil – the fertile source of our food – can be conserved and improved through on-farm nutrient cycling. Using manure and plant residues that are readily available on the farm can cut input costs from non-renewable inputs like pesticides and fertilisers, which also damage human health and the environment.

Food for thought: the value of regional collaboration

Significant regional collaboration in southern Africa will be required to respond and adapt to the impacts of climate change on food production, livelihoods and security.

Increased direct investments are needed to improve the agricultural sector's resilience to climate change.

Figure 11: LAND DEGRADATION IN SOUTH AFRICA IN 2006



Source: Department of Environmental Affairs (2006)

Good practice

Soil fertility

- Analyse soil and crop samples to determine the exact amount and type of fertiliser required, and aim to fill nutrient gaps rather than simply increasing total nitrogen and phosphorus.
- Use precision agriculture to calculate the fertilisation regime scientifically.
- Time, and target, fertiliser application to coincide with maximum plant uptake periods and apply fertiliser in regular smaller doses rather than a few large ones.
- Store synthetic fertilisers on an impermeable floor. Avoid interim storage on open fields, as this poses a high pollution risk.
- Fertiliser-spreading machines should never be washed in rivers, lakes or near drinking-water wells and springs.
- Where possible, use organic fertilisers that contain a carbon source (compost, manure and plant matter, especially from legumes).
- Use crop rotation and inter-cropping to increase soil organic matter and nutrients. Where possible, rotate between grains and nitrogen-binding legume crops.
- Maintain a permanent soil cover, using either cover crops or mulch.
- Avoid excessive irrigation and ensure good water quality.
- Reduce the use of pesticides and herbicides that cause a decline in soil micro-organisms.

Good practice

Soil structure

- Practise crop-appropriate minimum tillage.
- If tillage is required, till at the correct speed and only when the soil has the correct moisture content.
- If possible, avoid crops that require soil disturbance in order to harvest.
- Prevent soil compaction by limiting the use of heavy machinery, especially in wet conditions. Where traffic is necessary, use radial-ply tyres with low tyre pressures to minimise soil compaction.

Good practice

Livestock

- Ensure that stocking rates are within the land's carrying capacity, based on the commercial stocking rates for a given area and the present veld condition.
- Monitor and manage veld condition for optimal productivity with minimal environmental damage.
- Maintain the health of the soil by ensuring appropriate rest periods after relevant grazing and/or fire events.
- Prevent overgrazing, trampling and soil erosion.
- Rehabilitate degraded veld.
- Ensure that veld-improvement techniques are well understood and well managed to avoid environmental damage and a long-term decrease in productivity.

Case study

'Natuurboerdery' in Limpopo

ZZ2, a commercial farming company based in Limpopo and a world leader in tomato production, introduced the concept of 'Natuurboerdery', or Nature Farming, to their operations.

Beginning in 2002, the ZZ2 farming enterprise has implemented a programme for the gradual conversion of all its farming activities in tomato, onion, avocado and apple production from a predominantly conventional chemical approach to a more ecologically balanced nature-based farming approach. Nature Farming refers to achieving long-term improvement and stabilising the soil; achieving optimum and sustainable yields; producing nutrient-dense fruit, and promoting human health. These practices result in an ecological balance and the conservation of natural resources.

Climate change implications

- Rising temperatures will have a significant effect on soil moisture.
- The need for irrigation to maintain productivity and yields will increase.
- Irrigated agriculture is the largest single surface-water user in the country and water will be a key limiting factor to agricultural growth.

USEFUL LINKS

Department of Agriculture, Forestry and Fisheries: Directorate Land Use and Soil Management Landcare Programme: www.agis.agric.za/agisweb/landcare

Assessment of agricultural potential and land capability: www.agis.agric.za

Biological farming support: www.sabiofarm.co.za and www.ecosoil.co.za

No-till or conservation agriculture: www.notillclub.com

WATER

South Africa is dry by global standards. Rainfall, and therefore river flow, is unevenly spread throughout the country.

'If today's food production, consumption and environmental trends continue, we face a crisis.'

Only 8% of South Africa's land generates half the country's run-off (WWF-SA, 2014), and most of the rain is harvested up in the high mountains. Available water is also fully allocated between the country's water users. Agriculture, by far South Africa's largest water consumer, must share what is available with other users: the natural environment 'the ecological reserve', which is ring-fenced by law, growing cities and urban users, increasing demand from industries, and mining.

The greatest threats to South Africa's water supply is over-abstraction, thirsty invasive alien plants and pollution (from mining, municipal and agricultural waste-water treatment plants and poor land management). The growing biofuel industry and climate change impacts put additional pressure on water reserves. If today's food production, consumption and environmental trends continue, we face a crisis. Farming practices need to promote more sustainable water use if agriculture is to survive and flourish.

KEY FACTS

- Water availability will be one of the biggest constraining factors for growth in the agricultural sector.
- Almost two-thirds of South Africa's surface water is used by irrigated agriculture.
- Water quality is an increasing problem for food safety.
- Demand is already outstripping supply in many catchment areas.

KEY TRENDS

- **Pollution:** Phosphate from fertilisers is one the most widespread freshwater contaminants. A third of the 320 dams in South Africa are eutrophic (i.e. there is a lack of oxygen due to algae build-up); another third are close to eutrophic.
- **Job creation:** Labour-intensive, irrigated agriculture will be targeted to provide an additional 150 000 ha under irrigation to create one million jobs in agriculture by 2030.

FARMING FACTS: SETTING THE SCENE

Demand outstripping supply

South Africa's rainfall is highly variable, as is this run-off and river flow, meaning that approximately only 30% of this mean annual resource is captured in developed infrastructure, including dams and water transfer schemes. As much as 98% of these water resources are already allocated. Furthermore, it will be more difficult, and expensive and often ecological undesirable to develop the remaining 70% of mean annual water resource through physically engineered infrastructure. Water demand is expected to grow by 32% by 2030 (Van Rooyen and Versfeld, 2009) and climate change will result in shifting rainfall patterns and increasing unpredictability of where and when rain will fall. Figure 12 shows water use per sector in South Africa in 2005, with agriculture still accounting for the largest water use at around 60%. The energy sector, by comparison, only uses 2%, but is considered a strategic user of water.

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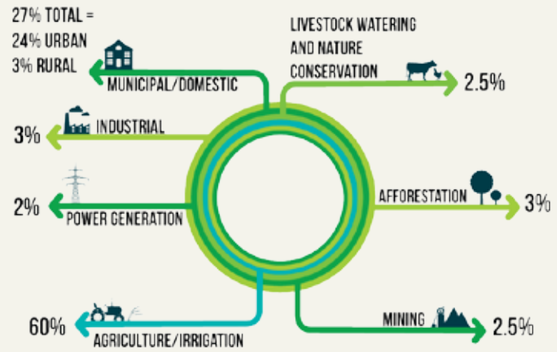
Figure 12: WATER CONSUMPTION IN SOUTH AFRICA IN 2005, BY SECTOR



Source: Reyers et al. (2009)

'... South Africa's water sector has capacity constraints, inadequate funding, ageing bulk infrastructure, and erratic water quality in smaller municipalities and rural areas.'

Strong leadership needed

South Africa needs strong water governance to secure this vulnerable resource. However, the Department of Water and Sanitation (previously the Department of Water Affairs and Forestry and, more recently, the Department of Water and Environmental Affairs) acknowledges its internal challenges in meeting this mandate: a lack of technical skills and high rates of turnover in leadership positions, which have hampered performance.

According to the South African Institute of Civil Engineers (SAICE) South Africa's water sector has capacity constraints, inadequate funding, ageing bulk infrastructure and erratic water quality in smaller municipalities and rural areas. Meanwhile, the National Planning Commission has recognised water as a binding constraint on future economic development (National Planning Commission, 2010).

Uncertainty in a changing climate

Climate change will first be felt through impacts on water resources, with a significant impact on rainfall, water availability and quality. Climate models project that:

- more extreme events like droughts and floods will occur more frequently (Engelbrecht et al., 2011)
- the central and northern interior of the country will become significantly hotter; the western areas will become more arid
- intensified or reduced rainfall will drastically increase or decrease river flows and water availability
- rising temperatures will increase crop-water needs and possibly increase eutrophication in dams (Department of Environmental Affairs, 2010)
- temperatures in dams will lead to more frequent algal blooms, with the associated release of toxins and equipment-clogging algal filaments.

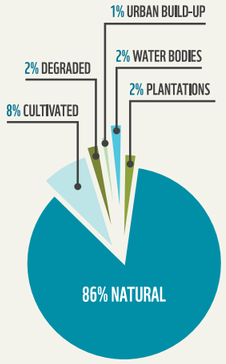
Climate change will have a negative impact on the availability of, and requirements for, water use in agriculture (Statistics South Africa, 2010). The worst hit will be commercial and subsistence farmers across the different agro-climatic zones, provinces and agricultural systems in the country (Benhin, 2006). The economic impacts of climate change will affect irrigated farms in a different way from dryland farms, as irrigated farms do not rely on rainfall only to maintain productivity and yield.

Figure 13: SOUTH AFRICA'S WATER SOURCE AREAS

Source: Reyers et al. (2009)

Source: WWF-SA Report, 2013

Figure 14: WATER USE FROM ONE OF SOUTH AFRICA'S KEY WATER-SOURCE AREAS



Northern Drakensberg

- This source area provides water to the economic hubs of Durban and Gauteng.
- The Orange River is South Africa's longest river – 2 200 km – and has the largest dam – the Gariep Dam with a capacity of 5 340 000 megalitres (1 megalitre = 1mil litres).
- Gariep was the San name for the Orange River. It means 'great water'.
- South Africa's largest Ramsar site, the Ukhahlamba Drakensberg Park (formerly Natal Drakensberg Park), comprising 2 428 km².

Province:	KwaZulu-Natal
Level of protection:	8%
Main rivers:	Senqu; Caledon; Thukela; Orange; Vaal
Free-flowing rivers:	None
Inter-basin transfer systems:	Thukela to Vaal Basin
Supplies water to:	Gauteng and Free State provinces; parts of the North West province (Rustenburg, Potchefstroom, Klerksdorp, Orkney, Stilfontein, Wolmaransstad, Vryburg); parts of KwaZulu-Natal (Durban, Pietermaritzburg and Port Shepstone)
Ramsar site:	Ukhahlamba Drakensberg Park (formerly Natal Drakensberg Park)
Protected areas:	Royal Natal National Park (forms part of the Ukhahlamba Drakensberg Park World Heritage Site); Golden Gate Highlands National Park
Threats:	Coal mining; land degradation

57%
OF TRIBUTARIES ARE HEALTHY

35%
OF THE LENGTH OF MAINSTREAM RIVERS IS IN GOOD CONDITION

The state of South Africa's rivers

South Africa's smaller river tributaries are in a better state than those of big rivers: 57% of the tributaries are healthy, while only 35% of the length of mainstream rivers is in a good condition. Smaller rivers support the sustainability of hard-working rivers further downstream by diluting poor water quality and 'flushing' pollutants.

About 57% of river ecosystems and 65% of wetland ecosystems are threatened. The high levels of threat result particularly from intense land pressures (such as agricultural expansion, mining and urbanisation), especially around cities (SANBI, 2011).

Meanwhile, 84% of ecosystems associated with large rivers are critically endangered, endangered or vulnerable (Driver et al., 2005).

Thirsty crops

'... the long-term success of the sector depends on matching the right crops to local water conditions.'

Farming crops and livestock is thirsty work, and the long-term success of the sector depends on matching the right crops to local water conditions.

Agriculture's 'water footprint' refers to the total amount of freshwater that is used to produce a certain commodity throughout the entire production chain, including all the water impacted in the process: green water (soil water); blue water (irrigation water) and grey water (water impacted by pollution from the activities) (Hoekstra et al. 2011. Table 1). It has been shown that primary agriculture (farms and pack houses) are the greatest users of water in the food supply chain. Much of the water on farms is lost through evapotranspiration (i.e. in the plant growth cycle) (WWF-UK, 2009).

Table 1: WATER FOOTPRINT EXAMPLES OF VARIOUS CROPS AND THEIR PRODUCED AMOUNTS IN SA

Product	Tonnes produced in SA (2010/2011)	Global water footprint (ℓ/kg)	Green	Blue	Grey
Sugar cane	16 016 000	1 782	66%	27%	6%
Maize	10 924 000	1 222	77%	7%	16%
Potatoes	2 167 000	287	66%	11%	22%
Apples	766 622	822	68%	16%	15%
Barley	301 000	1 420	85%	6%	9%
Nectarines/Peaches	171 271	910	64%	21%	15%
Groundnuts	73 000	2 782	89%	5%	6%

Source: Water Footprint Network: www.waterfootprint.org/?page=files/productgallery [accessed 14 September 2014].

FARMING FUTURES: WHERE WE COULD GO

Rules of thumb for water-wise farming

- Make the right crop choice for an area.
- Maximise irrigation efficiency and scheduling.
- Choose the most suitable technology.
- Demarcate and protect or restore permanent or seasonal wetland areas.
- Maintain good river buffers or corridors of natural vegetation to trap run-off and sediment.
- Apply fertilisers and pesticides efficiently to limit the impacts of contaminated run-off.

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Case study

Water efficiency in the fruit industry

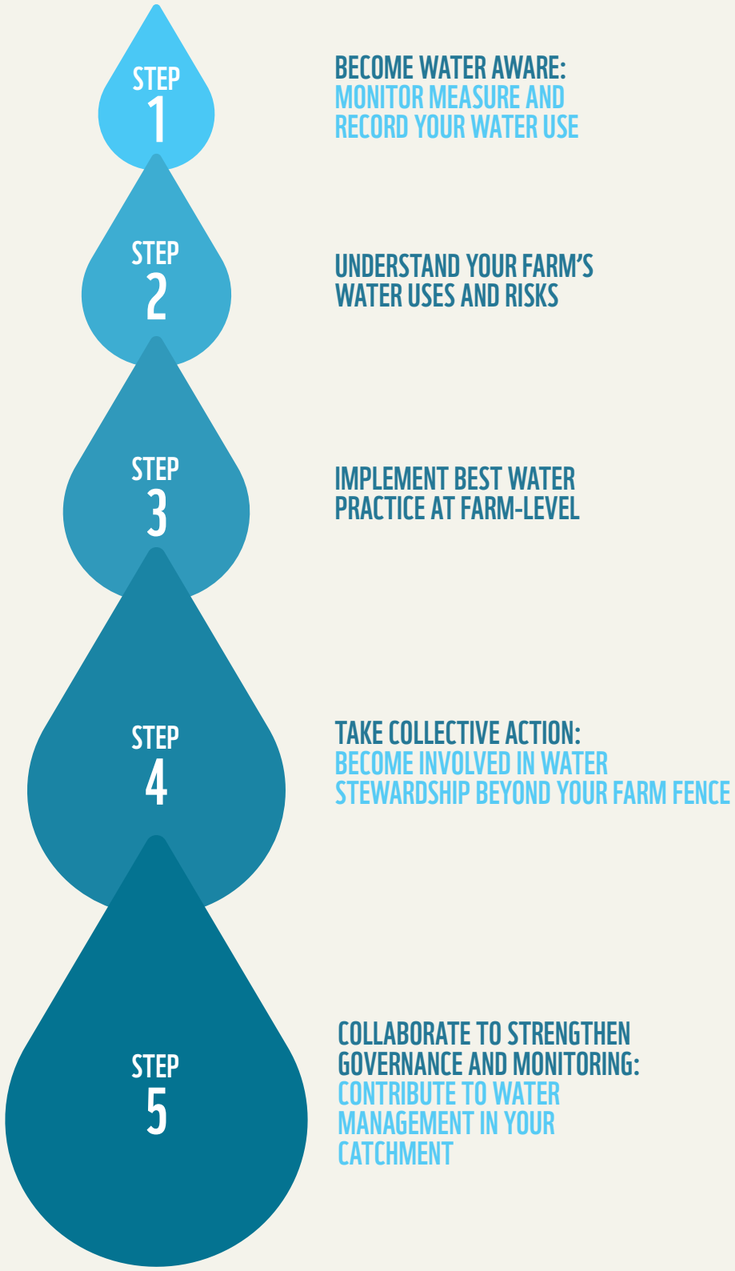
Some stone and pome fruit farmers in Ceres strive towards best practice. The farm Lushof uses a high-tech irrigation approach that is entirely flow-based and electronically controlled through one central computerised hub, using state-of-the-art irrigation hardware, from pumps to microjets. By mulching orchards, Romansrivier has cut irrigation frequency from once a day to once every three days. They have reduced annual fertiliser application, using water-quality tests of drainage water as their yardstick to cut input and protect downstream water quality.

Case study

Woolworths Farming for the Future

Farming for the Future (FFF) approaches farming holistically, linking biodiversity management, soil health and water management to good farming practice. Healthy soil retains more water so there is less run-off into water systems, and less need for using pesticides and fertilisers. When Woolworths started FFF six years ago, many farmers were unaware of legal obligations. Increased awareness of the impact of farming on the environment created by this initiative has resulted in a 16% reduction in water use by their top 15 suppliers between 2011 and 2012.

Figure 15: STEPS TO BECOMING A TRUE WATER STEWARD



'We all have to change how we think about using this shared resource.'

Water stewardship in farming

We all have to change how we think about using this shared resource. This is especially true for a high water user like agriculture. Every role-player in the agricultural sector has to become actively involved in water stewardship (Figure 15).

Business and consumer pressure for safe and sustainable farming practices has led to the development of a wave of standards that farmers nowadays have to comply with if they are to run a competitive business. These include the Global Gap standard, and local initiatives such as Field to Fork, Farming for the Future and Sustainable Wines South Africa. The Alliance for Water Stewardship has just brought out a stewardship standard, adding this to the list of good practices.

Water licensing and allocation procedures will also impact on farming's water practices, such as the policies and mandates implemented by the Department of Water and Sanitation in the Berg and Olifants-Doorn catchments.

Food for thought: the value of regional collaboration

Numerous countries and individual businesses are increasingly seeking access to new growth and investment opportunities in the sub Saharan region, due to the perceived abundance of land and water resources. This includes the potential for extensive agricultural expansion. However, this needs to be done within the context of sound land-use development planning and water resource management, particularly with regards to irrigated agricultural expansion.

Climate change implications

- Water quality will be affected by increasing temperatures and algal blooms.
- Shifting rainfall patterns will have the greatest impact on seasonal growth requirements.
- Increasing intensity and unpredictability of extreme weather events (droughts and floods) will increase risk in the agricultural sector.

USEFUL LINKS

Alliance for Water Stewardship: www.allianceforwaterstewardship.org

Water Risk Filter: www.waterriskfilter.panda.org

Wetland identification and management tools: www.wetlands.za.net and www.wetland.org.za

WET Management Series: www.wrc.org.za

BIODIVERSITY

Approximately 80% of South Africa's land lies in the hands of farmers. They are the true custodians of our resource base and ecosystems.

Thousands of South Africa's species and a third of the country's ecosystems are under threat, together with the critical free services they provide to farmers.

Without action, this threat will accelerate and negatively impact on agricultural productivity and food security in the future.

KEY FACTS

- 80% of South Africa's land surface is taken up by farmlands.
- Agriculture has the largest impact on biodiversity loss and land transformation.
- Farmers are the true custodians of many of South Africa's natural resources (catchment and water source areas, soils, natural vegetation).

KEY TRENDS

- Poor agricultural practices and unregulated expansion continue to threaten key biodiversity hotspots in South Africa.

FARMING FACTS: SETTING THE SCENE

Agriculture is eating into ecosystems

Farming is dependent on nature's essential services which give clean, regular water supply, protect against natural hazards such as floods, provide pollination and grazing, improve soil fertility and capture carbon. However, over the past 50 years, human activity has altered ecosystems faster and more extensively than ever before. The more ecosystems are eroded, the more the services they provide mankind begin to collapse.

Agriculture is a leading driver of landscape change and species loss. According to the latest IUCN Red List of Threatened Species (2011), crop cultivation is a primary cause of plant extinction.

In the Western and Northern Cape, potato and Rooibos production is a leading cause of lost habitat often due to illegal ploughing of virgin land (natural areas).

Sugar production is driving habitat loss on the northern KwaZulu-Natal coast (Palmer & Ainslie, 2006). Poorly regulated biofuel growth may accelerate this trend.

Impact of pesticides and herbicides

Indiscriminate *pesticide* use can have a devastating effect on biodiversity, with applications by aerial crop spraying and broad non-targeted applications or excessive amounts ending up in the surrounding environment. The effects of these pesticides kill amphipods (shrimp-like crustaceans found in soil and water bodies) and other species, upsetting natural predator-prey balances that are important in the food chain and, ultimately, affecting fish and higher animals such as birds of prey, and humans.

Case study

Saving the Renosterveld

The last 10% of critically endangered Renosterveld (literally translated: 'rhino veld') exists as fragments in South Africa's Cape lowland areas, scattered among the vast wheat fields and vineyards of the Western Cape. It is up to these farmers to be good stewards of the land. They can restore and reconnect these habitats by creating corridors of natural areas to protect the last remaining stepping stones of natural areas in the Cape lowlands. Many forward-thinking wine and barley producers of the Western Cape have risen to the challenge and are setting aside and managing these critically endangered areas on their farms by participating in WWF's partnership with the South African wine industry, and in the South African Breweries (SAB) and WWF 'Better Barley, Better Beer' Initiative.

Case study

Badger-friendly honey

Honey badgers have typically been killed by beekeepers for destroying hives. In 2002, beekeeping organisations, conservation agencies and NGOs, together with retailers and the public, worked together to develop and promote badger-friendly honey production methods. By developing cheap and effective protection measures, educating and incentivising the public and creating a 'Badger-friendly' labelling system for honey, this conflict has been turned into a notable gain for all.

'... the notable increase of "new" bee diseases in South Africa suggests that our bees are now more vulnerable and stressed than was previously the case.'

The recently completed Global Pollination and Honeybee Forage project (SANBI, 2013) provides mounting evidence of a global 'pollination crisis' with the mysterious disappearance in Europe and North America of hundreds of thousands of managed honeybee colonies and declines in populations of other wild pollinators. Thus far South Africa's honeybee populations have not exhibited significant losses, but the notable increase of 'new' bee diseases in South Africa suggests that our bees are now more vulnerable and stressed than was previously the case. One of the most important factors contributing to the sustainability of the pollination service for South African crops is the conservation and sustainable management of forage resources for managed honeybees. While crops provide forage for honeybee colonies during the pollination season, beekeepers are reliant on other forage sources to ensure the survival of their colonies at times when crops are not flowering.

Did you know?

The value of honeybees

The global pollination project (SANBI, 2013) summarises the following statistics:

- A third of crops that feed the world rely on pollination by insects or other animals to produce healthy fruits and seeds.
- Globally, honeybees are the most important pollinators of commercial pollinator-dependent crops – with at least 90% of these crops reliant on honeybee services.
- At least 50 crops in South Africa are insect-pollinated. These crops are worth over R10 billion annually and support at least 100 000 jobs.
- In South Africa, the managed honeybee industry is reliant on two ecosystem services:
  - forage provision (to sustain the colony and produce honey)
  - colony replacement (replenishment of a beekeeper's colony stock from the capture of wild bees).
- In South Africa, our indigenous honeybee species, *Apis mellifera* (with two subspecies), is facing increased threats from diseases, parasites and loss of forage habitat.

INSECT-POLLINATED CROPS ARE WORTH OVER **R10 BILLION** PER YEAR AND CREATE AT LEAST **100 000** JOBS

Despite an increase in the use and strength of pesticides since 1950, the percentage of crops lost to pests has stayed roughly the same. Pests have developed resistance to pesticide, calling for stronger and more frequent applications.

Many pest predators are also susceptible to pesticides and develop resistance far more slowly than pests do. As a result, spraying for one pest can result in outbreaks of other pests as natural predator populations are devastated.

The use of herbicides can also lead to a decline in species, particularly amphibians and soil micro-organisms. The advent of genetically modified herbicide-resistant crops has exacerbated the problem by allowing farmers to spray indiscriminately. Monsanto's Roundup herbicide, sprayed on millions of hectares of crops and weeds across the USA, has been found to be extremely toxic to amphibians. A recent study in the USA revealed that applying the recommended manufacturer's dose of Roundup unexpectedly caused a decline of up to 71% in tadpoles (Relyea, 2005).

Emerging farmers in South Africa are under a great deal of pressure to use pesticides and herbicides in order to produce consistent quantity and quality of produce that will allow them into formal markets.

75% OF GLOBAL AGRICULTURAL CROPS HAVE BEEN LOST

The march of monoculture

Modern day, large-scale farming uses more and more monoculture species, resulting in a loss of genetic diversity. Over the past 60 years, 75% of global agricultural crops have been lost. About 20% of the world's breeds of cattle, goats, pigs, horses and poultry are also currently at risk of extinction, which means that their features (such as resistance to disease or adaptation to climatic extremes) could be lost forever.

Indigenous African food crops, such as millet and sorghum, have lost their status on retail shelves. Concerted efforts need to be made to ensure that these hardy crops are not lost to agriculture forever. A fatal element in the runaway loss of our genetic wealth is the fact that it is not evident to the public when one looks at the bread shelves or the meat counters. Also, the disappearance of domestic varieties of fruit and vegetables is hidden behind exotic imports.

With every species and gene lost, we are limiting our options for future success, particularly in adapting to climate change. The wild relatives of crops (species that are genetically related to those in cultivation) and their genes are used to boost the nutritional value, the disease resistance and the productivity of food crops. This genetic diversity is at risk in the wild. More than one in 20 of the *Poaceae* species ('true grasses' related to crops such as wheat, maize, barley and millet) are threatened with extinction. In 2007 the wild apricot, *Armeniaca vulgaris*, the origin of all cultivated apricots, was classified as 'endangered' on the IUCN Red List.

Bio-technology: the answer to global hunger?

The argument is often made that high-yielding genetically modified organisms (GMOs) are the solution to food shortages and hunger.

However, they do come with an environmental risk and possible unintended long-term consequences: genetic contamination and the creation of 'super weeds'. While they might be a part of the solution, all alternative, faster and easier ways of tackling food production must be thoroughly explored before using expensive, high-tech and sometimes risky solutions. The alternatives include reducing the massive amounts of current food waste between farmer and fork, improving farming practices and maximising resource-use efficiency throughout the value chain.

FARMING FUTURES: WHERE COULD WE GO

Approximately 80% of South Africa's land in the hands of farmers, therefore farmers needed to be recognised and supported as the true custodians of key strategic resources and ecosystems.

Farming practices often directly impact or influence the fate of many rare species, such as indigenous birds, frogs, dragonflies and fish, and these species depend largely on farmers for protection. These species are often also good indicators of the health of the natural system in our farmlands.

The following good practices should become the norm for farming in South Africa in order to enhance the value and free services provided by natural systems:

Good practice

Managing biodiversity on farms

Identify natural ecosystems on the farm and draw up a management plan for their protection. Activities should include invasive alien plant control, reconnecting natural systems by establishing corridors and riparian and wetland buffer zones, erosion control, judicious water use, pollution control, hunting and poaching control and maintaining species checklists, among other things.

- Where applicable, enter into a biodiversity stewardship agreement with the local or provincial conservation agency.
- Use a combination of predator-friendly methods to control predators in livestock farming areas, such as Anatolian guard dogs, herders, livestock protection collars, fencing, kraaling, deterrent noises and smells.
- Rehabilitate and maintain water sources, floodplains, river corridors and wetlands.
- Ensure sustainable extraction rates and monitoring systems when harvesting indigenous species.
- Develop new crops from indigenous crops for niche markets and promote the use and improvement of indigenous animal species.
- Minimise the use of herbicides; use mulch instead.
- Minimise the use of pesticides and rather encourage plant health (through healthy soil and suitable crop varieties) and populations of pest predators (for example, by leaving corridors of natural vegetation throughout the farm).
- Prevent pesticide, herbicide and fertiliser run-off into the natural environment.
- Apply the precautionary principle to the use of genetically modified crops and follow manufacturers' requirements to plant non-GM blocks of the crop to avoid resistance building up.

Case study

Potatoes and the Sandveld

The Sandveld in the Western Cape is one of the most threatened vegetation types in the country. It is also the main seed potato growing region in the Western Cape, with about 6 000 ha under production.

Removing natural vegetation for new plantings is the single greatest driver of biodiversity loss in the Sandveld. Clearing of virgin land should only be considered where no alternative land is available, and may only be done with authorisation from the Department of Agriculture (DoA) and the Department of Environmental Affairs and Development Planning (DEADP).

The abstraction of water for irrigation also needs registration for both the source and the abstraction volumes with the Department of Water and Sanitation (DWS). The over-abstraction of groundwater for pivot irrigation has reduced water quality in aquifers (Ranger, 2010). The present ruling for most of the Sandveld is that no additional water may be abstracted unless a licence has been obtained from DWS.

All surface water sources, including the Olifants River, the Berg River and Verlorenvlei, have been excluded from the general authorisations and require an abstraction licence.

Legal compliance and best practice implementation in potato production are critical to ensure that the unique biodiversity of this region is maintained.

Climate change implications

- The uncontrolled spread of invasive alien plant species continues to out-compete indigenous plant species and drives too frequent, too hot wildfires.
- Increasing temperatures, wind speeds and shifting rainfall patterns will increase the spread of invasive alien plants.
- Increasing temperatures and rainfall in the eastern half of the country is likely to give rise to a new wave of pests and diseases.

Food for thought: the value of regional collaboration

Extreme widespread drought and flooding are likely to disrupt large sections of southern Africa's agricultural production. This will require strong collaboration among states to meet and manage the supply of and demand for food, and maintain socio-economic and political stability in the region.

USEFUL LINKS

Biodiversity land-use planning support tool and resources for land owners and decision makers: www.bgis.sanbi.org and www.biodiversityadvisor.sanbi.org

Greenchoice Alliance, supporting sustainable production and harvesting in South Africa: www.capeaction.org.za (select tab on 'Biodiversity economy')

Biodiversity compatible land-use support for Grasslands biome including veld management, grazing and fire management: www.grasslands.org.za

Support for environmentally sensitive control of damage-causing animals: www.ewt.org.za, www.landmarkfoundation.org.za and www.capeleopard.org.za

ENERGY

Food production accounts for about 30% of global energy consumption and rising energy costs drive rising food prices.

Energy generation uses about 8% of global water withdrawals, although in developed countries this is more like 45% (FAO, 2011). Agriculture uses large amounts of energy for pumping, cooling, milking, harvesting, processing, transporting crops and livestock, and producing agrochemicals. In turn, the production of this energy uses water in each step of the cycle: extraction of fossil fuels, processing, cooling of power plants and purifying and pumping of water. This highlights the importance of managing the food-water-energy nexus if we are to maintain a sustainable food system.

KEY FACTS

- Fossil fuel-derived agri-inputs are driving up costs because agrochemicals and pesticides are petroleum-based products. In addition, coal deposits in the country coincide with the best agricultural land and important water source areas. Continued dependence on coal-fired power stations will have significant negative implications for agriculture, directly and indirectly, through an impact on water resources.
- Energy and water insecurity is being driven by growing competition for these limited resources between sectors.
- Poorly regulated expansion of biofuel crops could compete with food production and increase pressure for limited land and water.

KEY TRENDS

- Increasing resource efficiency and optimal production are aimed at managing rising input costs.
- Fossil-fuel dependence, and increasing competition for limited energy supply between sectors, will drive agriculture to renewable energy.

FARMING FACTS: SETTING THE SCENE

'Eskom's load-shedding has a dramatic impact on the agricultural sector because this sector relies on the consistent supply of energy ...'

Rising input costs

Rising input costs put significant pressure on the agricultural sector. Electricity price increases since 2007/08 drove the annual electricity bill for agriculture up by over 20%, even though, since 2009/10, consumption by agriculture has only increased by 2%. Energy price hikes are also increasing the cost of materials used in the food-manufacturing process.

Eskom's load-shedding has a dramatic impact on the agricultural sector because this sector relies on the consistent supply of energy for harvesting, packaging, milking, cooling, processing, transporting and retail, among other things, to reduce food waste throughout the cold chain.

Fertiliser costs have risen dramatically because fertiliser is exposed to world market forces. There are no import tariffs or government-sponsored subsidies for fertiliser; costs are linked to oil prices. The weakening rand has added to these rising cost trends because South Africa imports most of its potassium and 40% of its nitrogen, two key ingredients of fertiliser.

Phosphorus

Phosphorus comes from mined rock phosphate, a non-renewable resource that takes 10 to 15 million years to form. Global rock phosphate supplies are dwindling and expected to run out within the century (Rosmarin, 2004). There is currently no substitute for phosphate in agriculture and a shortage will leave the world's future food supply hanging in the balance. South Africa has 5% of global reserves, but currently exports most of what it extracts and processes.

Road or rail?

Transport costs are a significant part of food production costs. About 30 years ago, 80% of grain was transported by rail. Now, owing to inadequate rail services, only 30% is hauled by rail. The bulk is transported by road and transport costs are therefore strongly linked to the fuel price.

FARMING FUTURES: WHERE WE COULD GO

Energy security and the environmental trade-offs

In light of the interplay between water, energy and food, the farming sector faces interesting challenges:

- water and traditional energy resources such as fossil fuels are becoming scarcer, more costly and less secure.
- climate change is impacting on crop-growing conditions and yields.
- there is global pressure to reduce climate-altering emissions.

South Africa's energy needs are growing and could seriously impact on its future water requirements.

65%
OF THE COUNTRY'S ELECTRICITY WILL BE PROVIDED BY COAL BY 2030

Coal will still provide 65% of the country's electricity needs by 2030 (Figure 16). Although adopting emissions-lowering coal technologies is an option, these technologies are water intensive. If water becomes scarcer, there will be serious trade-offs for water allocation between energy and agriculture. As it is, coal deposits in the country coincide with the best agricultural land and important water catchment areas, bringing with it the environmental threats associated with coal mining. The continued dependence on coal to meet electricity needs will therefore directly conflict with food production and have a negative impact on the quality of water resources.

Shale gas is a new potential energy source that might be abundant in the Karoo. However, this region provides much of South Africa's lamb and mutton. Drilling for gas could have the same devastating impacts on water resources as coal mining does, rendering already marginal farmland useless.

Turning to renewables

There is a slow but growing interest in agriculture to turn to renewable energy resources such as wind, solar, geothermal and effluent heat. However, relatively large initial capital investment, the perceived high risk involved in new technology and the lack of strong financial incentives remain obstacles for the wide application of these energy sources.

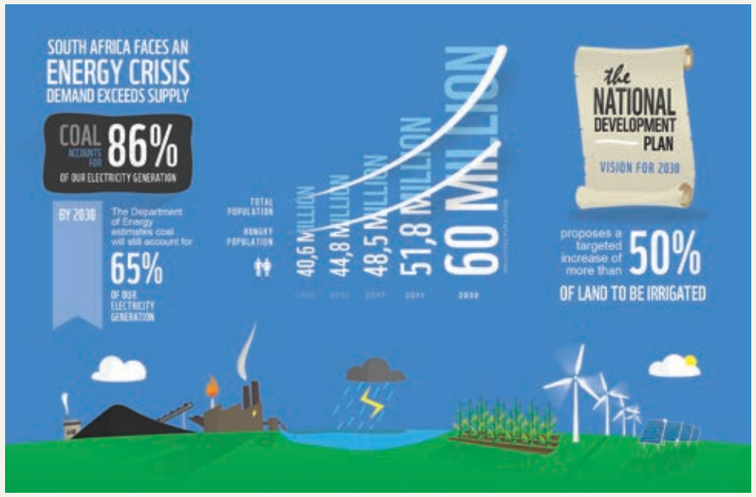
Biofuel or food?

Biofuel is another alternative, but this raises concerns over competition for land and water. South Africa's strategy is to achieve a 2% penetration of biofuels in the national liquid fuels pool per annum. The strategy mandates the use of non-food crops: sugar cane and sugar beet for bioethanol, and sunflower, canola and soya for biodiesel. However, if growing biofuel crops is poorly regulated or managed, there is nothing to prohibit farmers from substituting food crops with energy crops if the price for energy crops goes up and there is profit to be made.

FOOD FOR THOUGHT: VALUE OF REGIONAL COLLABORATION

There is good potential for regional collaboration with regards developing alternative, cleaner energy sources such as the generation of large scale hydropower in the region. However, this will require strong geo-political collaboration and be deeply dependent on regional stability.

Figure 16: SOUTH AFRICA'S MOST URGENT SUSTAINABILITY CHALLENGE IN TERMS OF THE FOOD-ENERGY-WATER NEXUS



Source: WWF(2014)

Regional solutions to the current energy crisis include the large-scale hydropower generation potential that exists in the southern Africa trans-boundary river systems such as the Zambezi, where the Grand Inga Hydropower Scheme is being built in the Upper Zambezi. This alternative energy source will support increased irrigation potential and agricultural expansion within the next five years.

However it could have significant negative environmental impacts, such as reduced environmental flows in trans-boundary river systems, and loss of floodplains and wetlands systems. This in turn could result in increased downstream flooding and the displacement of people, as was experienced in Mozambique in January 2015.

The implementation of this and other hydropower facilities remains highly dependent on good, integrated land-use planning, resource management and monitoring, and early warning systems to reduce and offset future downstream impacts.

Climate change implications

- Energy consumption for heating and cooling needs will likely increase due to changes in temperatures.
- Energy supply could be disrupted due to shifting climatic patterns:
  - increased temperatures will decrease the efficiency of thermal conversion of thermal power plants (86% of South Africa's electricity is provided by coal-fired power stations)
  - decreasing or seasonal shortages of water availability for cooling along with increasing ambient water temperatures could lead to power-plant operation at reduced capacity, or even temporary shutdowns
  - limited water availability could significantly affect oil and gas production, including shale gas fracking given the volumes of water required for enhanced oil recovery, refining and hydraulic fracturing.

USEFUL LINKS

Fruit and Wine Industry Carbon Calculator: www.climatefruitandwine.co.za

SOCIO-ECONOMIC CONTEXT

South African agriculture has undergone significant structural changes over the past 20 years, causing a move towards large-scale intensive production.

Farmers have shifted from producing low-value, high-volume products intended for domestic consumption (such as wheat and milk), to high-value products for export (such as deciduous fruit, citrus and game). The impact of certain policy changes on food prices, food availability and on South Africa's natural and socio-economic environment remains to be seen.

KEY FACTS

- South Africa has a dual agricultural economy with well-developed, largely export-orientated commercial farmers operating on privately owned land, and small-scale and subsistence farmers located mainly in the former homelands.
- In the past 20 years there has been a decline in the number of commercial farmers and farm workers (see Figure 18), although agricultural productivity and income has risen sharply.
- Land issues are central to policy debates.

KEY TRENDS

- Weather remains a key driver of volatility and uncertainty.
- Investment in the agricultural sector has fluctuated since 1997 and the intensity of investment and research and development has stagnated.
- The country has lost a number of experienced scientists and farmers.

FARMING FACTS: SETTING THE SCENE

'... the agricultural sector is responding to a series of important structural reforms that, since 1994, have resulted in an open, market-oriented economy.'

Agriculture's role in the economy

Agriculture contributes between 2–3% directly to total GDP, which is a relatively small share. Yet it is an important sector in providing employment, earning foreign exchange, sustaining rural livelihoods and supporting rural reintegration and development.

Twenty one years after democracy, the agricultural sector is responding to a series of important structural reforms that, since 1994, have resulted in an open, market-oriented economy. Some of these changes have been intended, while others are the result of the country's integration into the global economy following the end of apartheid-era sanctions.

The changes in policy were intended to relax the centralised control of agriculture and improve conditions for farm workers, while also redressing land inequalities and redistribution. Closing agricultural marketing boards, phasing out certain import and export controls and introducing certain import tariffs all converted a stagnant and state-controlled sector into a vibrant market economy.

However, dismantling state support to commercial farmers, combined with low import tariffs, left many local farmers unable to compete in certain areas. For instance, wheat and milk producers could not compete with the subsidised products of farmers in the developed world that were offloaded onto the South African market.

On the other hand, initiatives driven by the government and the private sector to increase irrigated farmland have led to growth in high-value export crops such as deciduous fruit, grapes, citrus and wine.

Figure 17: CRUNCHING THE NUMBERS

Statistics SA, 2012 Q2 report

Aliber 2005, Aliber & Cousins, 2013

National Development Plan, Vision 2030

* Through high-value, labour-intensive crop development

Small-scale and commercial farmers

While the last 20 years has seen a steady decline in the number of commercial farmers, this reduction has largely been on the back of a significant increase in the concentration of farm holdings (Table 2). The term 'small-scale grower' or 'smallholder' is often used to refer to the total number of farmers or households involved in farming on a relatively small scale (Pienaar, 2014). There are conflicting estimates of the total number of small-scale farmers. Coetzee (2003) suggests that there are approximately 2.1 million, Vink (2009) estimates around 1.3 million, and the National Department of Agriculture (NDA, 2001) estimates 3 million farming households. So while there is a lack of accurate and up-to-date census data in this regard, the most recent general consensus suggests an estimate of 2 million farming households (Aliber & Hall, 2010 and Aliber & Cousins, 2013).

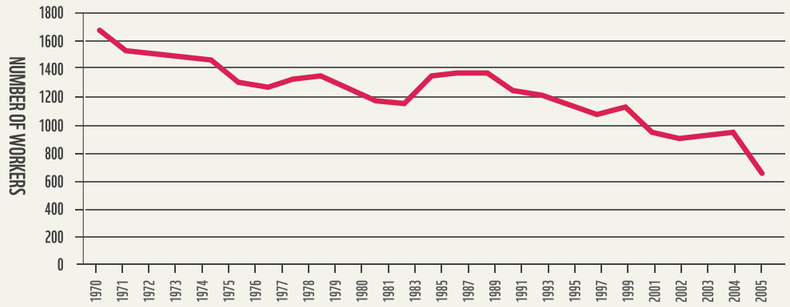
Table 2: SUMMARY OF CENSUS DATA ON THE NUMBER OF FARMERS IN SOUTH AFRICA*

Farmers	1991	1993	1996	2002	2007
Number of commercial farmers	Not available	57 980	60 938	45 818	39 966
Number of small-scale farmers in former homelands	1 292 600	Not available			

Source: Statistics South Africa (1993, 1996, 2002, 2007)

*Questions on agriculture were not included in the last census in 2011, hence more recent figures are not available.

Figure 18: DECLINING TREND IN FARM-WORKER NUMBERS, 1970–2006



Source: Department of Agriculture (2009)

The land reform question

Since 1994, South Africa began redressing past injustices through land reform in the agricultural sector. The land reform programme rests on three pillars (Pepeteka, 2013):

- **Restitution:** Settling claims of land lost under apartheid through either restoration or financial compensation.
- **Redistribution:** Transferring white-owned agricultural land to previously disadvantaged black farmers.
- **Land-tenure reform:** Providing more secure access to land in communal areas and on commercial farms.

'The first target period for the lodging of restitution claims ended on 31 December 1998, but this date was subsequently extended to the end of 2011.'

The Restitution of Land Rights Act 22 was passed in 1994. The first target period for the lodging of restitution claims ended on 31 December 1998, however this date for the first round of submissions was subsequently then extended to 31 December 2011. The government's mid-term review report shows that by 2011 South Africa had transferred over 6.8 million ha of land to people who had been dispossessed under apartheid. This represents 27% of the government's target of transferring 24.6 million ha by 2014.

The government had set the target of delivering 30% (24.6 million ha) of commercial agricultural land by 2014. By January 2013, 97% of the total restitution claims had been settled, translating to 1.443 million ha, which benefited 13 968 female-headed households and 672 persons with a disability.

However, a lack of post-settlement support underlies what the Department of Rural Development and Land Reform (DRDLR) acknowledges as the enormous failure of many land reform projects. A 90% failure rate of these projects (DRDLR, 2009) has resulted in reduced agricultural output and an increasing trend of poorly managed, underused agricultural areas. The Recapitalisation and Development Programme (RADP) was drawn up in 2011 to boost projects on the verge of collapse.

90%
FAILURE RATE OF DRDLR PROJECTS (2009)

In addition to underutilised farms as a result of the limited success of current land reform efforts, the uncertainty about policy shifts and land issues is also a disincentive for many commercial farmers to maintain strong capital investment in their farms and to continue ploughing resources into responsible farming practices.

This results in large tracts of natural areas in South Africa's farmlands not being effectively managed. These areas are characterised by poor control of widespread invasive alien plants, poor fire management, soil erosion and overgrazing, which all have a negative impact on the health and functioning of key ecosystems.

FARMING FUTURES: WHERE WE COULD GO

The issue of size

Although the number of farm units has dropped since 1993, gross farm income (GFI) has increased by more than 300%. Despite rapidly rising input costs, net farm income per farm unit has increased significantly to five times more than in 1993. This is largely owing to efficiencies achieved in economies of scale that kicked in as the units became fewer but bigger.

300%
INCREASE IN GROSS FARM INCOME SINCE 1993

Small-scale and marginal farmers are not enjoying the same benefits. In addition, they are often reliant on soft funding from institutions such as the Land Bank. And, like commercial farmers, they had to face a situation where government support was phased out at the same time as the markets opened to allow competition from cheap imports.

Policy measures could help the agricultural sector play its part in reducing poverty by creating jobs and improving economic security through increased land ownership. In the 2015 State of the Nation Address (Zuma, J, SONA 2015), the Presidency indicated that agriculture was on the cusp of potentially very significant proposed policy shifts.

However, radical improvements are needed in the pace, scale and sustained support given to emerging and small-scale farmers to improve success. This support would involve investment, technology, knowledge transfer and skills training, access to research and development (R&D) and markets, and credit. This must be done in a way that maintains and stimulates production while supporting responsible and sustainable farming practices.

Rethinking small-scale farmer support

The performance of smallholder co-operatives and 'associations' in the past two decades, even when supported by post-apartheid state institutions, agribusiness or civil society, suggests that these farmers will not be able to contribute significantly to agricultural output or wage employment in the short to medium term.

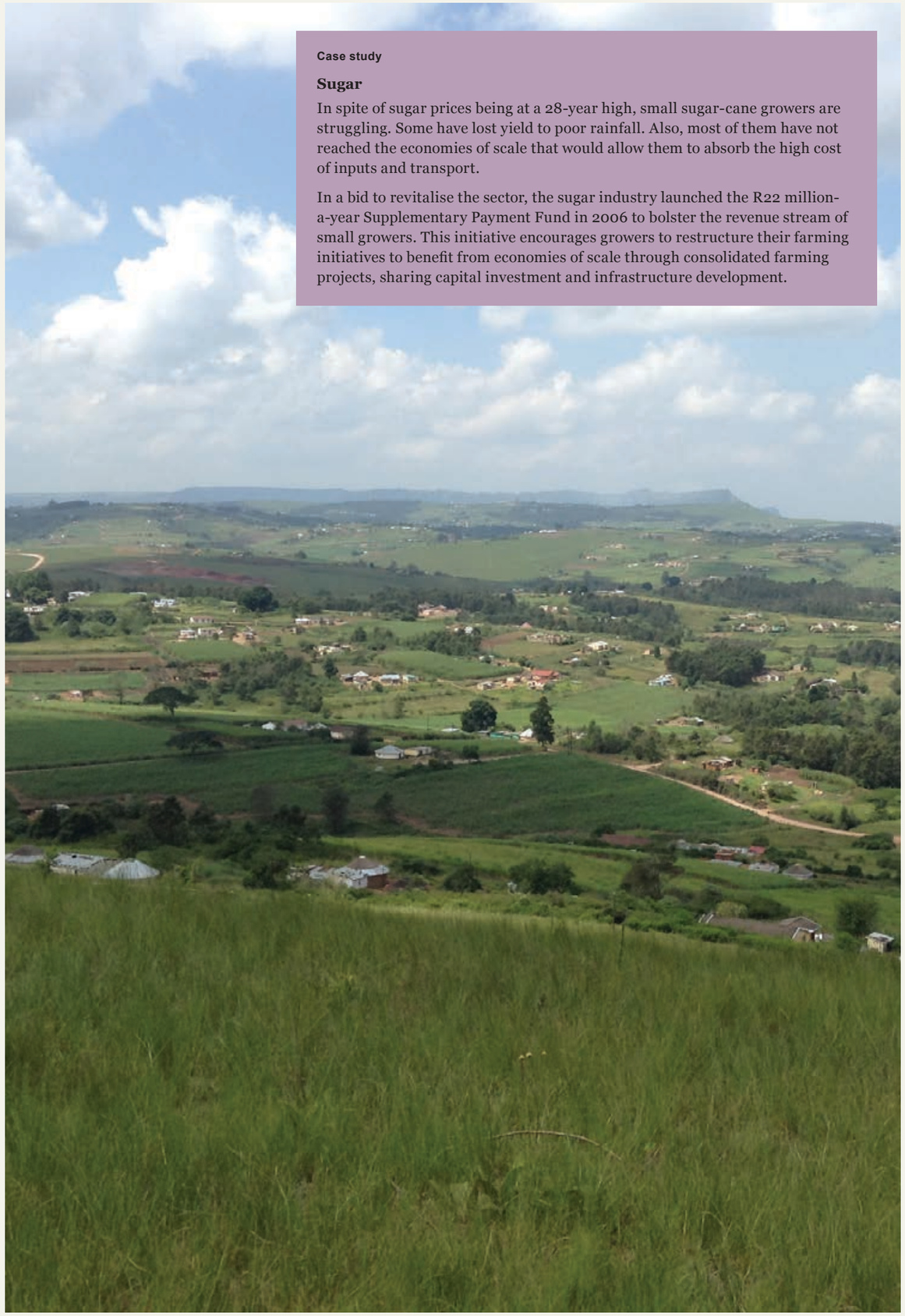
In the medium term, a better way of creating jobs and alleviating poverty in this sector might be to provide greater support to and investment in growing labour-intensive commercial agriculture and agro-processing activities that stimulate agriculture-based manufacturing.

'... land reform is unlikely to improve agricultural production, achieve significant poverty reduction, or improve household food security for the poor in the medium term.'

Land reform – in particular land redistribution – is often put high on the policy agenda as a way to address agricultural efficiency and equity, and reduce poverty. Yet, current evidence and research on the scale of farming suggests that land reform is unlikely to improve agricultural production, achieve significant poverty reduction, or improve household food security for the poor in the medium term.

Slow progress in the transfer of land ownership and sustained support to new owners translates into vast areas lying unused or currently operating sub-optimally, with poor production and little or no incentive to manage these areas responsibly.

This makes it imperative to rethink policy in this arena.



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Case study

Sugar

In spite of sugar prices being at a 28-year high, small sugar-cane growers are struggling. Some have lost yield to poor rainfall. Also, most of them have not reached the economies of scale that would allow them to absorb the high cost of inputs and transport.

In a bid to revitalise the sector, the sugar industry launched the R22 million-a-year Supplementary Payment Fund in 2006 to bolster the revenue stream of small growers. This initiative encourages growers to restructure their farming initiatives to benefit from economies of scale through consolidated farming projects, sharing capital investment and infrastructure development.

Good practice

Supporting socio-economic development in the sector

- Good land-use planning and mapping of new farming entities to ensure that the agronomic, livestock, veld and forage resources and mechanisation practices of the farm are appropriate for the climate, soil, freshwater resources and topography of that particular area.
- Rethinking an integrated strategy to revitalising the sector, including issues related to the scale of farming and land reform to achieve agricultural growth and reduce poverty.
- Renewed public investment and state intervention to support large-scale farming in order to boost agricultural production through high-value export products and ensure labour-intensive job creation.
- Improved coordination, collaborative extension and joint resourcing across the departments of Labour, Agriculture and Rural Development and Land Reform to support continued interventions that will improve the working conditions of farm workers.

Climate change implications

- Extreme weather events and unpredictability will increase the risks and vulnerability of smallholders and threaten the livelihoods of many rural poor communities.

USEFUL LINKS

10th BFAP Baseline Agricultural Outlook 2013–2022: www.bfap.co.za

National Agricultural directory 2013/14: www.AgriHandbook.co.za

National Planning Commission: www.npconline.co.za

Publications, research and policy briefs and Check Facts Sheets (1–4) on poverty, land and agrarian studies and land reform: www.plaas.org.za

CALL TO ACTION

The challenges of feeding South Africa's growing population in a climate-altered, resource-constrained future are enormous. Yet we do not have to be victims of an inevitable crisis.

By forming strong partnerships and collaborations between farmers, the industry, finance and insurers, retailers and consumers, everyone can work together to create a responsible, more efficient food value chain that makes the best use of the resources available to get a healthy, affordable diet to everyone in the country, without compromising the environment. Good policy, solid research and explicit, integrated thinking, and planning and managing the interlinkages between food, water and energy, can pave the way.

This call to action goes out to everyone involved in the food system. It includes each one of us, either as consumers making food choices every day; retailers; agro-processors; financial and insurance industries driving investment and mitigating risk in the sector; the government; or farmers and farm workers who are involved in the daily challenges of producing food.

'But ultimately this is a systemic problem and resolving it is going to require something more radical. It will require a shift in how we value the natural riches of our finite planet and recalibrate our aspirations versus our needs to create a new approach to living sustainably within the boundaries of natural systems.'

WHAT ARE THE CHALLENGES?

Clean water, energy and electricity, and nutritious food: these are the pillars on which our society and economy rest. How will our farmers manage to produce enough food for us all in the face of depleted soils; over-extracted and polluted water reserves; weather patterns and water distribution altered by climate change; shifting, unpredictable growing seasons; volatile global oil prices; rising costs of water and electricity; an uncertain domestic electricity supply and a failing national power grid; the politics of land reform and the need to redress poverty and historic land inequality?

'How will our farmers manage to produce enough food for us all ...'

South Africa's National Development Plan provides a blueprint for future economic growth and development and a vision for what South Africa could look like by 2030. The importance of agriculture is highlighted for its role in rural reintegration, job creation, food security and the equitable redistribution of land. By each doing what we can – and more – we need to make sure that our farmers grow sufficient food for our current needs and are able to respond to growing demand.

WHAT OPTIONS DO WE HAVE?

While we are all united in our interest and perhaps concern about the future of food in South Africa, we are also often divided by our different perspectives about, and different roles and interests in, the food system. The recently launched transformative scenario planning for a sustainable food system by 2030 (The Southern Africa Food Lab & Reos Partners South Africa, 2015) has started the conversation between multiple role-players. It is challenging all involved in or dependent on the food system to actively engage in this joint and coherent conversation to enable all actors in the food system to evaluate their role, and determine what strategic choices can be made now to influence or adapt to and shape the future of our South African food system.

These choices include reducing food waste, shifting food consumption patterns, taking action wherever we can and encouraging good governance and sound policies.

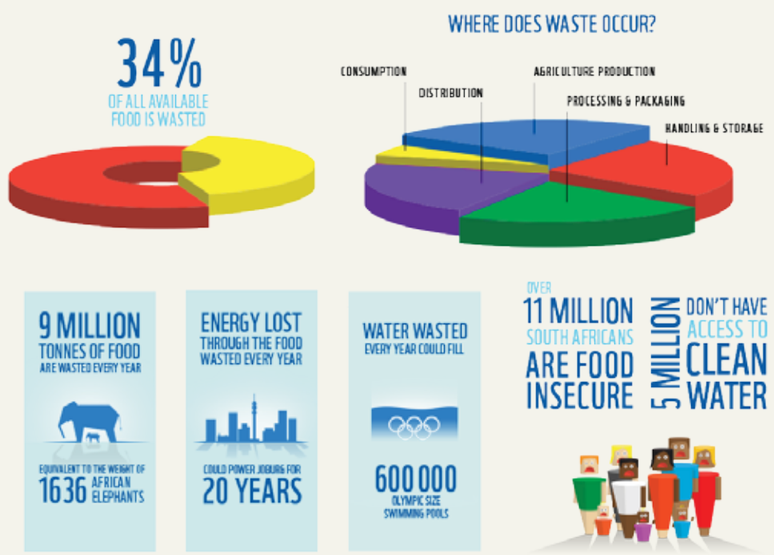
Reducing food waste

30–40%
OF FOOD IS WASTED AT EVERY STEP IN THE FOOD CHAIN

It is estimated that we currently waste 30–40% of food at every step in the food chain (Figure 19).

Even though the world produces more than enough food to feed everybody – global per capita food supply today is about 2 800 kcal per day – this is not evenly distributed, and the disconcerting fact is that up to a third of all food produced is wasted (FAO, 2011). Cutting down on food waste throughout the value chain is key to the more sustainable and efficient use of the limited available resources needed to farm our food.

Figure 19: EMBEDDED WATER, AND ENERGY LOST IN CURRENT FOOD WASTE



Source: The Food Energy Water Nexus. WWF SA Report, 2013.

Making more sustainable choices

'High-income countries and a rapid increase in westernised, middle-class consumers drive the demand for high-protein, highly processed foods and empty-calorie diets.'

High-income countries and a rapid increase in westernised, middle-class consumers drive the demand for high-protein, highly processed foods and empty-calorie diets. Providing enough food for these diets means farmers need to continually expand their food production, usually by using more land, more water and more energy. But this is not a sustainable solution.

Creating greater awareness among middle-class consumers of the dynamics underlying their food choices could go a long way towards getting them to make sustainable choices. Consider the conversion of maize to protein, for example.

More than two thirds of the locally-produced maize is consumed by the local market in the following pattern: human consumption (50%), the animal feed industry (40%) and the rest is used for seed and industrial use (10%). However, the direct consumption of maize is a more efficient use of the grain conversion to animal feed to supported production of meat. Nevertheless, the conversion of maize to chicken is still more efficient than the conversion of maize to feedlot beef. Exclusively range-fed beef has no direct impact on South Africa's maize supplies (DAFF, 2012).

75%
OR SOUTH AFRICA'S CATTLE SPEND A THIRD OF THEIR LIVES IN FEEDLOTS

Originally cows grazed on grasslands that were not suitable for crops, converting inedible grass into high-value protein. Today 75% of South Africa's cattle spend a third of their lives in feedlots, fed by grains grown on the country's scarce arable land. Not only does this practice produce meat with an unhealthy fatty acid profile, it is also a major water issue. Compared to naturally fed beef, it takes about 65 times the quantity of surface water to produce feedlot-finished beef in South Africa if the feed crops are irrigated – about 850 litres for every 500g of grain-fed steak. A sustainable solution is to reduce our daily consumption of red meat and to source natural, range-fed meat.

Grass-fed is best

'Grass-fed' beef is better for your health than grain-fed beef. It is not only lower in saturated fats, it contains up to six times more of the good omega-3 fatty acids that our modern diets lack. South African lamb and mutton are also good sources of omega-3 fatty acids, as most are fed on natural veld. Choosing grass-fed meat also keeps livestock on the land, rather than in large feedlots. This creates jobs in rural areas, reduces pressure on South Africa's maize supplies, uses less water and, if stocked at appropriate rates, is good for the country's grazing lands.

Becoming involved wherever we can

To deal with the key uncertainties in food production that are likely to affect and shape the 'food future' of South Africa, we need to do the following:

- develop a better understanding of how South Africa's water, energy and food security are interlinked
- join the debate about how we can continue to produce enough food and how land reform developments will affect future production
- develop a better understanding of the impact and role of global economics and how it affects the political, social and economic dynamics in South Africa's food system
- promote research and advocacy on the current poor levels of nutrition and increasing health implications for South Africa's people

- develop an understanding of the effect on food production in South Africa if consumers can be influenced to make more sustainable food choices.

Stepping up sound governance and policy

Managing the synergies and trade-offs to allocate interconnected natural resources among the various sectors of the economy is no easy task and requires a different approach to that which has governed these resources to date.

'It falls to the government to demonstrate the political courage that is needed to establish the protocols for a fair and transparent conversation about priorities and resource allocation ...'

Greater – and better – governance, underpinned by an integrated approach to policy, planning, management, development and, critically, appropriate institutional capacity, is what will secure South Africa's 'food future'.

It falls to the government to demonstrate the political courage that is needed to establish the protocols for a fair and transparent conversation about priorities and resource allocation among the respective government departments. The government will also have to take a long hard look at pricing and taxation, and must ensure a more effective deployment of 'the polluter pays' principle. All these actions depend on adequate institutions and measures to enforce decisions and regulations.

The government is also able to send the right signals to farmers through the right incentives and better investment in agricultural research and development (R&D) for the wider use of technology. In both the established and emerging small-scale commercial farming context, technological advancement and infrastructure development will remain the keys to optimal productivity and higher yields, while minimising the environmental footprint and associated impact of food production.

The successful creation of a sustainable and equitable food system will require strengthened collaboration and joint effort. This includes a well-coordinated network of collaborative extension services to support knowledge transfer, training and skills development, with a renewed focus on drawing South Africa's youth back into farming.

WHAT COURAGEOUS ACTIONS CAN WE TAKE TOGETHER TO CREATE A DIFFERENT FUTURE?

Many different initiatives are already under way to support and promote responsible social, ethical and environmentally sensitive farming and production practices (see 'Useful links' at the end of each section), but it is imperative to ramp up the pace, scale and coordination of these efforts.

Individual actions add up

Here are a few ideas of what you – as a farmer or producer, the government, a retailer or a consumer, – can do to contribute to a more collaborative, sustainable and equitable food system in South Africa:

WHAT CAN FARMERS AND PRODUCERS DO?

This is how you, as a farmer or producer, can make a difference:

Good farming always starts with good farm mapping

Develop a spatial farm and farm management plan – include the identification of your natural and agricultural resources.

Improve your production

Actively seek out and participate in industry good practice initiatives focused on better production practices and responsible farming.

Share your knowledge

- Share your knowledge and learning with others.
- Form and participate in study groups on agro-ecology, soil health and fertility, resource efficiency and waste reduction.

Be a good neighbour

- Participate in collaborative platforms such as fire protection associations, conservancies and water stewardship efforts in your catchment.
- Adopt a river and river-health programme.
- Ensure that you are legally compliant.

WHAT CAN THE GOVERNMENT DO?

This is how the South African government can make a difference:

- Focus on integrated spatial resource planning allocations and management - mapping resource use needs and the impact of competing land uses: mining, agricultural, infrastructure development, urbanisation.
- Create SMART incentives to support responsible farm planning and management and optimise resource efficiency and farm productivity.
- Increase investment in R&D and technology transfer.
- Actively support well-coordinated, decentralised collaborative extension partnerships to support farmers at district level.
- Improve the monitoring and enforcement of legal compliance.

WHAT CAN RETAILERS DO?

This is how you, as a retailer, can make a difference:

Play a more active role in supporting collaborative efforts

- Make sustainability a pre-competitive issue by collaborating with other retailers on certification and auditing processes. This will help reduce the costs of certification and audits and maximise the impact of certification.
- Pool your resources and expertise to support joint retailer farm-monitoring and measurement programmes.

Reduce food waste in your supply chain and in-store

- Take responsibility for managing your cold chain from farm to shelf.
- Set public targets for reducing your food waste.

Support collaborative farmer extension programmes

- Share your knowledge on good farming practices.
- Actively participate in existing study groups and platforms.
- Participate in industry self-regulation initiatives, rather than developing your own internal programmes.

WHAT CAN CONSUMERS DO?

This is how you, as a consumer, can make a difference:

Manage your food waste

- Buy smaller quantities of fresh produce or perishable goods by shopping more frequently and sourcing local, seasonal products.

- Get creative with your leftovers – freeze them for soups or broths, use them in other dishes.
- Compost your food waste.

Grow your own

Start a vegetable garden – even if it is just to understand how challenging and yet rewarding farming food can be.

Get invloved

Support your local (organic) food markets, start community food gardens or establish a free-access pavement food garden.

Be water-wise

Install rainwater tanks and grey-water systems in your household.

Evaluate your current food choices

- Work towards reducing your intake of highly processed, high-sugar and empty-calorie foods.
- Consider the source of the protein you eat because high-protein diets have a dramatic impact on our planet. Reduce your intake of red meat or consider alternative sources of protein.

Know what's in your food

Read food labels, do the research and increase your voice as a consumer.

Support products that demonstrate responsible food choices

Examples are SASSI sustainable seafood, rangeland grass-fed beef, free-range chickens, fairtrade, organic or badger-friendly honey, sustainably produced wine, 'Farming for Future' products.

Further reading

The Food Energy Water Nexus – understanding South Africa's most urgent sustainability challenge. WWF SA Report, 2013.

The Southern Africa Food Lab and REOS South Africa. *The Future of Food in South Africa: Four scenarios examining possible futures of the food system in South Africa*. The Southern Africa Food Lab 2015.

WHAT IS WWF CURRENTLY DOING?

This is what WWF and its partners are currently doing:

- Supporting industries in strategically important catchments to improve their collective agricultural water stewardship, manage on-farm water risk and optimise irrigation efficiency.
- Lobbying against coal mining due to its downstream impacts in key strategic water-source areas.
- Supporting multiple commodity partnerships to promote better production practice:
  - **Wine and fruit:** WWF 'Champions in Conservation' label, Sustainable Wines South Africa seal, SIZA fruit initiative, Confronting Climate Change carbon calculator
  - **Sugar:** Sustainable Farm Management System (SUSFARMS®)
  - **Barley:** SAB partnership supporting 'Better Barley, Better Beer'
  - **Beef:** Enkangala Grasslands Programme supporting rangeland beef production.
- Facilitating individual and local community biodiversity stewardship by providing free extension services. These services support individual private landowners and communities to implement good natural resource management practices and protect critical natural areas. This includes successful land reform community engagements.
- Supporting training for small-scale growers and the implementation of good farming practice and farm-level land-use planning.
- Researching alternative energy options – renewable energy, and the decentralised and localised generation and distribution of energy.
- Supporting the development of a low-carbon, low-water future for agriculture by:
  - providing extension services to support the use of the Confronting Climate Change carbon calculator
  - investigating the potential of small hydro plants
  - working with the transport sector to reduce the carbon emissions of transporting food
  - mapping and creating innovations to manage waste in the supply chain
  - undertaking food product life-cycle analysis to understand where the greatest impacts and biggest leverage points for change lie. The analyses for beef, fruit, wine are under way while those for dairy and sugar have been completed.
- Developing a prototype model for a climate-resilience fund for agriculture to support and incentivise farmers to adapt to and mitigate the impacts of climate change.
- Exploring a range of financial incentives to support the uptake of responsible farming practices.

Useful WWF links

Visit www.wwf.org.za for more information or to download the following reports:

- *The Food Energy Water Nexus – understanding South Africa's most urgent sustainability challenge*. WWF-SA Report, 2013.
- *The Future of South Africa's Food System: What is research telling us?* Pereira, LM. 2014. SA Food Lab Report. (Full report available at: www.southernafricafoodlab.org)
- *Water stewardship experiences in the Western Cape*. WWF-SA Report, 2014.
- *Better Production for a Living Planet*. WWF-SA Report, 2013.
- *Living Planet Report 2014 – Species and spaces, people and places.*
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SOUTH AFRICA'S AGRICULTURE BY NUMBERS

100% RECYCLED

3%

of the country has truly fertile soils

69%

of South Africa's land surface is good for grazing

13%

of our land is good for cultivation

1%

of South Africa has the right climate and soil combinations for rain-fed crops

25%

of South Africa's soil is susceptable to wind erosion

30%

of food is wasted at every step in the food chain

WWF

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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