



# TIPS FORUM 2017

## INDUSTRIALISATION AND SUSTAINABLE GROWTH

### SUSTAINABLE AGRICULTURE FOR A BETTER ECONOMY: POLICY PLANNING AND PUBLIC FINANCING

June 2017

**Author: Selebogo Leshoro**

Paper presented at the TIPS Annual Forum 2017.

The Annual Forum 2017 is being hosted by Trade & Industrial Policy Strategies (TIPS) in partnership with the South African Research Chair in Industrial Development, based at the University of Johannesburg, and in association with the Green Economy Coalition (GEC). It is supported by the European Union and the Department of Trade and Industry.



**the dti**

Department:  
Trade and Industry  
REPUBLIC OF SOUTH AFRICA

## **Abstract**

Weather patterns in recent years have shown the negative impact of climate change on general agriculture produce, and if robust policy plans and public funding are not put in place, sustainable agricultural productivity will be badly hampered. The paper explores instances where sustainability within the agriculture sector is a crucial strategic need. The paper further zooms in on the current policy within the sector with the aim to identify possible gaps. The impact of El Nino and La Nina on the production of maize and other important crops in the country for example, has been very disastrous and devastating to the economy. Downstream in the value chain, the impact was dire in relation to all the industries using these products e.g. livestock feeds and human consumables industries. The high prices on agricultural products which lead to higher food inflation require better planning and good policy on public financing in the agriculture sector. Similarly, sustainable agricultural productivity requires a holistic, yet goal specific public financing that demands change management in policy.

Different national Departments play a role in the agriculture sector, from land to water to the development of rural spaces, all of which are vital for continued good performance by the sector. As such public planning and funding should comprehensively connect these public entities through an integrated and all-encompassing strategy for sustainable agriculture. By understanding their respective developmental role for the sector in a changing climate, these entities will be positioned to adjust their functions accordingly. Therefore, the study will bring clarity if agricultural planning has evolved such that it encompasses programmes, solutions and activities that enhance sustainable productivity. Furthermore, the paper will show that although state funding has evolved in recent years, there is a need to investigate whether funding in agriculture has embraced, and to what extent, the urgency to fund efforts and plans towards a more sustainable agriculture. Policy recommendations will be done in relation to future trends in planning and public financing for sustainable agriculture.

## **About the author/s**

The author is a Senior Statistician in the Department of Agriculture, Forestry and Fisheries (DAFF), Pretoria.

## Introduction

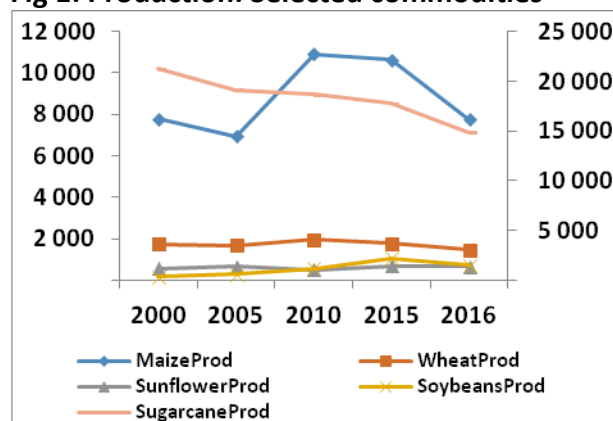
Agriculture sector forms an important basis for economic development and whilst most developed economies were once highly dependent on this sector, developing economies such as South Africa to a large extent still require an efficient agriculture sector. The sector is vital in that it connects various industries, from the input products and implements – upstream - to processed products and packaging (downstream) in the economy. Over and above water and land as the backbone for a successful agriculture sector, the sector contributes immensely to industries such as chemical, transport, energy, technology, hospitality and finance to mention some. Therefore, it is evident that the sector contributes enormously to employment, economic growth, food security, international trade and export income.

However, over the years agriculture productivity has declined due to adverse weather patterns. In a report on agriculture, the Food and Agriculture Organisation of the United Nations (FAO) asserts that food security, sustainable development and poverty eradication globally are threatened by the developments in climate change. In order to address these challenges, agriculture needs to radically evolve, adapt and adopt new productive ways in order to remain sustainable. This development requires concerted effort in planning and financing by the state.

## Trends in the Sector

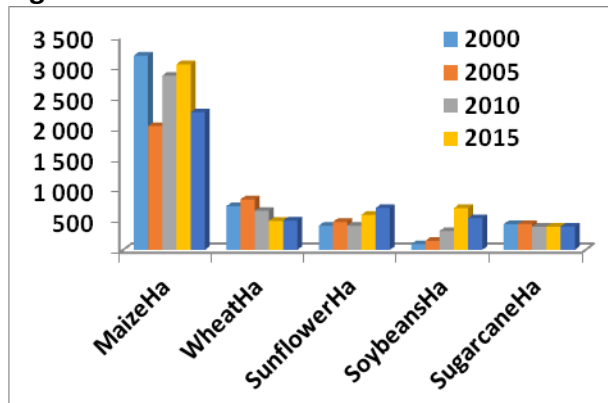
Figure 1 and 2 below indicate production and hectare levels for some selected commodities, with maize and sugarcane showing a significant decline since 2010. Over the same period, the area planted for these selected commodities, except sunflower, shows a falling trend. Figure 3 captures numbers for selected livestock, further indicating a steady drop in these numbers.

**Fig 1: Production: Selected commodities**



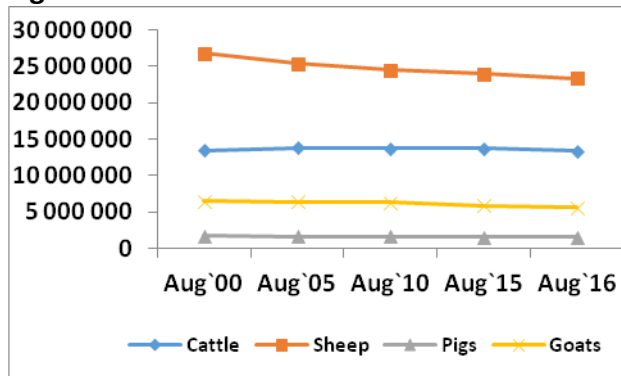
Source: DAFF

**Fig 2: Hectares: Selected commodities**



Source: DAFF

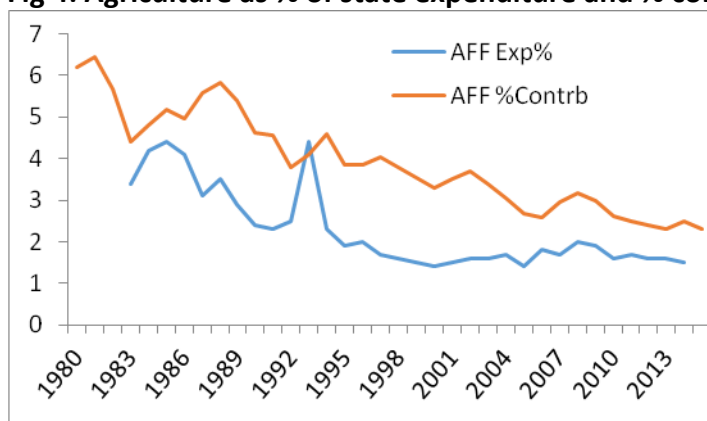
**Fig 3: Selected Livestock**



Source: DAFF

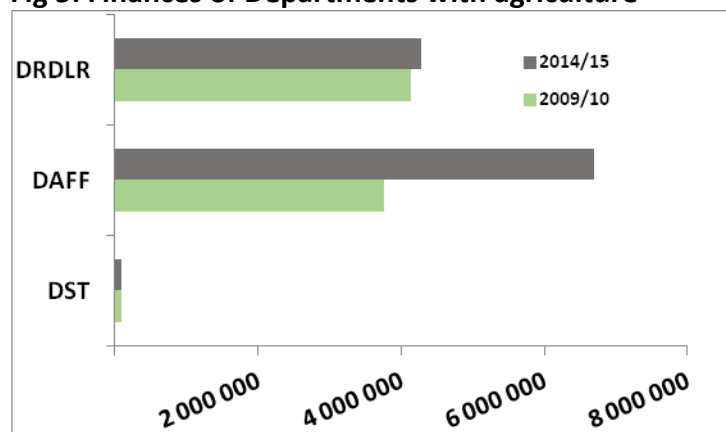
Trends from the 1980s also show a decline in the agriculture as a percentage of total expenditure by the state, as well as the contribution of agriculture to total national GDP has declined over the same period. This is disturbing as these dwindling numbers represent less employment, threat to food security and low rural development.

**Fig 4: Agriculture as % of state expenditure and % contribution to GDP**



Source of data: AFF % Expenditure – SARB; AFF % Contribution - DAFF

**Fig 5: Finances of Departments with agriculture**



Source: Departmental Annual Reports

**Fig 6: Agriculture research expenditure, 2000 and 2007**

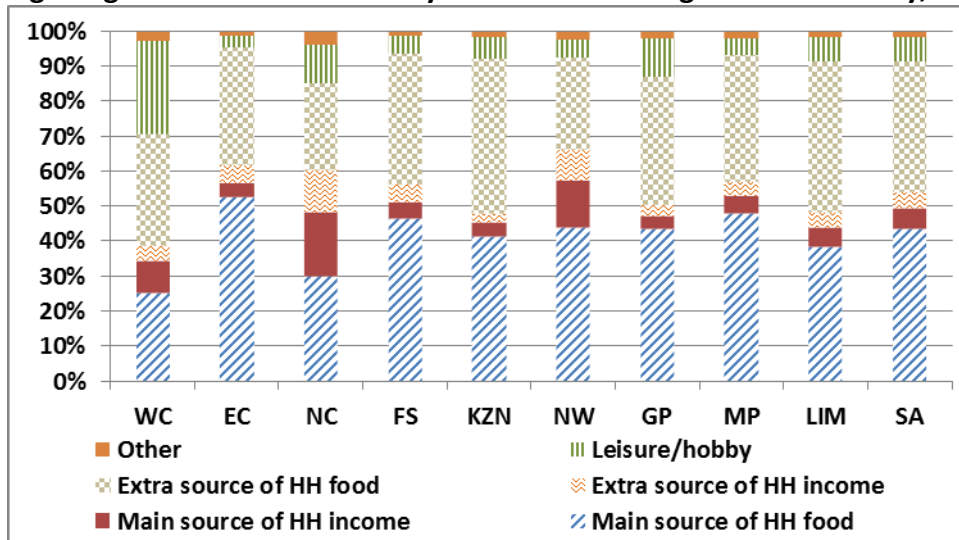
Organisation	R million		Contribution %	
	2000	2007	2000	2007
Agricultural Research Council (ARC)	391,6	695,6	66,8%	49,9%
Higher Education	96,1	159,8	16,4%	11,5%
Other public institutions (WRC, CSIR etc.)	43,2	208,7	7,4%	15,0%
Private (profit and non-profit)	55,3	329,5	9,4%	23,6%
<b>Total</b>	<b>586,2</b>	<b>1393,6</b>	<b>100%</b>	<b>100%</b>

Source: DAFF, APAP 2015-19

## Agriculture at household level

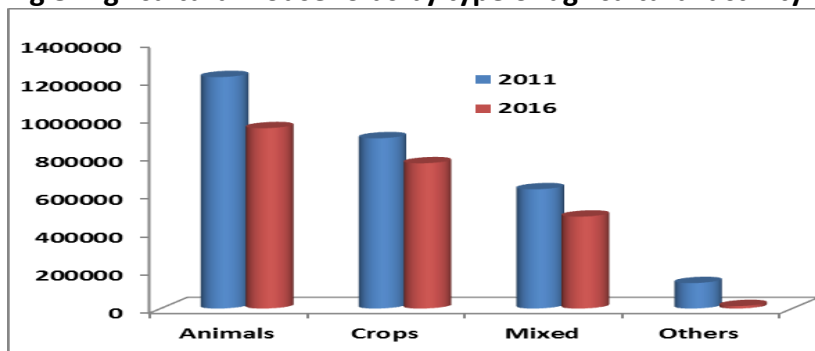
Agriculture is a huge part of rural South Africa, while it also contributes to peri-urban and urban households. Eastern Cape, Limpopo, KwaZulu-Natal, Mpumalanga and Free State respectively rank high in terms of percentage of households engaged in agriculture (Stats SA, Community Survey 2016-Agricultural Households, 2016). Furthermore, Stats SA points out that between 2011 and 2016, the number of households engaged in agriculture declined by approximately 19% due to drought in 2014/15 season. Agricultural activity, as highlighted in Fig 7, is engaged as the main and extra source of household food, with livestock rearing ranking high as the main type of activity, followed by crops (Fig 8).

**Fig 7: Agricultural households by main reason for agricultural activity, 2016**



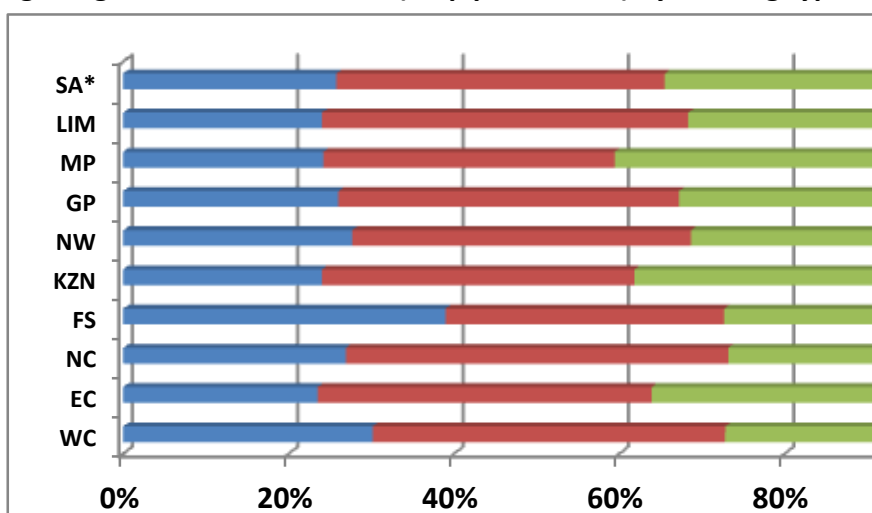
Source: Stats SA, Community Survey 2016 – Agricultural Household

**Fig 8: Agricultural households by type of agricultural activity**



Source: Stats SA, Community Survey 2016 – Agricultural Household

**Fig 9: Agricultural households (crop production) by farming type, 2016**



Source: Stats SA, Community Survey 2016 – Agricultural Household

## Review

Agriculture is concerned with issues of food security, land use and poverty reduction, with activities related to production, processing, promotion and distribution of agricultural products in the economy. In a report by ARC (Annual Report, 2014/15), it is asserted that success in agriculture for the country lies in the effective application of innovations from the laboratories by scientists and interactive exchanges with farmers (commercial and smallholder producers), with targeted focus on smallholder and resource poor enterprises. This mandate the ARC has duly carried out and has disseminated a wide range of scientific solutions, information and technology to the agricultural sector to respond to different challenges in year 2014/15.

Tiffin and Irz (2006) find that growth in agricultural productivity is important to economic growth and development, as it results in increased surplus of food, labour, raw materials, capital, and foreign exchange, while simultaneously generating demand for industrial goods and services.

Referred studies in the Draft Climate Change Adaption and Mitigation Plan for the SA Agriculture and Forestry Sectors (2015) indicate that hot days are significantly increasing, while lower temperature days are declining. Furthermore, data on rainfall as well as data on runoff show a decreasing trend. In addition, production and yield levels are found to be negatively affected by declining rainfall, while forestry sector has seen increased frequencies in forest fires, pests and diseases that affect all forestry beneficiaries.

In their study on the US economy, Mendelsohn *et al* (1994) find that climate change produces complicated effects on agriculture, the effects being different per season and also nonlinear. Their study concludes that global warming is harmful when using a narrow definition of crops<sup>1</sup>, while slightly beneficial (citrus belt, corn and wheat) when using an inclusive definition of crops<sup>2</sup> for the US agriculture.

## Strategic points in agriculture

Agriculture is the lifeblood for developing economies such as South Africa, specifically for the majority of the poverty-stricken rural areas. A well-functioning agricultural sector not only bode well for food security, but it also contributes to better rural incomes, reduced inequality and better living standards for the majority of the population. In this paper, the strategic points in agriculture talk to land, water, plant breeding, animal feeds, energy, production systems, processing and marketing and planning for sustainable agriculture should focus on these aspects.

### Land

Composition of land use in South Africa indicates about 81% being used for agriculture and subsistence livelihoods, with approximately 69% of this agriculture land used for grazing, while 11%

---

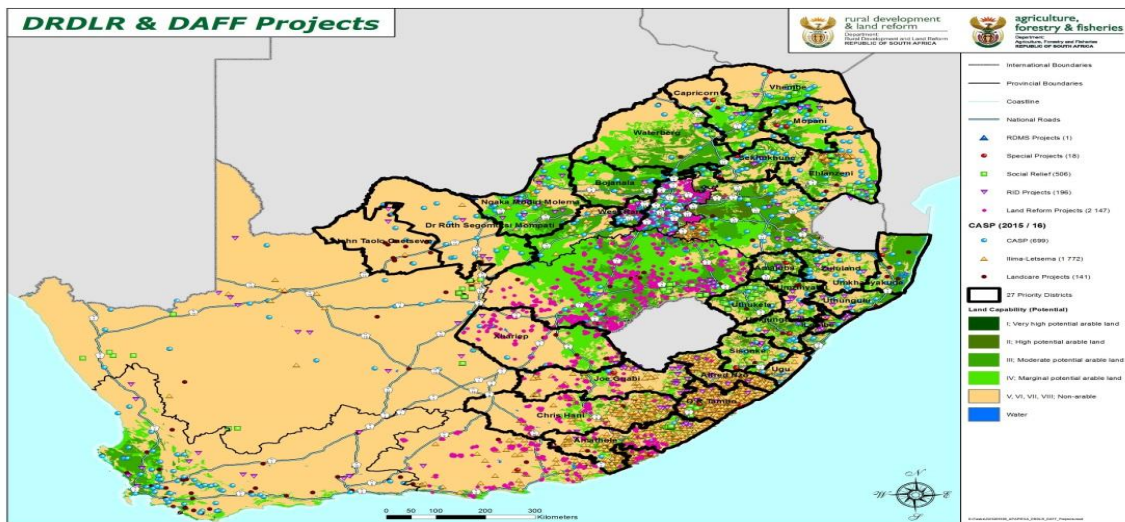
<sup>1</sup> A first set of regressions uses the cropland weights, in which observations are weighted by the percentage of each county in cropland. Counties with a large fraction of cropland should provide a better reading on price determination because other influences, such as cities or forests, are minimized;

<sup>2</sup> A second set of regressions uses crop-revenue weights; that is, observations are weighted by the aggregate value of crop revenue in each county. This second weighting scheme emphasizes those counties that are most important to total agricultural production

is arable potential. Forestry comprises less than 2% of the land and approximately 12% reserved for conservation purposes.

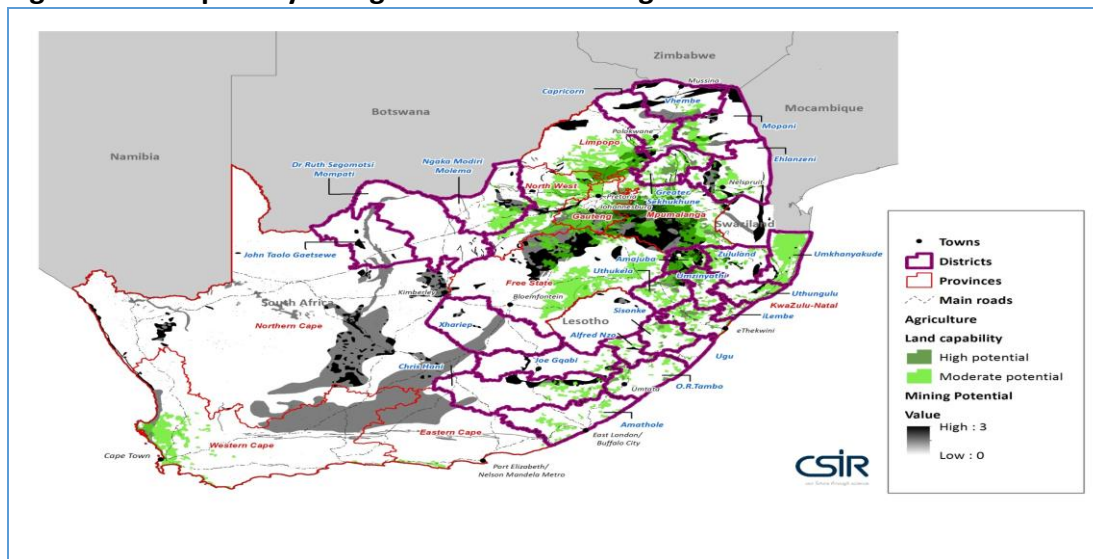
Using spatial mapping, the current land conditions should be compared to conditions several decades back to identify land degradation levels that speak to land capacity and capability for crop and livestock production. As the de facto land administrator, DRDLR is well-placed to ensure that good land is bought by the state and the production support (inputs and infrastructure) is provided to improve production levels in the country. This will ensure that the allocation of land is informed by land capability and soil potential for targeted commodities. The graph below shows land capacity as identified by the DRDLR/DAFF team as recent as 2014/15.

**Fig 10: Land capabilities in SA**



Source: DRDLR/DAFF

**Fig 11: Land capability for agriculture and mining**



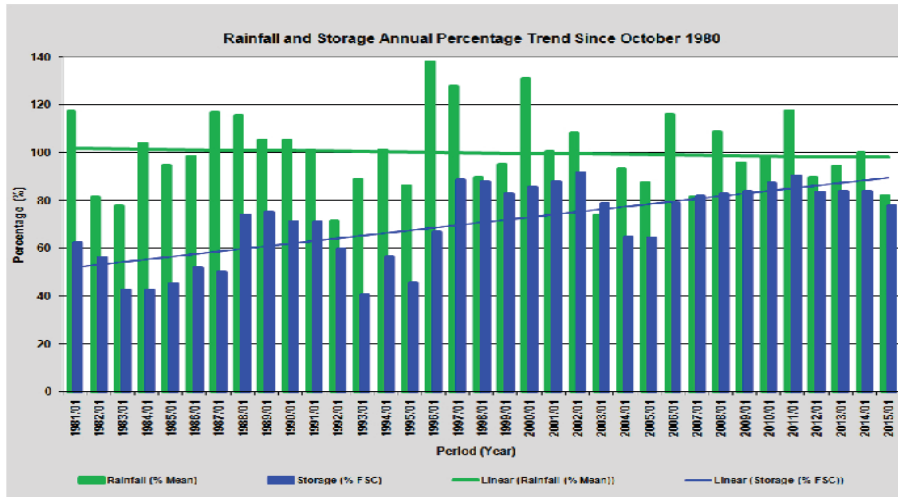
Source: CSIR

## Water



Climate change impact on rain patterns has been felt in the country, with 2014/15 being one of the driest seasons for agriculture. Shortage of water is one of the factors that constrain agricultural production. South Africa has an uneven rainfall distribution, with humid, subtropical conditions occurring in the east and dry desert conditions in the west, with about 50% of South Africa's water used for agricultural purposes (DEA, 2017). In addition, the Lesotho Highlands Water Scheme continues to play an important role as South Africa has been importing water since the 1990's, a vital source of water for the Gauteng province.

**Fig 12: Annual rainfall and storage**

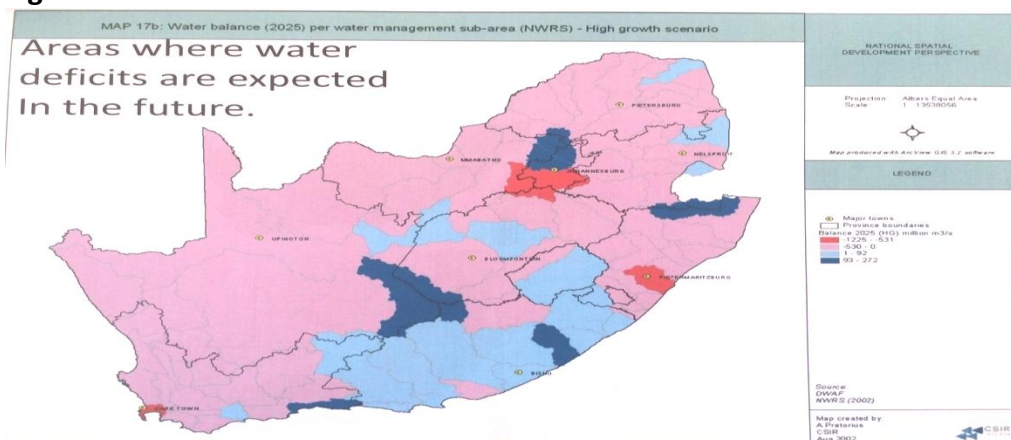


Source: DWS

One of the desired outcomes of Agri-parks (DRDLR, 2017) involves expanding land under irrigation. The current situation in the country as regarding water availability is dire, with dams and river levels at a low, although Gauteng has received good rains in the in the past 12 months. Water harvesting in the country has improved, as the graph above indicates an increased storage of rainfall water.

Below is a map that captures water balances by 2025, which shows a grim situation that will affect agriculture production if proper planning is not done.

**Fig 13: Water Balance**



Source: CSIR

## Plant and animal breeds

Plant and livestock breeding is one aspect in agriculture that needs to continuously evolve in relation to sustainability in the sector. Pest and diseases, drought, high temperatures and soil degradation and fertiliser needs are constant threats to sustained production levels and potential yields, while changes in rainfall and temperature as well as pest and diseases pose a constant threat to animal production.

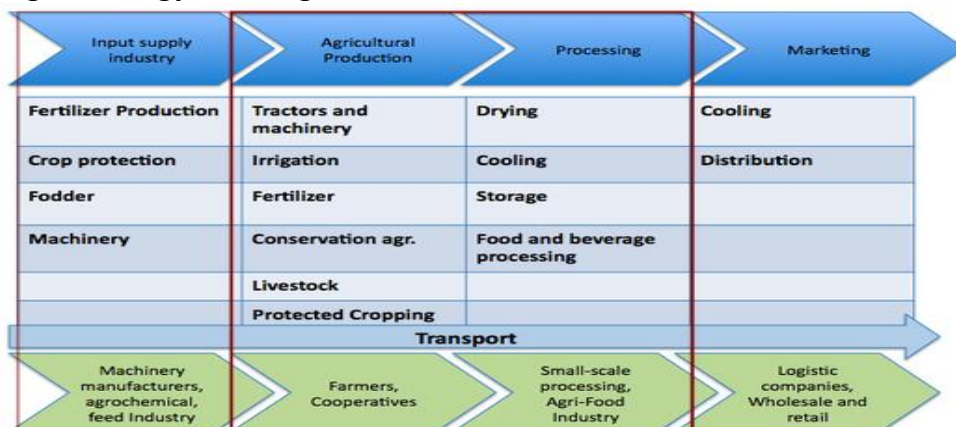
## Animal feeds

Animal feeds are a major factor in the daily performance in the sector. Feeds costs have been observed to escalate in the seasons when lower rainfall and high temperatures have been recorded, due to the impact of climate change on crops that are highly dependent on climatic conditions. These costs affect production costs for livestock producers, affecting their contribution to sector income and employment.

## Energy

Sustainable and successful agricultural sector depends highly on the efficiently available and supply of energy. Sources of energy and the resulting costs associated with the types of energy determine efforts to pursue agricultural activities. Below, the graph shows energy demands in the sector, which indicates the importance of an efficient, sustainable power supply for the effective sector.

**Fig 14: Energy in the Agriculture Value Chain**



Source: DAFF

## Production Systems

Understanding and taking advantage of production systems for different agricultural products form a major obligation for sustainability in the sector. There are livestock (e.g. goats) and crop products that have developed strong resistance to adverse climatic conditions and moving forward, these should form the basis in new policy directive, more so in addressing rural food security and income generation.

## Processing

Activities within processing are important within value chains for some agricultural products. Post-harvest losses are a major threat to food security, with Africa Post Harvest Loss Index (2014) putting these losses at about 10-40% across the sector. In the wake of climate change, these losses may increase, and sustainability within processing requires better activities in indigenous knowledge

(drying, salting, crushing, pre-cooking) or modern technology based methods (extraction, canning, bottling, concentration) to reverse losses (DAFF.gov.za/Agro-processing Support, 2017).

## Policy Planning and Funding

DAFF is mandated with ensuring an efficient and effective agriculture sector, assisted by state owned entities in ARC, Land Bank, NAMC, OBP, PPECB and SA Veterinary Council. The National Development Plan (NDP) by the Presidency puts agriculture at the driving seat of its “2030 Vision” of an inclusive rural economy. In response, DAFF tabled before the Cabinet an Agricultural Policy Action Plan (APAP) to align to the NDP, New Growth Path (NGP) and the Medium Term Strategic Framework (MTSF). In order to live up to the expectations, planning in the mid to long term must embrace the potential negative effects of climate change.

Efforts in good planning resulted in consultative meetings with stakeholders in the sector. Ultimately, APAP, which was cabinet-approved in 2015, resulted in DAFF collaborating with Department of Rural Development and Land Reform (DRDLR) for its implementation in order to eliminate duplications regarding public resources to be employed by the two departments. Having identified the constraints, challenges and gaps that inhibit growth in agriculture sector, APAP maps out the potential in the sector through sectoral and transversal interventions. This synergy between the two departments has further birthed Operation Phakisa and Agri-parks<sup>3</sup>.

The APAP implementation planning includes developing commodity value chain mapping that will identify what must be grown where and how and where it can be distributed. The collaborating team between the two has produced some of the most up-to-date and relevant spatial products for development and advancement of rural spaces and agriculture production. The results of the collaboration, though evident, are temporary in relation to the jobs created. Furthermore, Revitalization of the Agriculture and Agro-processing Value Chain (RVAAC) emerged as a tool for implementation, expanding on the high impact indicators to speed progress. These indicators are fast tracking land reform, market access (Agri-Parks, trade development, SIP11), producer support and production.

Furthermore, the Agrarian Transformation System, birthed from the Green Paper on Land Reform of 2011, mandates the DRDLR to provide Economic Infrastructure<sup>4,5</sup> relevant to cropping and livestock as a measure for rural develop and land reform (DRDLR Strategic Plan, 2015-2020).

## Sustainable Agriculture

Sustainability is centred on three pillars which are social, environmental and economic aspects (thwink.org, 2017). According to the Food and Agriculture Organisation (FAO.org, 2017) climate smart agriculture (CSA) involves activities that transform and reorient agricultural systems to

---

<sup>3</sup> An Agri-park is a networked innovation system of agro-production, processing, logistics, marketing, training and extension services, located in a District Municipality (each District in South Africa will have an Agri-park)

<sup>4</sup> Processing Plants • Small Industries • Abattoirs, Animal Handling, Facilities, Feed-lots, Mechanising, Stock Water Dams, Dip Tanks, Silos, Windmills, Fencing, Harvesters, etc.

<sup>5</sup> Agri-parks, Fencing, Extension Support, Inputs: Seeds, Fertiliser, Pesticides, etc., Fresh Produce Markets, Credit Facilities

support the evolvement of agriculture in the face of climate change. These activities are concerned with maintaining or increasing agricultural productivity and incomes, adapting to systems that are resilient to climate change and eliminating greenhouse gases where possible. The ability to identify agricultural strategies suitable to local conditions as deemed by both local and international stakeholders is the cornerstone of CSA.

## **Planning**

In acknowledging the need to gear agriculture towards sustainability, APAP, in response to the NDP mandate identifies activities promoting CSA with systems on organic agriculture, agro-ecology and conservation agriculture. Clear CSA aspirations include the development of CSA framework, the up-scaling of the CSA concept and practices throughout the country, the provision of incentives for CSA practices (special focus on smallholder farmers) and to produce more with the same amount of water by using more efficient irrigation methods & water demand management. Also, APAP brings out policy levers for better Land-Care programme and irrigation strategy for effective land and water use. In addition, policy levers needed towards adopting CSA include a comprehensive collaboration between national, provincial, local authorities, relevant departmental agencies and academic institutions.

Furthermore, the RVAAC document asserts as an objective the aim to address risks from climate change through adoption of CSA by improving land and water use. Agriculture, Forestry and Fisheries/Aquaculture Research Forums (with term of reference) have been established, prioritising important processes towards the development of R&D model. Similarly, several Sector Research Plans have been approved through the Sector Innovation Funds (DST) and these are meant to play a crucial role in sustainability. Several service level agreements between ARC (DAFF) and NRF (DST) are in place and these specifically address issues of climate change.

In relation to climate matters for APAP, the Poultry Value Chain planning targets incentivising R&D to produce better yielding and resistant soybean and yellow maize seed varieties. The Red Meat Value Chain targets new livestock breeds and better pesticides. Planning in the Wheat Value Chain targets a combination of R&D in new cultivars and the adaptation of conservation agriculture technologies to produce cultivars resistant to climatic changes. Planning for CSA in APAP (2015-19) has identified the need to enhance adaptive capacity towards climate change for vulnerable communities. In addition, increased funding is identified as crucial in response for increased food security, food price crisis as well as climate-resilient development that is farmer driven, focusing on farmers, women and youth.

Inclusive in the planning is the establishment of a Strategic Framework that will outline incentive programmes for producers to adopt best practices and strategies on CSA, as well as a Framework to monitor the extend of adoption of CSA technologies.

Collaboration between SA and some African counterparts has resulted in the development of a new, drought tolerant maize cultivar that has been distributed to small-scale farmers in the year 2014/15 (ARC Annual Report, 2014/15). In addition, two wheat cultivars and six apple cultivars have been developed as part of breeding program to address the impact of climate change. ARC has further engaged in the research and development towards pests and diseases that affect crop and livestock.

The National Plan for Conservation and Sustainable Use of Farm Animal Genetic Resources (DAFF, 2015/16) with its objectives, lists its strategic priorities as being 1) Characterisation and inventory 2)

Sustainable use and development 3) Conservation and 4) Policies, legislation, institutions and capacity building in relation to farm animal genetic resources. The plan is for a period of 5 years and will be funded between public and private institutions.

## **Funding**

Public funding is a challenge due to limited financial resources in government. ARC, as one of the key agencies of DAFF in terms of research, has over the years stipulated the financial challenges that accompany the state mandate, (ARC, 2014/15). Therefore, there is a need for generating evidence for interventions, financing climate change interventions and creating an enabling environment, in directing and supporting interventions and the constraints to agricultural productivity and food security due to climate change. Funding in relation to interventions on climate change are not clear in the departments, however, research components for ARC and NRF indicate an effort in addressing climate issues in relation to animal breeds, plant cultivars,

### **Experiences from other countries**

## **Conclusion and Recommendations**

There is a need to understand sustainability in different contexts of the farming systems, sizes and outputs in order to develop sector interventions and policy levers that will support specific, identified sustainability definitions. The National Development Plan has highlighted the importance of the sector as a key driver for development, and this has allowed a considerable planning for sustainability within the sector. Increasing land under irrigation is one objective to develop the sector, however, recent events due to climate change has shown scarce rainfall in between prolonged drought periods.

Early warning systems are key in disseminating information to assist decision makers in the wake of these changes. However, projections of reliable climate change data require complex and sophisticated models (SAWS-CCRA, 2017) which may be costly for a developing country such as SA. This data as sourced by the South African Weather Services (SAWS-CCRA, 2017), indicates a rise in hot days for summer and fewer cold winter days, while rainfall incidences are slowing down in some parts of the country. Understanding how to interpret and analyse the information produced is critical in ensuring the correct decision are taken through planning and funding the interventions.

In addition, agriculture contributes to national GHG levels, and studies in the US have found a correlation between high carbon dioxide levels and weeds (some toxic) and these may be a threat to ecosystems, having the potential to choke growth of new trees in forests (National Geographic News, 2006). Studies to investigate the relationship between the increased carbon dioxide emissions and the spread of these weeds in the country are crucial, as the plant is harmful to both plants and humans.

Trends on agricultural households indicate the need to develop mitigation and adaptation interventions for climate change that can also be owned at household's level. The percentage of crops dependent on rain is large for households, and if uncertainty around the climate change continues, interventions may not capture the gist of potential damage and the impact may be devastating on food security and income generation at this level.

One of the important activities by state will be to speed up the process of completing the survey on the state of soil in the country, as this will assist in identifying interventions and funding where there is need.

## References

Mendelsohn, R., Nordhaus, W.D. and Shaw, D., 1994, 'The Impact of global warming on agriculture: a Ricardian analysis', *The American Economic Review*, 84 (4), 753-771

Tiffin, R. and Irz, X, 2006, 'Is agriculture the engine of growth?', *Agricultural Economics*, 35, 79-89

Department of Agriculture, Forestry and Fisheries, 2015, *Agricultural Policy Action Plan 2015–2019*, Pretoria

Agricultural Research Council, 2015, *Annual Report 2014-15*, Pretoria

Government Gazette, 2015, *Draft Climate Change Adaptation and Mitigation Plan for the South African Agricultural and Forestry Sectors*, Notice 500, No. 38851, 3 JUNE 2015, from [http://www.gov.za/sites/www.gov.za/files/38851\\_gen500.pdf](http://www.gov.za/sites/www.gov.za/files/38851_gen500.pdf)

Department of Agriculture, Forestry and Fisheries, Agro-processing support, viewed on 25 May 2017, from <http://www.daff.gov.za/daffweb3/Branches/Economic-Development-Trade-Marketing/Agro-processing-support>

South African Weather Services, *Climate Change Reference Atlas*, 2017, from [http://www.weathersa.co.za/images/SAWS\\_CC\\_REFERENCE\\_ATLAS\\_PAGES.pdf](http://www.weathersa.co.za/images/SAWS_CC_REFERENCE_ATLAS_PAGES.pdf)

Brian Handwerk, 2006, 'Poison Ivy Itchier, More Plentiful With Warming, Study Says', *National Geographic News*, viewed 29 May 2017, from <http://news.nationalgeographic.com/news/2006/05/060530-warming.html>

Department of Agriculture, Forestry and Fisheries, 2016, 'National Plan for Conservation and Sustainable use of Farm Animal Genetic Resources', *Strategic Output 2015-2016*,

Food And Agriculture Organisation of the United Nations, Climate Change, viewed 17 May 2017, from <http://www.fao.org/climate-change/en/>

<http://www.thwink.org/sustain/glossary/ThreePillarsOfSustainability.htm>

## **Abbreviations**

AFF – Agriculture, Forestry and Fisheries

APAP - Agricultural Policy Action Plan

ARC – Agricultural Research Council

CSA - Climate smart agriculture

CSIR – Council for Scientific and Industrial Research

DAFF - Department of Agriculture, Forestry and Fisheries

DEA – Department of Environmental Affairs

DRDLR – Department of Rural Development and Land Reform

DST – Department of Science and Technology

DWS – Department of Water and Sanitation

FAO - Food and Agriculture Organisation of the United Nations

GDP – Gross Domestic Product

GHG – Green House Gases

MTSF - Medium Term Strategic Framework

NAMC – National Agricultural Marketing Council

NGP - New Growth Path

NRF – National Research Foundation

OBP – Onderstepoort Biological Products

PPECB - Perishable Products Export Control Board

SARB – South African Reserve Bank

SAWS: CCRA - South African Weather Services Climate Change Reference Atlas

Stats SA – Statistics South Africa

US – United States of America

WRC – Water Research Commission





TIPS is a research organisation that facilitates policy development and dialogue across three focus areas: trade and industrial policy; inequality and economic inclusion; and sustainable growth. The Annual Forum is platform for researchers, policymakers and other stakeholders to present research and engage in dialogue on policy-relevant issues. The Forums have overarching themes and have been running since 1997.

For details of past Forums and copies of research presented go to Forum Papers

info@tips.org.za +27 12 433 9340 [www.tips.org.za](http://www.tips.org.za)



For more TIPS Policy Briefs go to [www.tips.org.za](http://www.tips.org.za)

info@tips.org.za

+27 12 433 9340

[www.tips.org.za](http://www.tips.org.za)