Agricultural Research Council

"Transforming Africa's Agriculture: harnessing opportunities for inclusive growth and sustainable development"

ANNUAL REPORT
2014/15

ARC • LNR
Excellence in Agricultural Research and Development

About the ARC

Vision

Excellence in Agricultural Research and Development

Mission

The Agricultural Research Council is a premier science institution that conducts research with partners, develops human capital and fosters innovation in support of the agricultural sector.

The organisational values of the ARC

Truth: Incorporates honesty and integrity. The ARC shall conduct its business in a transparent and ethical way towards its employees, stakeholders and shareholder;

Accountability: Incorporates responsibility. The ARC shall accept responsibility and accountability with respect to employee well-being, occupational health and safety (OHS), environmental sustainability, and agriculture;

Respect: Includes equity, diversity and dignity. The ARC shall conduct its business with respect for our colleagues, clients and stakeholders;

Growth: Includes equity, rewards and recognition. The ARC shall ensure equity in terms of race, gender, creed, fair treatment, training and development to all its employees, stakeholders and shareholder;

Excellence: Incorporates empowerment and innovation. The ARC strives to conduct research and development (R&D) in an efficient, effective, professional and accountable manner; and

Trust: Includes ethics and transparency. The ARC shall ensure and foster trust among its employees, stakeholders and shareholder.

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Agricultural Research Council

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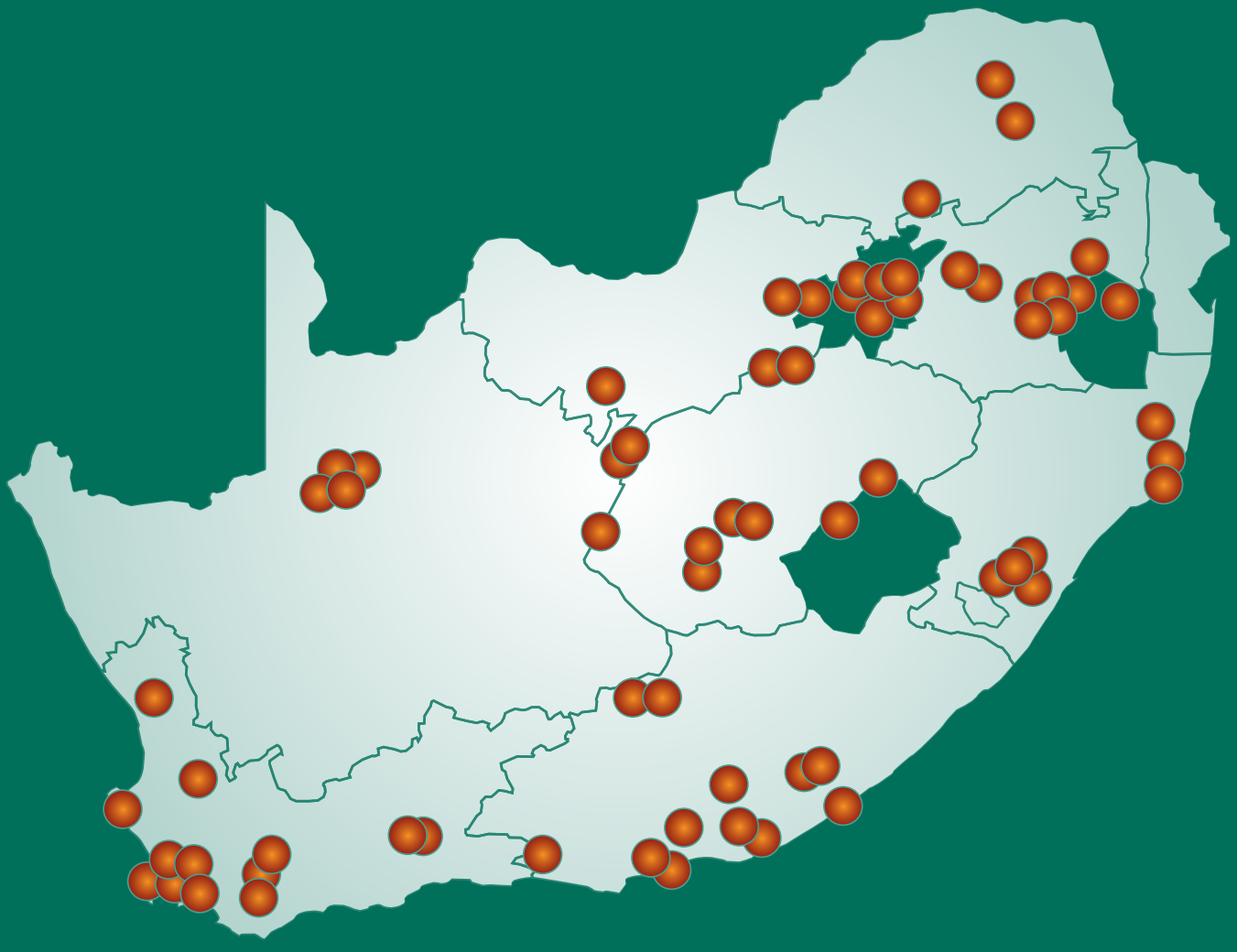
Agricultural Research Council Research Facilities



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The Agricultural Research Council Leadership

The Agricultural Research Council is led at the top by a Board of 17 capable and competent members who oversee governance and performance of the organisation. Underneath the Board is the Executive Management led by the Chief Executive Officer. The Executive Management is responsible for the overall running and management of the Agricultural Research Council including but not limited, and in consultation with the ARC Council, to crafting the strategic direction to deliver on the mandate of the organisation as derived from the Agricultural Research Act, 1990 (Act no. 86 of 1990, as amended by Act 27 of 2001).

ARC 2014/15 Board Members

Prof Sibusiso Nkomo

(Gauteng) PhD (Economics and Policy Analysis/Public Sector/Political Economy); Research Prof – Centre for the Advancement of Scholarships at University of Pretoria; Serves on various Public Sector Boards and Chairperson of Mapungubwe Institute for Strategic Reflection

Ms Dudu Msomi

(Gauteng) MBA Chairperson: Finance & Investment Committee; CEO: Busara Leadership Partners; Independent Non-Executive, Financial Services Board; Independent Non-Executive, National Housing Finance Corporation; Trustee, Humulani Trust (Invicta Holdings); Trustee, University of Limpopo Trust

Prof Frans Swanepoel

(Free State) PhD (Animal Science); Professor: Centre for Sustainable Agriculture; Director: Research Development

Prof Michael Kahn

(Western Cape) PhD (Mathematical Physics); MA (Policy); Management Consultant; and Professor Extraordinaire, Stellenbosch University

Dr Joyce Chitja

(KwaZulu-Natal) PhD (Food Security); Lecturer: Food Security, University of KwaZulu-Natal

Mr Clive Kneale

(Gauteng) Fellow of the Chartered Institute of Secretaries and Administrators (International); Fellowof the Southern African Institute of Chartered Secretaries and Administrators; Company Secretary

Dr Wilna Jansen Van Rijssen

(Gauteng) PhD, Pr. Nat Sci M.Sc (Applied Toxicology, Plant Biochemistry, Masters in Public Administration); Honours in Pharmacology; Consultant to Government

Distinguished Prof Louw Hoffman

(Western Cape) PhD (Meat Science); Professor Meat Science DST/NRF South African Research; Chair in Meat Science: Genomics to nutriomics, Department of Animal Sciences, Faculty of AgriSciences University of Stellenbosch

Mr Mzolisi Dyasi
(Eastern Cape) Diploma in Business Administration; Red Meat Farmer

Ms Dora Ndaba
(Gauteng) BTech Transport Logistics; Business Person

Mr Allan Bishop
(Western Cape) B.Com (Hons), B.Compt (Hons) (CTA); Independent Business Consultant

Mr Gerard Martin
(Western Cape) B.Sc; Business Management (Master); Executive Manager, Winetech

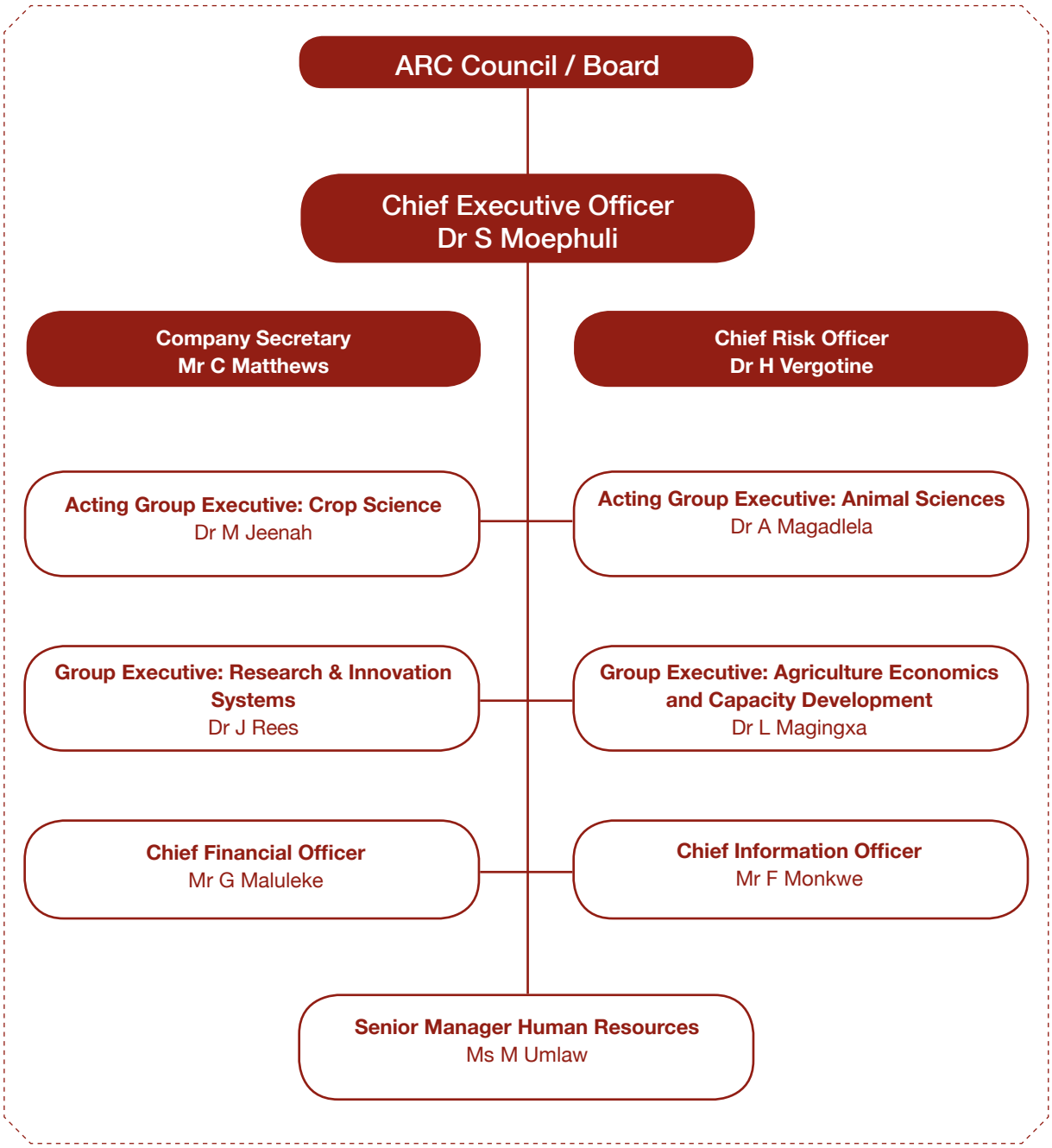
Ms Joyce Mashiteng
(Gauteng) B.Sc (Master); Environmental Management Programme Manager: Nuclear Sites, ESKOM

Mr Ismail Motala
(Western Cape) Farmer

Mr Rowan Nicholls
(Western Cape) B.Com CA (SA); Business Person; Registered Accountant and Auditor

Dr Shadrack Moephuli
(Gauteng) PhD
ARC President and CEO

Mr Jonathan Godden
Former Chairperson of ARC Board
Term ended 31 August 2014


ARC Council / Board
Chief Executive Officer
Dr S Moephuli
Company Secretary
Mr C Matthews
Chief Risk Officer
Dr H Vergotine
Acting Group Executive: Crop Science
Dr M Jeenah
Acting Group Executive: Animal Sciences
Dr A Magadlela
Group Executive: Research & Innovation Systems
Dr J Rees
Group Executive: Agriculture Economics and Capacity Development
Dr L Magingxa
Chief Financial Officer
Mr G Maluleke
Chief Information Officer
Mr F Monkwe
Senior Manager Human Resources
Ms M Umlaw

Chairperson's Overview

> *The Council is satisfied with the performance of the ARC against its objectives and targets*

Prof Sibusiso Vil-Nkomo
Chairperson of the ARC Board

On behalf of the Governing Council of the Agricultural Research Council (ARC), it gives me great pleasure to endorse the ARC Annual Report for the financial year 2014/2015. I further extent my appreciation as Chair of Council, to the Chief Executive Officer, his Executive Management Team, Senior Management throughout the organisation and all the staff of the Agricultural Research Council, for a job well done.

This year has been a busy and demanding year for the Agricultural Research Council, with challenges arising from operational matters striving to meet the objectives that were set in the previous year.

With the Council reporting to the Minister of Agriculture, Forestry and Fisheries the change of the political leadership from Minister Joematt-Pettersson and Deputy Minister Mulder to the Honourable Minister: Mr. Senzeni Zokwana and General Cele as the Deputy Minister, in the last year, has necessitated that the Council should seek direction on a number of strategic objectives. This led to the ARC reviewing its 3 year strategic plan to a 5 year strategic plan to be aligned to the requirements of the new administration.

At the beginning of the year Mr Jonathan Godden resigned from the Council having served almost two terms as Chairperson, Mr Godden brought considerable expertise and leadership to the Council.

Following Mr Godden's departure, I was appointment as Chairperson of Council and Professor Kahn as Deputy Chairperson. We extend our appreciation for the good work done by Mr Godden. The current Council took office in September 2013 and our term will be ending in 2016, which leaves the Council with less than 18 months as Council of the ARC.

The ARC strategic goals were revised and aligned to the National outcomes and relevant sectoral policy frameworks with a focus on the statutory mandate. The strategic plan focused on the five strategic goals that were crafted to enable the Agricultural Research Council to effectively focus and prioritise its options in delivering on its mandate.

The Council is satisfied with the performance of the ARC against its objectives and targets, which was further enhanced with the ARC receiving an unqualified audit opinion for the 8th consecutive financial year. This is an achievement that continues to inspire confidence and pride within the organisation. We also acknowledge that there are areas of improvement which have been highlighted by the Auditor General. I am confident that the organisation is geared to address those challenges through the implementation of the new Enterprise Resource Planning (ERP) system.

The ARC Council established a Technical Review Committee (TRC) that comprised of Council members to oversee and guide the process for the ARC Institutional Review covering the period 2007 to 2014. The TRC appointed a Review Committee (RC), following international good practice of an internally managed external review process. The TRC also appointed a team of Strategic Advisors for the review process. Primarily, the Review ascertained that the ARC continues to meet its mandate, mission and objectives as outlined in the Agriculture Research Act, 1990. The Review also ascertained that for the review period, the ARC has stabilised and strengthened its governance and executive management functions as compared to 2006/7. The organisation has made exponential progress in human capital capacity building, since the previous review, and the approach is both structurally and strategically commendable. The ARC has now established a track record of assisting and developing smallholder agriculture farmers, which is seen as an important contribution to advancing agriculture and food security in our country

On the international front there has been visible progress. Collaborations and linkages have been established with different sectors in the African continent, Europe, South America and other parts of the world. We are aware that to internationalise is an expensive endeavour during times of a global economic crises. The ARC is encouraged to pursue global relations to their final conclusion even under the economic considerations referred to.

In conclusion, I would like to thank my Council members and members of the Audit and Risk Committee for the commitment and support that they have afforded the ARC during the year and for the wise counsel that they continue to provide me.

Prof Sibusiso Vil-Nkomo
Chairperson of the ARC Council

ARC 2014/15 Executive Management

Dr Jasper Rees
Group Executive: Research Innovation and Systems
PhD

Dr Mohammed Jeenah
Acting Group Executive: Crop Sciences
PhD

Dr Litha Magingxa
Group Executive: Agricultural Economics and Capacity Development
PhD

Mr Frans Monkwe
Chief Information Officer
B.Com and MBA

Dr Andrew Magadlela
Acting Group Executive: Animal Sciences
PhD

Mr Gabriel Maluleke
Chief Financial Officer
B.Compt (Hons) and CA (SA)

Dr Shadrack Moephuli
ARC President and Chief Executive Officer
PhD

Ms Makgomo Umlaw
Senior Manager: Human Resources
B.Com (Hons) and MBA

Chief Executive Officer's Introduction

... a farmer who participated in this project successfully sold 20 tonnes of sweet potato at R3000/ton.

Dr Shadrack Moephuli
President and CEO of ARC

MESSAGE FROM THE PRESIDENT AND CEO OF ARC

On behalf of the employees and Council of the Agricultural Research Council (ARC), we hereby submit to Parliament, through the Executive Authority, the Minister of Agriculture, Forestry and Fisheries (DAFF): Hon. Mr. Senzeni Zokwana, this annual report, associated performance information, and the audited financial statements of the organization for the financial year ending 31 March 2015.

The ARC has delivered its outputs in the said financial year in accordance with the stipulated mandate as per the Agricultural Research Act, 1990 (Act no. 86 of 1990, as amended), and as required by the Public Finance Management Act, 1999 (Act no. 1 of 1999, as amended). This annual report fairly represents the work of ARC along with its partners and the government of South Africa during the reporting period.

The outputs in this annual report were in accordance with the pre-determined objectives that are contained in the Business Plan for financial year 2014/15 as approved by Council, and tabled in parliament by the Honourable Minister of Agriculture, Forestry and Fisheries: Mr. Senzeni Zokwana.

On behalf of the employees of the ARC we hereby express our gratitude for good governance and the support given to the ARC by the Honourable Minister and Council during this period. Further, management and staff hereby express their appreciation for the oversight and stewardship of the Audit and Risk Committee.

Analysis of performance for this reporting period (2014/15) indicates that the ARC succeeded in delivering on the pre–determined outputs and in many instances exceeded the set targets per strategic goal. Performance was achieved within the allocated, albeit limited resources (people, finances, equipment, infrastructure etc) available to the organization.

Disseminating Scientific Solutions for Agricultural Development

South Africa's agriculture success lies in the effective application of innovations from the laboratories by scientists and interactive exchanges with farmers (including large commercial producers), with targeted focus on smallholder and resource poor enterprises. In the year under review, the ARC has disseminated a wide range of scientific solutions, information and technology to the agricultural sector to respond to different challenges.

Income generation among small enterprises is an important mechanism towards economic growth,

poverty alleviation and sustainable agriculture development. The ARC has facilitated the establishment of economically viable enterprises in Eastern Cape, Gauteng, Limpopo, Mpumalanga, North West and Kwazulu – Natal provinces. These small enterprises focus on production and marketing of quality African leafy vegetables, sweet potatoes and medicinal plants. Projects included training on production of propagation material (establishment of nurseries), pest and disease management, marketing of seedlings, and use of disease free planting material. The impact of these projects has been income generation where a farmer who participated in this project successfully sold 20 tonnes of sweet potato at R3000/ton.

To ensure food and nutrition security it's important to ensure access to animal protein in people's diet. Accordingly, cattle are an important source of animal protein. A recent census by Statistics SA has revealed that more than 600 000 rural households own cattle as a form of wealth and source of food. To ensure food and nutrition security, as well as provide sustainable income generation opportunities, the ARC has embarked on information and technology dissemination programmes that integrate scientific research into production systems of smallholder livestock producers, popularly known as Kaonafatso ya dikgomo (KyD). Following training by ARC, to date KyD has registered more than 8300 smallholder livestock farmers on Integrated Registration Genetic Information System (INTERGIS), a national animal improvement database. Evidence suggests that participants have experienced market off–take increased by 16%. This result is a significant harvest more than 5000 from more than 33 000 head of cattle.

Other than food insecurity, malnutrition has been identified as significant threat to human growth and development as well as productivity. In particular, vitamin A deficiencies have been found to be common among poor communities and children in South Africa. In response, the ARC has disseminated more than 15 000 seedlings of orange – fleshed sweet potatoes to nurseries established in partnership with the Department of Rural Development and Land Reform (DRDLR). Further the ARC provided training on the nutritional value of orange – fleshed sweet potatoes, production practices and processing.

Climate change has been predicted to adversely impact on agriculture production. In recent years South Africa has experienced variable rainfall patterns that have also changed in spatial distribution. To enable South Africa to respond to the adverse impacts of climate change and ensure food security, the ARC has focused on the development of scientific solutions that would make agriculture resilient. During the reporting period the ARC distributed 10 000 (ten thousand) seed packs of drought tolerant maize cultivar, DroughtTEGO, to smallholder farmers for planting in various provinces. DroughtTEGO is a product of research and development through a partnership known as Water Efficient Maize for Africa (WEMA) that involved the African Agricultural Technology Foundation (AATF), International Centre for Maize and Wheat Improvement (CIMMYT), national agriculture research organizations of Kenya, Tanzania, Mozambique, Malawi, Uganda and an international seed company.

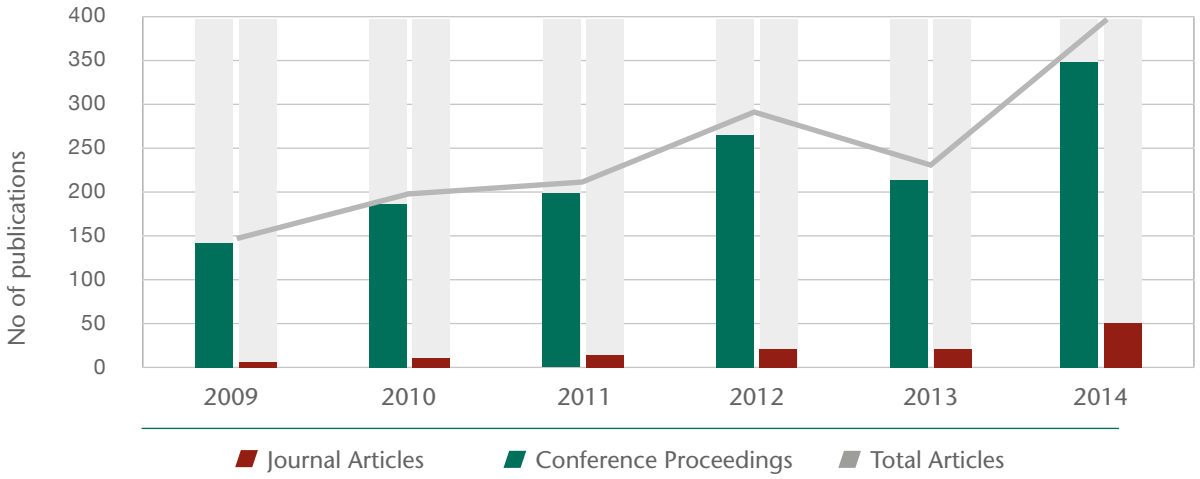
Towards Solutions for a Developing Economy: Research and Development

Research and development efforts within the ARC continue to contribute towards the scientific excellence within the country's National System of Innovation. Further, the ARC's research and development initiatives continue to contribute towards national priorities as outlined in the Medium Term Strategic Framework.

In the year under review the ARC has continued to increase its contribution to scientific knowledge base of our economy through peer reviewed publications emanating from research and development. In the last 6 years the ARC has more than doubled the number of peer reviewed scientific journal articles from 144 in 2008/2009 to 432 in 2014/2015 which is an impressive success. Further, research collaboration across the spectrum of strategic objectives has increased and diversified, as demonstrated by the greater number of peer reviewed scientific journals with external authors that exceeded targets.

When compared to prior year (2013/14), the number of peer reviewed publications in 2014/15 increased by 32% where more than 400 journal articles were produced. This includes the increased number of publications with ISI rating (impact factor) higher than 2.0 suggesting improved quality of science and publications. These outcomes are particularly

Journal Articles



significant as they form the basis of technology development, information dissemination and possible development of new innovations; which in turn, indicates the ARC's excellence in research and development.

Climate change is a serious threat to South Africa's primary objective of food security, sustainable agricultural production, rural development and economic growth. The adverse impacts of climate change have often been experienced through decreased agricultural production and productivity, with severe consequences on food security and people's livelihoods. To enable the agriculture sector to respond with practical solutions towards climate change, the ARC has been engaged in a range of scientific research and development initiatives, including learning about experiences and solutions from other countries. To this extent, the ARC has a number of breeding programmes, such as low chill apples, which can grow in new areas at different temperatures, and the development of maize cultivars capable of growing in low nitrogen soils. To date the ARC has successfully developed at least six cultivars of low chill apples that have been granted Plant Breeders' Rights (PBR) and will be disseminated into production areas during 2015 and beyond. Research and development of the low nitrogen maize hybrids uses conventional breeding and genetic modification to develop cultivars that require less fertilizer; which in turn, could contribute significantly to mitigating climate change.

Food and nutrition security is an essential element of a peaceful, developmental society that depends on ensuring increased agricultural production. In the year under review the ARC successfully developed and released two varieties of wheat. These varieties are important as they comprise a number of characteristics: high yields, good baking and milling qualities, which contribute to profitability of wheat production. In addition, increased wheat production contributes to national food security and reduces imports that in turn facilitate the balance of trade consequently leading to job creation in agriculture.

Pests and diseases if left unattended could devastate agricultural production and threaten national and household food security. In the year under review, the ARC continued to conduct research and development towards solutions that could mitigate the impacts of pests and diseases in crops and animal production systems. Examples of this included Lumpy skin disease (LSD), Rift Valley Fever (RVF), African Horse Sickness (AHS), Heartwater, and Foot and Mouth Disease (FMD), to name a few.

Efforts of the ARC are at various stages of solutions against the diseases mentioned above. One example, towards development of a vaccine for Heartwater (also called cowdriosis) demonstrates success for the ARC. The disease is endemic in South Africa and can easily kill large numbers of animals. As

vaccination is the main method of managing the disease, an effective and efficacious vaccine is critical for animal production. To date, the ARC has conducted clinical trials to investigate the efficacy of a live attenuated vaccine against heartwater disease in livestock, specifically in small stock (goats and sheep). Results from clinical trials demonstrated that this attenuated heartwater vaccine is safe and protective, which in turn enable the ARC to develop appropriate standard operation procedures for production and use of the vaccine.

Using next generation sequencing (NGS) researchers at ARC have discovered several new viruses affecting South African sweet potato cultivars. Genetic material from sick and healthy plants collected from the Western and Eastern Cape were sequenced at the ARC's Biotechnology Platform. Through this process a geminivirus in sick plants and two new badnaviruses in both sick and healthy plants were identified. This project demonstrates the value of using new technologies in agricultural research and it expands our knowledge and understanding about sweet potato pathogens.

The ARC continues to provide technical advice, data and information for the National Cultivar Evaluation Programme on the most suitable crops for specific agro – ecological zone production. The Cultivar Evaluation Programme continues to provide valuable information and advice to producers through the publication and dissemination of production guidelines such as the "Maize Information Guide", "Guidelines for Production of Small Grains," printed in English, Sesotho and in isi-Xhosa.

Our People, the Most Important Asset for Effective Delivery

The ARC values its human resources for effective delivery and sustainable impact on agriculture development. In the year under review, the ARC embarked on a number of initiatives to provide the best environment that would encourage excellent performance.

Management continued to place a premium on good employee relations. Such goodwill was reflected in the successful implementation of change management as reflected through the organisational design, employee engagement survey, capacity building programmes and the ARC Professional Development Programme (PDP) interventions.

Capacity building is important for the ARC's pipeline development as a tool for succession planning. During the year under review the ARC engaged more than 200 students through its PDP so as to fill critical and scarce skills gaps identified in the organization. Through these initiatives, the ARC has been building capacity and developing agricultural research professionals. The aim is to positively impact on the success of the sector.

During the year under review the number of labour disputes and disciplinary cases remained relatively low, with little adverse impact on the organization. Such an atmosphere enabled all employees and management to place greater effort in ensuring good to excellent individual performance as reflected by the organization's performance information.

Successful organizations effectively retain high performing employees and continue to recruit the best talent available. During the year under review the turnover rate remained low at 3.83%; suggesting a stable organization with an effective retention strategy. Exit interviews suggest that a significant number of resignations were due to early retirement, uncompetitive remuneration offered by the ARC, other opportunities elsewhere and career development. However, South Africa lacks critical mass of highly skilled scientist, engineers and technicians. Therefore, any resignations of skilled scientists at ARC are likely to significantly impact on the organization's performance. For example, some projects had to be delayed due to resignation of the principal researcher.

To mitigate the lack of critical mass of skills in South Africa, the ARC continued to invest substantially in the training and development of the employees. Such training and development includes formal training at higher education institutions that includes the use of National Research Foundation, Technology for Human Resources Industry Programme (THRIP) and Agri-SETA support. Through these initiatives, the ARC successfully engaged more than 338 students to participate in its flagship Professional Development Programme (PDP) and other industry funded programmes. In all instances, ARC researchers have been involved in the supervision of students together with collaborating scientists at universities.

MANAGING OUR FINANCES FOR EFFECTIVE AND SUSTAINABLE SUCCESS

Effective, efficient and transparent management of finances is an important indicator for organizational sustainability and success. The ARC continues to strive for ensuring that its customers and the shareholder derive optimal value from the utilization of financial and other resources.

In order to provide reasonable assurance against material losses and misstatements of financial results, the ARC reviewed its materiality framework for improvement of internal controls. The ARC's internal financial controls comply with the Public Finance Management Act, 1999 (Act no. 1 of 1999, as amended) (hereafter referred to as PFMA) and the organisation's Enterprise Risk Management Framework. Further, management recognized the importance of a good control environment for effective management of risks, improving performance, enhancing governance and enlisting stakeholder confidence in order to strengthen the organization's reputation. Therefore, in the year under review particular emphasis was placed on managing business risk and its possible impact on continuity.

During the reporting period the ARC continuously improved upon its performance information system that is aligned to the Business plan for financial year 2014/15. A dashboard system was used throughout the year to enable management to monitor and report on performance information. This has enhanced the ability of management to ensure accurate and timely reporting of performance on all pre – determined objectives and targets as well as monitoring any non – compliance or failures. The results of this performance information system are contained in this annual report.

Conducting business in financial year 2014/15 was difficult for the ARC due to poor economic conditions and in some instances poor agriculture sector performance. This placed the ARC in a difficult position to generate external income. Needless the organization has pulled through on income to the extent that the ARC managed to perform its functions within the allocated resources. This was achieved largely through cost containment and reprioritisation of projects. Unfortunately, these cost containment measures are not sustainable as they adversely impact on the ability of the organization to deliver solutions for agriculture development and economic growth.

Although the ARC received a significant increase in funds during the reporting period for infrastructure renewal and equipment replacement, such allocation remains highly inadequate. The ARC continues to face a huge backlog that requires additional funding over the Medium Term Expenditure Framework (MTEF) period. It's estimated that ARC's ageing infrastructure (obsolete equipment linked to specific research laboratories), capital replacement and maintenance costs require capital injection of R480 million over the MTEF. Infrastructure and capital equipment investments would enable the ARC to effectively deliver on its mandate, thus positively contribute to sustainable growth of the agriculture sector and economic growth.

In the year under review the ARC was saddled with unfunded and insufficiently funded mandates from the Department of Agriculture, Forestry and Fisheries (DAFF); which are mainly the national public good assets that continue to adversely impact on the financial performance of the organization. Further, Parliamentary Grant allocations were not commensurate with associated operational cost requirements. Resource limitations constrained the ARC's potential to grow external income without adversely impacting upon research, technology development and technology transfer. Lack of financial resources adversely impacted upon the ARC's ability to successfully complete some of the research, technology development and technology transfer projects, again compromising the organization's ability to fulfil its mandate.

Internal audit service providers have been instrumental in assisting ARC to improve upon its internal controls. This has provided assurance to management, the Audit and Risk Committee and Council on the effective and efficient use of resources at the disposal of ARC. Therefore, on behalf of the ARC we thank them for providing this high quality assurance system.

The ARC hereby thanks the Auditor General for providing an external audit service of good quality in a professional manner.

TO OUR CLIENTS AND STAKEHOLDERS

To our most valued customers, partners, beneficiaries, suppliers and stakeholders, we the people at ARC hereby extend our utmost gratitude for your support and assistance during the last financial year. We trust and hope you will continue to partner and work with us in various ways to ensure that we meet the expectations and developmental needs of the South African communities.

A special message of thanks for support, advice and commitment for the success of the ARC is extended to the government, mainly through the Departments of Science and Technology and DAFF. Further thanks and appreciation are extended to our partners in the private sector, particularly the commodity organizations of commercial agriculture that have continued to place trust in the scientific capability of ARC through funding allocations; and, in some instances joint partnerships in executing projects.

On behalf of the ARC management hereby thanks all members of the previous Council whose term expired during financial year 2014/15 for their dedication to ensure effective oversight of ARC governance. Further, the ARC thanks the Audit and Risk Committee for exercising their fiduciary duties with utmost care and vision for excellence. In particular, management appreciates the support, guidance and effort you have all devoted to the ARC.

Further, on behalf of all at the ARC, Executive Management hereby thanks the Executive Authority, the Minister of Agriculture, Forestry and Fisheries: Honourable Minister Mr. Senzeni Zokwana for consideration of this report and the Portfolio Committee for Agriculture, Forestry and Fisheries for the contribution and support towards the success of ARC.

Re a leboha, le ka moso
Re a leboga, le kamoso
Re a leboga, le gosasa
Siyabulela, nangamso
Siyabonga, nakusasa

Siyathokoza, nangamoso
Ha khensa, aswive tano na mudzuku
Ria livhuwa, khazwiralo na matshelo
Baie dankie
Thank you

Dr Shadrack Ralekeno Moephuli
President and CEO

Executive Report

Statutory Basis

The Agricultural Research Council is a public entity established under the Agricultural Research Act, 1990 (Act No. 86 of 1990, as amended). It is a schedule 3A public entity in terms of the Public Finance Management Act, 1999 (Act No. 1 of 1999, as amended by Act No. 29 of 1999).

Primary Mandate

In terms of the Agricultural Research Act, the objectives of the Agricultural Research Council are to conduct research, drive research and development, drive technology development and transfer (dissemination), in order to:

- Promote agriculture and related industries;
- Contribute to a better quality of life;
- Facilitate or ensure natural resource conservation; and
- Alleviate poverty.

Main Functions

The Agricultural Research Council's main functions, as provided for in the Act, are to:

- Undertake and promote research, technology development and technology transfer;
- Utilise the technological expertise in its possession and make it generally available;
- Publish information concerning its objectives and functions, and establish facilities for the collection and dissemination of information in connection with research and development;
- Publish the results of research;
- Establish and control facilities in the fields of research, technology development and technology transfer that the Council may determine from time to time;
- Cooperate with departments of state, institutions, persons and other authorities for the promotion and conduct of research, technology development and technology transfer;
- Promote the training of research workers by means of bursaries or grants-in-aid for research, technology development and technology transfer, and contribute financially to research, development and technology transfer Programmes;
- Hire or let facilities; and
- Cooperate with persons and authorities in other countries conducting or promoting research, technology development and technology transfer in agriculture.

Agency Mandates

The Government of South Africa, through the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Science and Technology (DST), has mandated the Agricultural Research Council to manage and maintain National Public Goods Assets. The National Public Goods Assets comprise national collections (gene banks) of animals, bacteria, animal databases, range and forage gene banks, fungi, genetic material, insects, plants, yeasts and viruses, to mention a few.

These provide important sources of genetic material for research and development, scientific reference (especially for pest risk assessment), future use, as well as rehabilitation of planting and breeding stock for national recovery from natural disasters. The collections serve as a basis for the Agricultural Research Council research, technology development and technology transfer, which contributes to a better life for all and the conservation of natural resources. The Agricultural Research Council maintains and manages a combination of the classes in alignment with its mandate as indicated below.

Animal Production, Improvement and Health	
This includes the full value chain of animal production and animal health.	
DNA Databank for Stock Identification The maintenance and expansion of a national DNA database that is utilised for DNA fingerprinting, biochemical genetic typing and species identification with the purpose of animal identification, the prevention of stock theft, forensic investigations, and species and population characterisation. **Conservation of Adapted Indigenous Livestock Breeds** The conservation, maintenance and evaluation of indigenous and adapted South African cattle, small stock, poultry and pig breeds. This activity is in line with the Green Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity. **Animal Recording Facility** The maintenance of a domestic animal genetic resources information system to organise information regarding indigenous breeds so that it is easily accessible. **National Forage Gene Bank** The National Forage Gene Bank was founded in the early 1980s and incorporates the valuable National Forage Collection from Rietondale, which already incorporated previous collections from Prinshof, Stellenbosch and Cedara dating back to 1900. **National Culture Collection of Beneficial Gastrointestinal and Food Fermentation Organisms** The maintenance, conservation, utilisation and development of the bacterial culture collection. This indigenous culture collection is unique in Africa and has existed since 1950.	**Exotic Diseases Division, Onderstepoort** This division is responsible for the diagnosis of Foot and Mouth Disease (FMD) and African Swine Fever (ASF) and the manufacture of FMD vaccines. It is a P3 high-containment facility that operates under special quarantine restrictions within a specially-designed building. It used to operate as an institute on its own. DAFF and Provincial Departments of Agriculture take full responsibility for the control of FMD and ASF in the country. **Rabies Laboratory, Onderstepoort** This laboratory is responsible for diagnosing rabies in animal brain tissue submitted for analysis. DAFF and Provincial Departments of Agriculture take full responsibility for the control of rabies in animals in South Africa. It is a zoonosis (an animal disease that can be transferred to humans), and is therefore significant to public health. **Blood Vaccines Production Unit** This unit produces blood that contains the parasites for use as vaccines against redwater, heartwater and gall sickness. All these diseases severely limit production. **National Tick Collection** • National Helminth (parasitic worms) collection • Serum bank (virology) • Insect collection (entomology) • Diagnostic services (reference laboratories for Rift Valley Fever, blue tongue, African horse sickness, lumpy skin disease and African swine fever).

Natural Resources Management, Mechanisation and Engineering

Activities focus on biosystematics and integrated pest and weed management, soil, climate and water, as well as engineering.

Agricultural Engineering
- Agricultural equipment and implementation of test facility
- Renewable energy demonstration centre

Soil, Climate and Water
- Agro-meteorological network, databanks and information systems
- Land type and other surveys with associated databases and sample collections
- National Oceanic and Atmospheric Administration (NOAA) satellite image database for natural resource and disaster management

Plant Protection
- National collection of insects
- National collection of arachnids
- National collection of nematodes
- National collection of fungi
- South African plant pathogenic and plant-promoting bacterial collections
- South African plant virus and antisera collection
- Rhizobium culture collection
- Integrated pest and disease management
- Biological control of invasive alien plants

Plant Voucher Specimen Collection and Vegetation Database

This is an Integrated National Vegetation Resource database. The databases currently being used by the Vegetation Ecology Section are:

- Phytotab, which contains site records of species with estimates of abundance
- The Roodeplaat herbarium specimen database
- National weeds list
- Ecology literature index
- Autecological database containing miscellaneous information about plant species
- Agricultural Research Council/INFO database, which contains map coverage and Acocks' sampling site localities. The Acocks maps database has been made available to SA-IGIS and includes information from other floristic data sets

Crop Production, Improvement and Protection

This includes work on citrus and subtropical crops, deciduous fruits and grapes, as well as vegetable, medicinal and ornamental plants, summer grains and oil and protein crops, small grains, and industrial crops.

Germplasm Collection

The collection has a large number of inbred lines and cultivars well-adapted to local and sub-Saharan biotic and abiotic stress factors. Some germplasm collections have been maintained for more than 50 years. If this asset is lost or not maintained properly, all breeding projects of mandated crops will suffer and become entirely dependent on foreign, often non-adapted material.

Deciduous Fruits, Vines and Wine
Grapevine, deciduous fruit, yeast and alternative crops gene bank

Tropical and Subtropical Crops
Tropical crops gene banks, indigenous plants and vegetable gene banks

Vegetable and Ornamental Plants
Indigenous plants and vegetable gene banks

Grain Crops
Protein seeds and summer grain gene banks

Small Grains
Small grain gene banks, wheat, barley, oats, rye, triticale, durum and tropical crops gene banks

Industrial Crops
Tobacco, cotton and fibre crops gene banks

Custodianship of the National Assets

It is important and in the national public interest to maintain a national reference collection. The concept of the "public good" is defined as "that good, the benefit (including financial) of which does not entirely accrue to an individual or group, but to the public at large and where the government acts on behalf of the country". It also relates to ongoing research and the delivery of essential services. They provide a wide range of functions, among which are:

- To support public functions of government and obligations under international agreements.

  Regulatory decision support systems include:
  - o International obligations such as the Convention on Biological Diversity (CBD), and the International Plant Protection Convention (IPPC), which compels it to keep reference collections of all agricultural specimens with respect to the import and export of agricultural produce;
  - o Providing critical diagnostic support to the government phyto-sanitary services;
  - o Strategic national and international diagnostic and animal disease control capacity; and
  - o Strategic national and international diagnostic and plant disease control capacity.

- Research
  - o Natural resource inventories such as soil, water, climate and vegetation databanks, as well as weather stations for climate inventories and collection of data;
  - o A significant amount of the germplasm contained in the gene banks forms the basis for further research and development (plant breeding, cultivar development, new product development, etc.);
  - o Provide a resource for training; and
  - o They make an important contribution to scientific studies, biodiversity replenishment, sustainable development and production, food security and pest invader identification.

- Emergency systems - Gene banks serve as the basis for resuscitating agricultural production following natural disasters and are important for biodiversity and food security.

- Organisation and Facilities: the Agricultural Research Council conducts its business at various campuses, including its administrative office, situated at different locations within the country – at Bethlehem, Nelspruit, Potchefstroom, Pretoria, Rustenburg and Stellenbosch – and at a number of laboratories, office buildings and research farms throughout the country. Much of the research facilities of the Agricultural Research Council are distributed in accordance with agro-ecological zones, which enables specific focus on particular commodities. The Agricultural Research Council's research and development capability is organised as follows:
  - o Crop Production, consisting of the following research areas: Citrus and Subtropical Crops, Deciduous Fruits and Grapes; Vegetable, Medicinal and Ornamental Plants, Summer Grains and Oil and Protein Crops, Small Grains and Industrial Crops;
  - o Animal Production, consisting of Animal Production, Animal Health and Aquaculture;
  - o Natural Resources Management, consisting of Soil, Climate and Water; Biosystematics and Integrated Pest and Weed Management;
  - o Mechanisation and Engineering consisting of Engineering;
  - o Agro-processing, Food Technology and Safety; and
  - o Biotechnology.

Additionally, the Agricultural Research Council has an Agricultural Economics and Capacity Development division that focuses on transferring research output to stakeholders such as farmers, both smallholder and commercial, as well as communities. Supporting core business divisions, the Agricultural Research Council has functional divisions, namely human resources; marketing and communications; finance; information technology and communication; infrastructure management; risk and planning; and internal audit, all of which operates from its main office in Pretoria.

Chief Financial Officer's Review

The ARC received an unqualified audit opinion once again.

Mr Gabriel Malukele
Chief Financial Officer

Overview

The prevailing difficult financial conditions have had a negative impact on the ARC in terms of the level of Parliamentary Grant received from the government as well as the External Income raised by the ARC. Investments in agricultural research and development by the private sector has been on the decline over a number of years now. Although the level of funding through Parliamentary Grant by the government, including Economic Competitiveness Support Packages, has increased over the past four years, the increase in operational Parliamentary Grant between 2014 and 2015 was less than 1%. This has happened against the backdrop of increased costs such as personnel costs, utilities, maintenance and travelling which are necessary to carry out the research and development mandate of the ARC. The ARC continued to exercise tight cost control measures and working capital management to mitigate impact of reduced revenue during the year ending 31 March 2015.

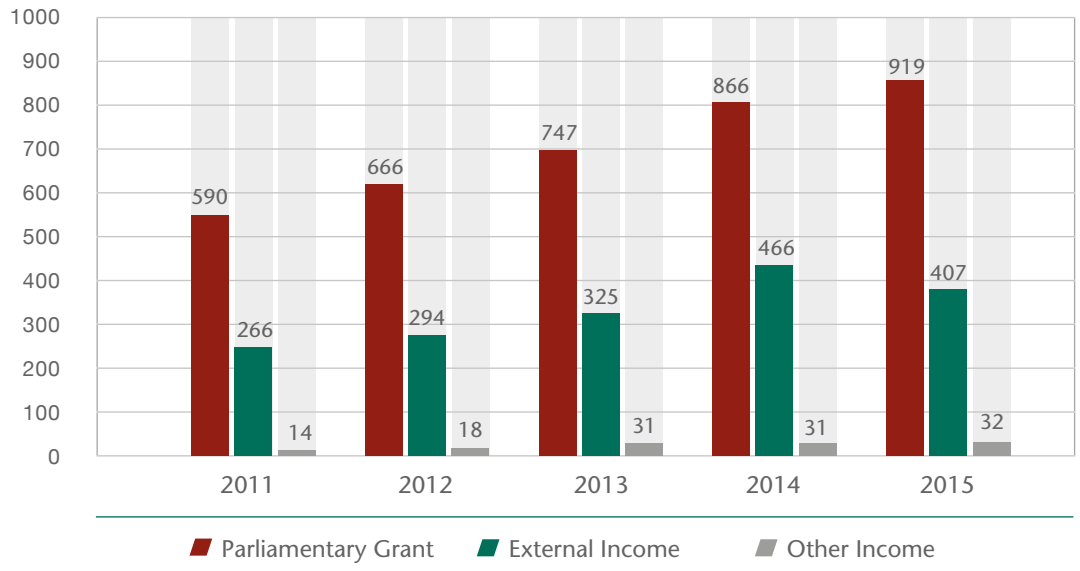
The decline in operational Parliamentary Grant and External income has resulted in the total revenue for the year under review remaining flat while the expenditure increased by 8% resulting in a decreased surplus of R34m for the year compared to R137m in the prior year.

Financial Performance	2014 R'm	2015 R'm	Var. %
Parliamentary Grant	866	919	6%
PG - Operational	699	705	1%
PG - ECSP	92	135	46%
PG - Capex	75	79	5%
External Income	466	407	(13%)
Other Income	31	32	4%
Total Revenue	**1 363**	**1 358**	**(0%)**
Operational Expenditure	1 227	1 325	(8%)
Personnel Costs	685	760	(11%)
Other Operating Costs	491	517	(5%)
Depreciation & Impairment	51	48	7%
Surplus/(Deficit) for the year	**137**	**34**	**(75)**

Revenue

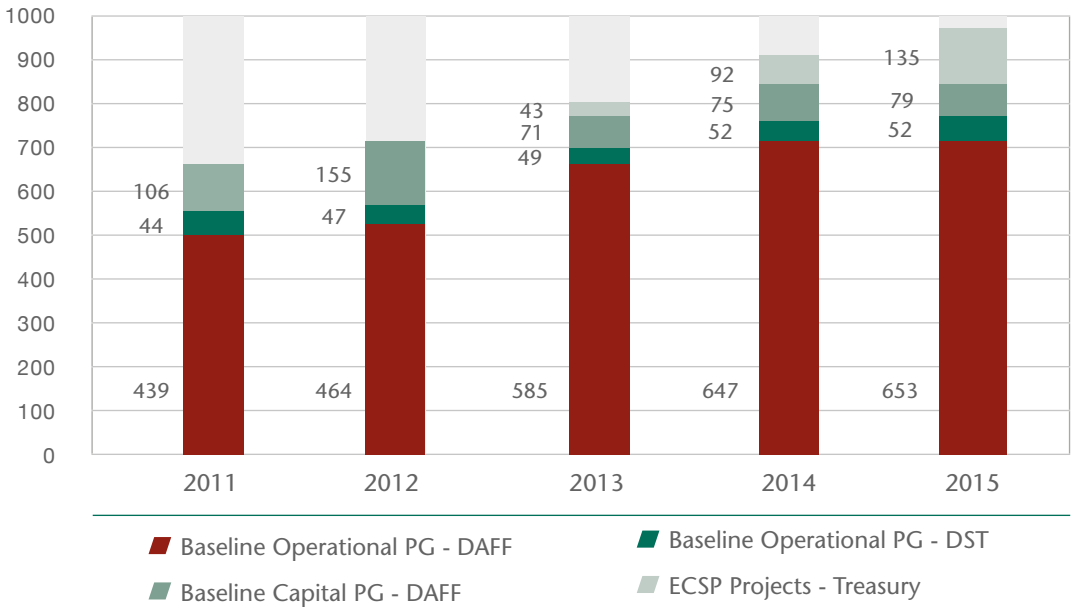
The ARC's total revenue dropped by R5m to R1 358m (2014: R1 363m). The ARC derives revenue from Parliamentary Grant from the Department of Agriculture, Forestry and Fisheries and the Department of Science and Technology as well as contract research and development income from both the public and private sectors; locally and internationally. Short term cash investments also yield interest which also augments the funding of the ARC operations.

Revenue



The ARC's revenue is spent on research and development programmes, technology transfer, infrastructure as well as support services. There are processes, policies and guidelines within the ARC to ensure effective utilisation of the funding in line with the PFMA, National Treasury guidelines and applicable accounting standards.

Parliamentary Grant (PG)



Parliamentary Grant (PG) increased by 6% to R919m (2014: R866m). The baseline PG which constitutes 77% of the total PG increased by less than 1%.

The increase in PG is driven by the 46% (R43m) increase in Economic Competitiveness and Support Packages (ECSP) projects. The ARC received R400m (including VAT) ECSP from National Treasury over a 3-year period ending during 2014/15 financial year. Only R135m of the ECSP was recognised in the current financial year as projects to the value of R80m will only be completed during the coming financial year.

Baseline Operational PG from DAFF increased by 1% to R653m (2014: R647m). This grant is generally used to cover operational activities, such as salaries, consumables, maintenance etc. The Baseline Operational PG from DST remained flat at R52m and is mainly used for maintenance of National Assets such as, Indigenous plants and vegetable gene banks. Baseline Capital PG from DAFF increased by 6% to R79m (2014: R75m), which is still far below the level required to maintain the ageing infrastructure within the ARC

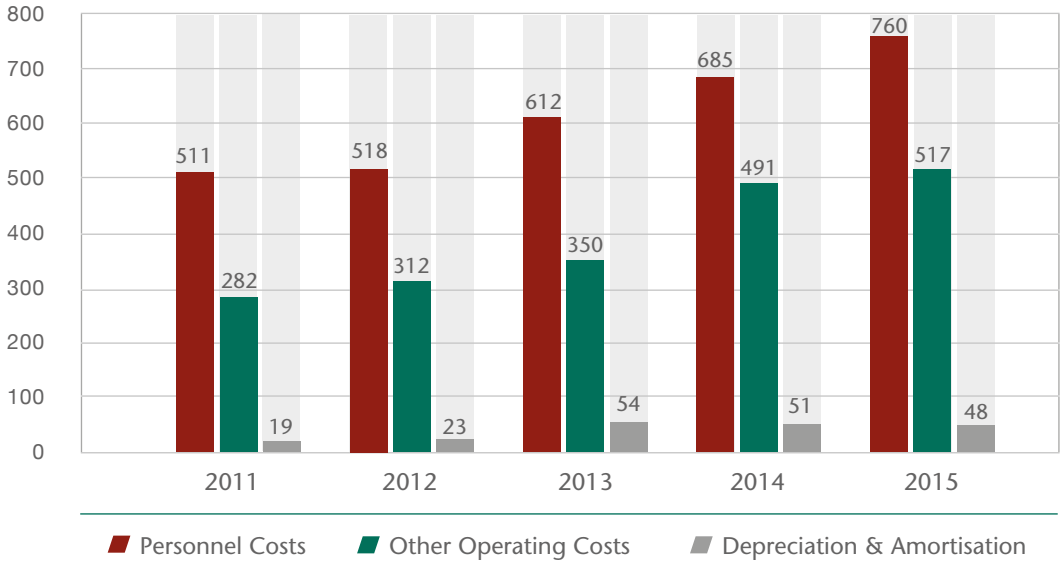
External Income

External Income is derived through project contracts, research and development contracts, income from Intellectual property, and sales of farm products. External Income is down 13% to R407m (2014: R466m). The tough economic conditions in the country has resulted in some of the potential clients within both the private and public sector revising their expenditures down from the previously anticipated levels.

Other Income

Other income comprises mostly of interest received from short-term investments of prepayments received from both government grants and funding for projects from private sector clients. Other income is up 4% to R32m (2014: R31m). Over the past couple of years, the ARC has been prudent in the management of its cash resource in order to achieve cash neutrality. This has been achieved through investing in the highest interest-bearing investments to achieve higher short-term returns.

Operating Expenditure



The ARC's revenue is spent on research and development programmes, technology transfer, infrastructure as well as support services.

- **Personnel Costs**

  Personnel costs increased by 11% to R760m (2014: R685m). The growth is driven by the 8% annual salary increase and an increase in manpower to execute Economic Competitiveness & Support Packages projects.

- **Operating Cost**

  Operating costs are mainly research-related costs such as consumables, utilities and maintenance of infrastructure. Operating costs increased by 5% to R517m (2014: R491m), driven mainly by an increase in utilities and energy and research consumables used in the ECSP projects.

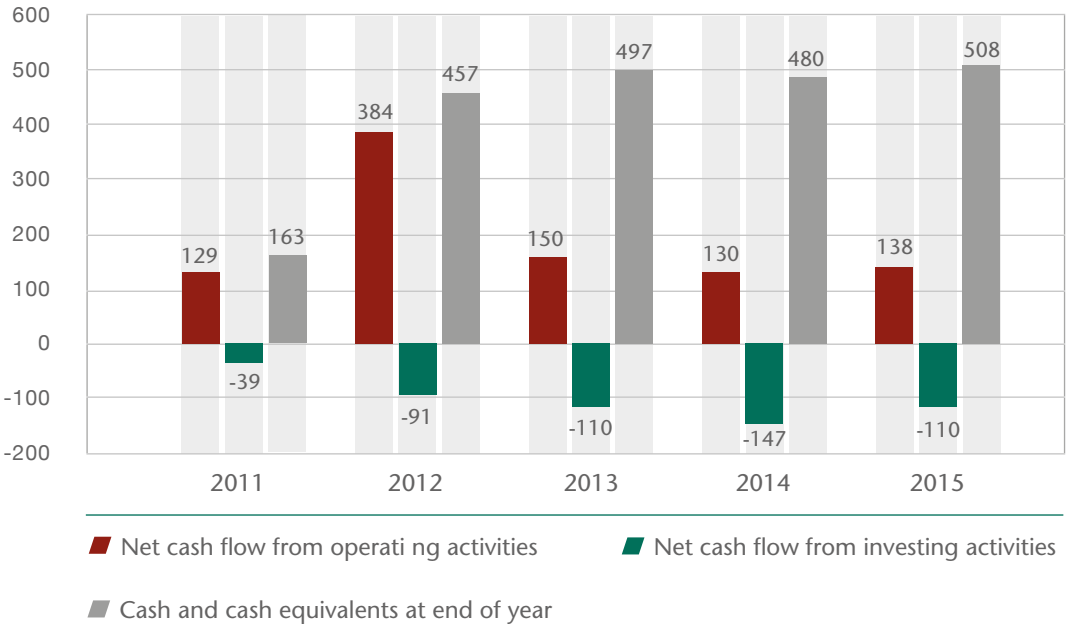
- **Depreciation**

  Depreciation and impairment cost down by 7% to R48m (2014: R51m). Depreciation is driven mainly by increase in capital expenditure related to the upgrading and replacement of property plant and equipment. The ageing of the ARC infrastructure has resulted in recognition of impairment on some of the buildings which have decreased in value over the years.

Cash flow

ARC's cash position increased to R508m as at 31 March 2015, from an opening balance of R480m at the beginning of the financial year.

Cash flow



Although the cash balance of the ARC appears high as at the 31 March 2015, it should be viewed against the level of cash commitments as at the same date, such as follows:

- The ARC received R188m for the construction of the Foot-and-Mouth Disease (FMD) factory over the past few years. As at the 31 March 2015 R130m was still unspent as a result of the delay in the process development and the design of the facility. This amount is ring-fenced and does not form part of the operational funds of the ARC.
- As at 31 March 2015 the ARC had R80m cash relating to the Economic Competitiveness and Support Packages for work to be completed during the 2015/16 financial year.
- Income received in advance from clients totalling R24m was on hand as at the 31 March 2015. This is for work to be completed during the 2015/16 financial year. The ARC asks for prepayments on contracted work to fund the working capital required to execute the contracted work. This is due to the lack of cash reserves within the ARC to fund such contracts which run over an extended period of time.
- Trade creditors, representing amounts owed to providers of goods and services to the ARC, amounted to R68m as at 31 March 2015

All these commitments need to be provided for from the cash on hand as at the 31 March 2015.

The ARC improved the credit control measures during the year which also resulted in the reduced level of long outstanding debtors.

The Control Environment

The ARC received an unqualified audit opinion once again. There are areas of improvement which have been highlighted by the Auditor General which need urgent attention. During the past year, a new ERP system was also implemented with the intention to streamline processes and strengthen controls. Various challenges were experienced during the implementation of the new system which need attention in the new financial year.

10 Year review

AGRICULTURAL RESEARCH COUNCIL-TEN YEAR REVIEW										
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15
	R'm	R'm	R'm	R'm	R'm	R'm	R'm	R'm	R'm	R'm
STATEMENT OF FINANCIAL PERFORMANCE										
Total Income	**671**	**704**	**730**	**762**	**831**	**871**	**978**	**1 104**	**1 364**	**1 358**
Parliamentary Grant	463	434	452	470	533	590	666	747	866	919
Baseline Operational - DAFF	388	356	371	373	434	439	464	585	647	653
Baseline Operational - DST	35	37	37	37	42	44	47	49	52	52
ECSP Projects - Treasury	-	-	-	-	-	-	-	43	92	135
Baseline Capital - DAFF	39	41	43	60	57	106	155	71	75	79
External Income	197	235	266	256	293	266	294	325	466	407
Other Income	12	34	12	36	6	14	18	31	31	32
Total Expenditure	**657**	**696**	**718**	**778**	**773**	**811**	**854**	**1 015**	**1 227**	**1 325**
Personnel Costs	396	416	416	467	490	511	518	612	685	760
Operating Costs	241	269	289	296	265	282	312	350	491	517
Depreciation & Amortisation	20	11	13	14	18	19	23	54	51	48
Net Surplus\(Deficit)	**14**	**8**	**12**	**(16)**	**58**	**59**	**124**	**89**	**137**	**34**
STATEMENT OF FINANCIAL POSITION										
Property, plant and equipment	397	523	608	649	649	666	729	784	880	942
Investments	1	2	2	2	2	2	2	4	4	5
Current assets (excluding cash)	129	77	95	82	93	76	84	87	141	126
Cash resources (net of bank overdraft)	**153**	**97**	**59**	**35**	**73**	**163**	**457**	**497**	**480**	**508**
Total Assets	**680**	**699**	**764**	**768**	**818**	**908**	**1 273**	**1 372**	**1 506**	**1 582**
Capital and Reserves	197	206	273	502	559	618	742	832	968	1 001
Non Current Liabilities	230	309	326	87	71	72	115	213	209	213
Current Liabilities	252	184	164	180	188	217	416	327	329	368
Total Equity and Liabilities	**680**	**699**	**764**	**768**	**818**	**908**	**1 273**	**1 372**	**1 506**	**1 582**
CASH FLOWS										
Net cash flow from operating activities	32	7	5	36	56	129	384	150	130	138
Net cash flow from investing activities	(31)	(63)	(42)	(60)	(17)	(39)	(91)	(110)	(147)	(110)
Cash and cash equivalents at beginning of year	152	153	97	59	35	73	163	457	497	480
Cash and cash equivalents at end of year	**153**	**97**	**59**	**35**	**73**	**163**	**457**	**497**	**480**	**508**
RATIO ANALYSIS										
Profitability and asset management										
Asset Turnover	1,5	1,3	1,2	1,2	1,3	1,2	1,1	1,0	1,1	1,1
Return on net assets (%)	3,4%	1,5%	2,0%	(2,7%)	9,3%	8,6%	31,2%	16,2%	19,7%	4,8%
Current Ratio	1,1	0,9	0,9	0,7	0,9	1,1	1,3	1,8	1,9	1,7
Operating margin (%)	2,2%	1,2%	1,7%	(2,2%)	7,1%	6,9%	13,0%	8,3%	10,3%	2,5%
Performance										
Personnel Costs as a % of Total PG	86%	96%	92%	99%	92%	87%	78%	82%	79%	83%
Personnel Costs as a % of PG (Exc Capex)	93%	106%	102%	114%	103%	106%	101%	90%	87%	90%
Personnel Costs as a percentage of total expenditure %	60%	60%	58%	60%	63%	63%	61%	60%	56%	57%
External revenue as a % of total income	30%	35%	36%	34%	35%	31%	30%	29%	34%	30%

Ratio definitions	
Net Assets	**Total assets excluding cash and current liabilities**
Asset turnover	**Revenue devided by net assets including cash resources**
Return on net assets	**Net profit as a percentage of net assets excluding cash resources**
Current ratio	**Current assets (excluding cash resources) to current liabilities**
Operating margin %	**Net surplus\(deficit) as a percentage of turnover**

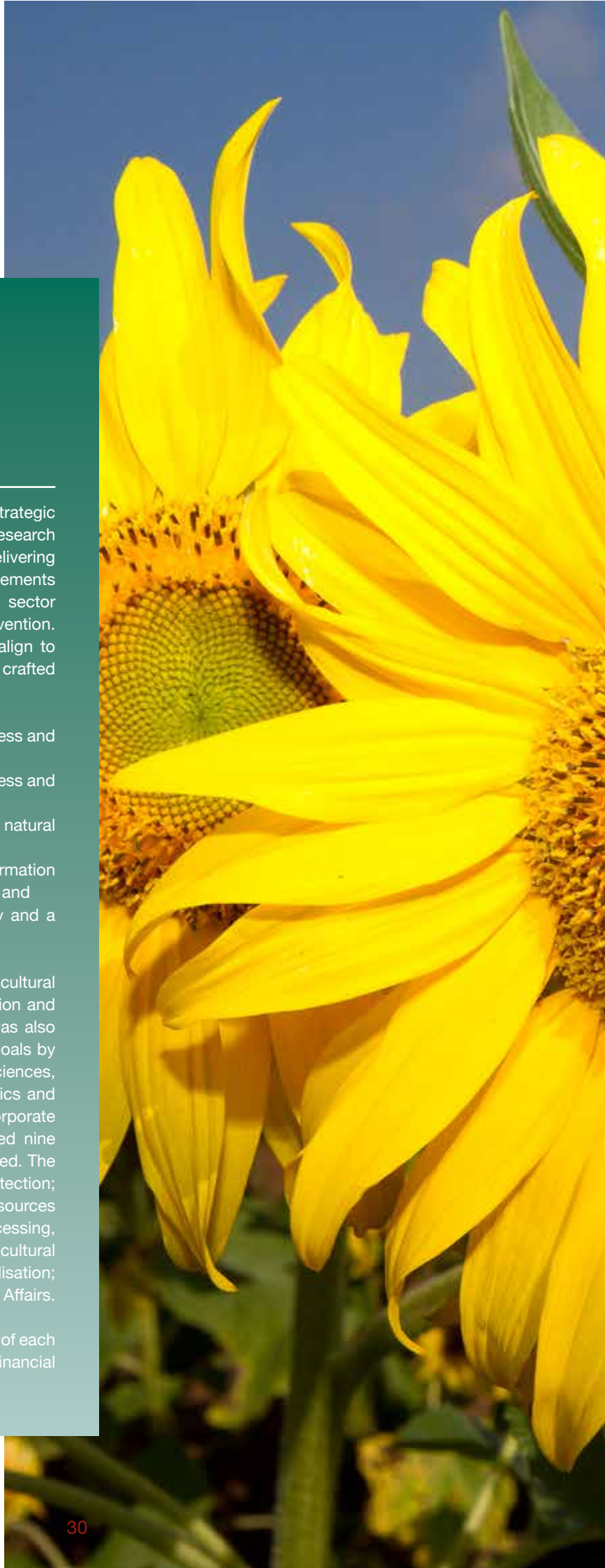
Strategic Goals and Organisational Achievements

With the mandate and statutory basis in mind, five strategic goals were crafted in order to enable the Agricultural Research Council to effectively focus and prioritise its options in delivering on its mandate. The strategic goals are framed as statements that describe the outcome expected in the agricultural sector as a result of the Agricultural Research Council intervention. They align fully with the National Outcomes, but also align to the relevant sectoral policy and strategy frameworks. The crafted strategic goals were:

- To improve the productivity, production, competitiveness and sustainability of crop-based agriculture;
- To improve the productivity, production, competitiveness and sustainability of livestock-based agriculture;
- To enhance the productive use and conservation of natural resources;
- To translate research results to support agrarian transformation and the efficiency and competitiveness of the sector; and
- To achieve good governance, financial sustainability and a high performing and visible organisation.

These strategic goals served to inform the Agricultural Research Council's research focus, programme orientation and performance data. The Agricultural Research Council was also structured in a way that would support these strategic goals by clustering its divisions under Crop Sciences, Animal Sciences, Research and Innovation Systems, Agricultural Economics and Capacity Development as well as Administration and Corporate Affairs. The Agricultural Research Council also identified nine programmes through which these goals would be achieved. The programmes are Crop Production, Improvement and Protection; Animal Health, Production and Improvement; Natural Resources Management; Mechanisation and Engineering; Agro-processing, Food Technology and Safety; Smallholder Agricultural Development; Agricultural Economics and Commercialisation; Training and Extension; and Administration and Corporate Affairs.

The following section outlines the overview and highlights of each division as achieved under various programmes in the financial year 2014/2015.



Overview and Highlights of Crop Sciences

The Crop Sciences division of the Agricultural Research Council primarily supports three of the organisations strategic goals:

- Strategic Goal 1: To improve the productivity, production, competitiveness and sustainability of crop-based agriculture,
- Strategic Goal 3; To enhance the productive use and conservation of natural resources, and
- Strategic Goal 4: To translate research results to support agrarian transformation and the efficiency and competitiveness of the agricultural sector in South Africa.

Research is carried out on citrus and subtropical crops, deciduous fruits and grapes, as well as vegetables, medicinal and ornamental plants, summer grains, oil and protein crops, small grains and industrial crops.

Crop Sciences has research facilities in Stellenbosch, Rustenburg, Potchefstroom, Bethlehem, Roodeplaat and Nelspruit. The division also has satellite stations strategically positioned in almost all of the nine provinces of South Africa. Achievements attained by this division, under various Agricultural Research Council programmes for the financial year 2014/15, are highlighted below.

The research that supports Strategic Goal 1 can be categorised into three distinct disciplines viz. breeding, crop production systems and crop protection.

Research Focusing on Breeding

The ARC has extensive breeding programmes that encompass almost all the different crops. The work is conducted to create new cultivars that would improve yield, taste or appearance of the commodity, are tolerant or resistant to either pests, diseases or variation in climate, or have improved nutrient value. The development and release of new cultivars increase the competitiveness of the sector and thus create jobs and increase income. In this financial year the ARC has produced 12 new plant breeders rights. The examples below is an indication of the potential impact of these new cultivars.

'DroughtTEGO' - a new drought-tolerant maize launched

"South Africa faces a challenge as only 13% of the land is suitable for crop production. This challenge is exacerbated by low rainfall, which often results in drought. Drought leads to crop failure, unemployment, hunger, and poverty,"

"Climate change is predicted to worsen the situation with more variable rainfall and above average temperatures. These drought-tolerant maize varieties will help our farmers to adapt to climate change and mitigate drought".

Honourable Deputy Minister of DAFF: General Bheki Cele

DroughtTEGO, a new drought-tolerant maize cultivar that holds promise for South African maize farmers faced with low rainfall and the threat of climate change, was officially launched at the end of 2014. The new hybrid was developed by the Agricultural Research Council in conjunction with several role players on a Water Efficient Maize for Africa (WEMA) project, an international private-public partnership comprising of the ARC, the African Agricultural Technology Foundation based in Kenya, the International Maize and Wheat Improvement Centre (CIMMYT), national agricultural research systems in Kenya, Mozambique, Tanzania and Uganda, and Monsanto seed company, dedicated to developing low-cost maize cultivars that will thrive in difficult African conditions. The WEMA consortium will be providing this cultivar duty-free, to ensure that the seeds are as accessible as possible to farmers. Ten thousand seed packs were distributed to farmers and extension officers at the official launch of the cultivar, with thousands more currently being distributed to smallholder farmers in all the provinces across the country. Certified seed of the hybrids will be marketed by Capstone Seeds, Jermart Seeds and Seed Co. in 2015. DroughtTEGO represents an important step towards food security in South Africa in the face of uncertain climate.

Six new apple cultivars for warmer South African conditions

Until recently only a few regions in South Africa have been suitable for growing apples because of South Africa's relatively warm winters and the high winter chill requirement of traditional apple cultivars. Over the past fifteen years, the ARC apple breeding programme placed more emphasis on breeding apples that are

adapted to South African conditions and that require fewer chilling hours than standard cultivars. Harvest times for some of these low chill selections can be six to eight weeks earlier than existing cultivars in some regions. This extends the apple season by two months and, although optimum cold storage time is shown to be around 4 weeks, they provide good quality fresh apples in late December and January when other apples are not yet readily available.

Six of these low chill selections have now been protected with Plant Breeders' Rights (PBR) and the new varieties referred to as the Afri range will be released by the Agricultural Research Council later this year. These cultivars make it possible to plant apple trees in non-traditional apple growing areas of South Africa and will boost non-traditional apple farmers, especially in the warmer rural areas such as Limpopo.

'Afri Star', one of the ARC's new apple varieties suitable for warmer regions.

New Protea cultivar developed

A small, intense pink *Protea* cultivar, with the proposed name of "Delight", has been developed by the Agricultural Research Council to address the need of the fynbos cut flower industry for smaller flowers. The flower is only 11 cm in length and 8.7 cm in diameter. Smaller flowers are popular due to greater economy in terms of the number of flowers per carton packed for export. They are also popular in bouquets and address the demand from northern hemisphere countries for smaller, but unique flowers. The plants have a vigorous, upright growth habit and a long flowering window from July to November in the southern hemisphere. As soon as the Plant Breeder's Rights are registered, it will be released through the newly developed fynbos (protea) commercialisation plan developed by the organisation's Commercialisation Office.

'Delight', a small new Protea cultivar for the cut flower industry

New flowering bulbs for export

The Agricultural Research Council has produced five new *Lachenalia* cultivars for export to Dutch flower markets, as part of a broader project promoting the indigenous flower bulb industry in the Northern Cape. The new *Lachenalia* cuiltivars are being tested for distinctness, uniformity and breeding stability, in order to apply for plant breeder's rights in the Netherlands.

The organisation established a community nursery in Nieuwoudtville in the Northern Cape where community members, operating as a cooperative, were trained to produce pot plant sized bulbs. To date several hundred thousand bulbs have been exported. The community members earn a salary through their participation in the project and the Agricultural Research Council provides training and continuous technical assistance.

The project has faced significant challenges in the last five years, such as reduced funding and a difficult commercialisation environment due to exclusive trading with a single overseas buyer. The Agricultural Research Council has now devised a more aggressive commercialisation strategy.

Josephine, one of the ARC's new Lachenalia cultivars

New high-potential wheat cultivars released for commercialisation

Long-term sustainability of the South African wheat industry depends on the development and availability of high-yielding varieties. High yield integrated with customary high milling and baking quality ensures profitability of commercial wheat production, but also contributes towards national food security and job creation in affiliated business sectors.

Two varieties with a shorter growth period were released for production under irrigation; Renoster, a semi - dwarf variety with very high yield potential, and Koedoes, a short growth period cultivar with exceptionally high yielding potential. These two cultivars are envisaged to replace the old, short growth period variety Steenbras with an average yield potential.

Wedzi, suitable for dry land production in the summer rainfall regions, is an intermediate - type wheat cultivar with high yield potential at both early and late planting dates in the Eastern Free State. It also has good bread-baking quality characteristics (good dispensability and loaf volumes) that are superior to those of Eland, the current quality standard. Seed sales of these cultivars will generate a considerable income for the Agricultural Research Council.

New cotton cultivars to counter pests and diseases

Cotton farmers in the Northern Cape are faced with cotton wilt disease, which can devastate an entire cotton crop. The Agricultural Research Council developed two cultivars that are high yielding and resistant to diseases, including wilt disease.

Cotton leafhopper, *Jacobiella fascialis*, has taken over from bollworm as the most destructive pest in the cotton industry. The Agricultural Research Council produced a new hairy cotton cultivar that is resistant to leafhopper attacks. The cultivar was registered in 2014 and is currently being distributed to smallholder farmers.

Resistant cotton cultivars remain green while others show reddish leaf damage due to leafhopper infestation.

Research Focusing on Protection against Pests and Diseases

Pests and diseases, if left unchecked, can cause serious crop losses and even total crop loss before harvest and during post-harvest storage. Research conducted by the ARC includes surveys to identify and monitor new and invasive crop pests and diseases, studies to understand their life cycle, seasonal occurrence and economic damage, as well as the development of monitoring methods and integrated pest and disease management systems. The identification and treatment of pests and diseases decrease the losses farmers face and in turn produce more crops.

Managing grapevine virus diseases

Grapevine leafroll is the most serious virus disease threatening the South African wine industry. Grape and wine quality, as well as yield of diseased vines are lower, while the economic lifespan of diseased vines are shortened. Grapevines only become profitable about eight years after planting, as the high cost of establishment (currently approximately R140 000 per ha or more) must be recouped. Instead of a productive lifespan of at least twenty-five years, leafroll diseased vines generally need to be replaced after about fifteen years. The ARC has been doing research for many years to identify the viruses associated with the disease in South Africa and to identify local vectors that transmit the disease.

To ensure that virus-free planting material is supplied to farmers and to gauge the efficacy of the industry's leafroll management strategy by monitoring the spread of the disease, researchers must be able to detect and identify all relevant viruses in large numbers of grapevine samples reliably and cost-effectively. In order to develop detection assays that can identify multiple viruses in a single sample, all the viruses found in grapevines across South Africa must first be identified. Researchers have now completed such a survey, focusing on Grapevine leafroll-associated virus 3 (GLRaV-3), which causes grapevine leafroll disease. Five variants of GLRaV-3, as well as several other similar viruses, were identified. The complexity of virus populations detected in this study highlights the need for new detection methods that are able to identify all viruses and their variants in grapevines.

Typical Grapevine leafroll disease symptoms in a red grape cultivar

A major threat to South African honeybees

American Foul Brood (AFB), caused by the bacterium *Paenibacillus* larvae, is the most widespread and serious bee brood disease in the world. The spores of this bacterium are very long-lived and resistant to both heat and cold. South Africa has long prohibited the entry of honey bees or bee products into the country, or allowed their entry only after irradiation, primarily to prevent entry of AFB.

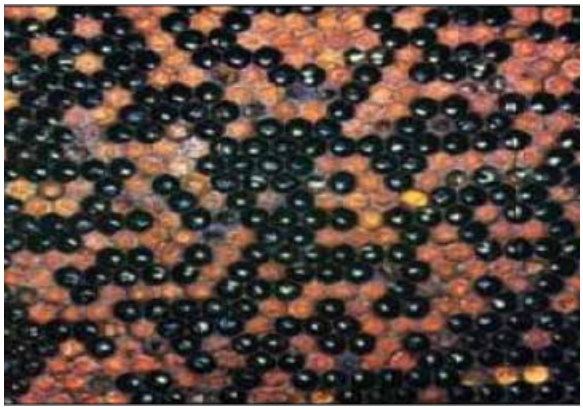
An outbreak of American Foulbrood, with full clinical symptoms which resulted in the collapse and death of colonies, occurred in colonies of the indigenous Cape honey bee, Apis mellifera capensis, in the Western Cape in 2009. The Agricultural Research Council's honey bee research unit, based in Stellenbosch, first reported AFB in colonies in November 2008, and confirmed this by laboratory analysis in January 2009.

A survey by the Department of Agriculture, Forestry and Fisheries (DAFF) established that the AFB infection was well established and widespread, but limited to Cape Town and surrounds, as well as Oudtshoorn. The beekeeping operations affected were encouraged to control the AFB in their operations by eliminating the infected colonies, and disinfecting contaminated hive material.

By the end of 2012 it was already clear that AFB had not dissipated as hoped, but was continuing to spread through the honey bee population of the Western and Southern Cape, and was well established in the wild honey bee population. This process has seemingly accelerated in the past year, to the extent that it is now considered that AFB has reached epidemic proportions in the Western Cape. Most worryingly, AFB infected colonies monitored by the honey bee section since 2012 have all succumbed to the disease, and at present there does not seem to be any substantial degree of natural tolerance to AFB in the Cape honey bee population.

The Agricultural Research Council issued a report on the disease to DAFF in this financial year, calling for action to be taken. This has resulted in a number of meetings between DAFF and the commercial beekeeping industry, and the research findings of the Agricultural Research Council are being taken very seriously. DAFF has committed itself to a thorough de-limiting survey of the country to determine the full extent of the spread of the disease, the training of a

team of inspectors to deal with the disease, as well as supporting a comprehensive research programme to assess the impact of the disease in South Africa, and to develop measures to control and mitigate the disease.



Bee brood infected by American foulbrood.

Facing the threat of fruit flies

Fruit flies belonging to the fly family Tephritidae are major pests of fruit and vegetables worldwide. Direct economic losses are due to fruit fly larvae feeding inside fruit, rendering them unmarketable. This has a significant impact on sustainable rural livelihoods. Indirect losses are due to quarantine (phytosanitary) restrictions and loss of market opportunities. The impact of fruit flies is further compounded by the fact that many of them attack a wide variety of host plants. Few pests have a greater impact on world trade in agricultural products than fruit flies.

The Agricultural Research Council has played a major role over many years in helping South African farmers deal with the threat of fruit flies. In the Western Cape the Agricultural Research Council, in collaboration with the International Atomic Energy Agency, developed a Sterile Insect Technique to control Mediterranean fruit fly in table grapes and other deciduous fruit. The technology has since been handed over to a private entity, FruitFly Africa (Pty) Ltd, set up by the deciduous fruit industry, although they still use the Agricultural Research Council's irradiation facility at Stellenbosch.

Subtropical fruit crops in South Africa are also prone to attack by fruit flies, particularly the Marula fruit fly (Ceratitis cosyra), the Natal fruit fly (Ceratitis rosa) and the Mediterranean fruit fly (Ceratitis capitata). Lately the industry is facing a new threat from the recent invasion of the Oriental fruit fly (Bactrocera dorsalis). The Oriental fruit fly was first found in Kenya in 2003. Since its introduction, the presence of Oriental fruit fly has hampered commercial trade of fresh fruit in many African countries.

The Agricultural Research Council and various grower organisations have been collaborating with DAFF to monitor for the presence of Oriental fruit fly along the country's borders and at ports of entry. Oriental fruit fly was first reported in South Africa in 2010 in an area on the northern border of the country. DAFF recently declared it present in various areas of South Africa, including the main subtropical fruit production areas.

Researchers of the Agricultural Research Council carried out monitoring with various traps and lures in and around subtropical fruit orchards in Limpopo and Mpumalanga to identify which fruit fly species are present, to determine the abundance and seasonality of economic important species, especially Oriental fruit fly, and to identify reservoir hosts of pest species. Oriental fruit fly was present in all orchards monitored, with higher numbers occurring in mango and guava orchards. It was evident that Oriental fruit fly is becoming more prominent in subtropical fruit orchards. However Natal Fruit fly, Marula fruit fly and Mediterranean fruit fly were still the predominant species trapped and reared from fruit.

Since Oriental fruit fly is now present in the main subtropical fruit production areas, fruit fly control methods must target the traditional fruit flies as well as the Oriental fruit fly. The performance of different male annihilation techniques (MAT) for Oriental fruit fly was evaluated in combination with the bait application technique (BAT) in the form of bait stations for the control of the fruit fly complex in mango orchards. BAT involves application of poisoned protein baits in the form of sprays or bait stations. The male annihilation technique (MAT) comprises a male lure combined with an insecticide that are incorporated in a carrier. Results showed that MAT and BAT treatments were effective in preventing fruit infestation. It is recommended that both BAT and MAT be used to control the fruit fly species complex in subtropical fruit orchards. Orchard sanitation remains an integral part of the management strategy of fruit flies.

Indigenous stink bugs pose a serious threat to subtropical fruit

The four main subtropical crops, macadamia, avocado, mango and litchi, are all affected by a complex of indigenous stink bugs. Latest statistics for macadamias indicate that stink bugs induced direct damage estimated at ± R166 million during the previous production season. Direct damage to avocado is estimated at ± R50 million per year. Recent surveys indicated that severe damage also occurs in litchi and mango orchards.

Stink bugs are not easy to see in the trees, making monitoring difficult. Traditionally farmers applied several preventative insecticide sprays to control stink bugs. However, stink bugs mostly occur in the top parts of trees, while commercial spray equipment only cover the bottom third of these tall, dense trees adequately. Stink bugs in the tops of the trees were therefore exposed to sub-lethal doses of the synthetic pyrethroids, resulting in resistance to these inecticides appearing in some regions.

Researchers of the Agricultural Research Council studied the biology and relative seasonal abundance of the stink bug species complex on the various subtropical crops in order to develop management strategies for these pests. It was found that the two spotted bug *(Bathycoelia distincta)* is the dominant stink bug in macadamia. It migrates into the orchards every season after flowering and three successive generations breed in macadamias. A degree day model was drawn up to predict the three nymphal (larval) peaks and this model will be used to manage stink bugs on macadamia in the new season. The strategy aims to control the nymphs before they mature and can lay eggs. This will only work if the trees are of a manageable size, therefore the subtropical industry is busy with a drive to promote pruning (thinning of trees as well as height reduction).

Commercial sprayer with a vertical extension demonstrating the inability of spray equipment to cover the top parts of macadamia tree canopies where most two spotted stink bugs occur.

Research also showed that the coconut bug (Pseudotheraptus wayi) overwinters in litchis and invade avocados anew during spring. This winter, litchi orchards will be treated with a biological insecticide on a large avocado/litchi/pecan estate just outside Nelspruit in an attempt to break the life cycle of this notorious pest. Another approach being tested was to tie pieces of hessian sacking around pecan tree trunks. Large numbers of stinkbugs aggregated underneath these overwintering “traps” during late autumn where they could either be mechanically destroyed or sprayed with a contact insecticide. With this technique only a very small part of the tree is sprayed, thereby reducing unintentional environmental contamination considerably.

Our resesearch also showed that these stink bugs migrate between the various crops with ease, which means that the problem will have to be addressed on a regional basis encompassing all known fruit tree host plants, rather than on an individual crop basis.

New pest-resistant wheat lines made available to wheat breeders

A 20-year breeding programme at the Agricultural Research Council has produced ten new high-quality wheat breeding lines with a unique combination of resistance to both Russian wheat aphid (RWA, *Diuraphis noxia*) and three common cereal rust species (*Puccinia striiformis, Puccinia triticina f. sp. tritici and Puccinia graminis f. sp. tritici*). Where RWA and cereal rust occur together, they can devastate a cereal crop, therefore the need for resistance to both the pest and disease.

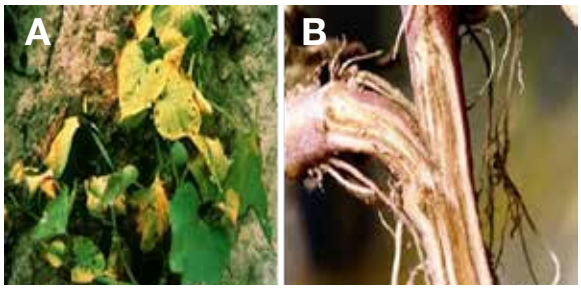
The baking quality of all ten lines is suitable for home and commercial baking. These new lines have been accessioned with the National Small Grain Germplasm Collection, and five were released internationally and accessioned in the USA. These breeding lines can now be used in commercial breeding programmes.

Identifying new fungal diseases that threaten crops

Effective disease control strategies to limit crop damage and yield loss, including the breeding of resistant or tolerant cultivars, can only be developed when the organism causing the disease has been accurately identified.

Sweet potato plays an important role as a traditional and food security crop in sub-Saharan Africa, but it is subject to infection by various debilitating fungal diseases. A project by the Agricultural Research Council has characterised the various forms of Fusarium oxysporum, the fungus responsible for the economically-threatening Fusarium wilt (FW) in sweet potato. They found that there are four different genetic groups of the fungus present in South Africa. These results will significantly assist in the development of sweet potato cultivars that are resistant to FW through breeding programmes, because the pathogen to be used in the screening and selection process during field trial evaluations for FW resistant sweet potato cultivars can now be correctly identified. This will ultimately result in increased sweet potato yields, and contribute to higher income generation and improved nutrition, particularly for smallholder farmers.

Alternaria blight (AB) of sweet potato is a new, recently reported fungus disease in South Africa and currrently limited to certain areas in Gauteng. Symptoms include leaf spot/blight, petiole spot and stem blight, and losses of 10-30% can be ascribed to AB infestation. It became evident that the majority of imported and recently released orange-fleshed sweet potato cultivars from the Agricultural Research Council's breeding programme to address vitamin A deficiency in rural communities, is susceptible to this new disease.



Leaf yellowing and wilting (A), and brown discoloration of vascular tissues (B) in sweet potato caused by Fusarium Wilt.

A detailed study of the disease was therefore undertaken in Gauteng to develop different control strategies against AB, should it spread to other areas within the province, and to better understand which pathogens cause AB. Field assessment of sweet potato cultivars/breeding lines for tolerance to AB showed that W119 is the most susceptible cultivar. Field trials also identified some fungicides that gave good control of the disease. Taxonomic studies and pathogenicity tests showed that four fungal species caused AB symptoms, including two newly described species. This information will be used to breed sweet potato cultivars that are resistant to AB. The results also enabled researchers to develop simple Integrated Disease Management (IDM) strategies for the control of AB for both small holder and commercial sweet potato growers in Gauteng.

Fungal diseases also cause serious damage to subtropical fruit crops, therefore regular surveys are conducted to identify new threats timeously. Researchers from the Agricultural Research Council have identified a new species of fungus, *Daldinia eschscholzii*, on South African orange trees. The fungus was previously associated with a disease in lemon trees, but this is the first time it has been identified on oranges. Three new species of fungus were also identified on guavas showing symptoms of pink spot disease. Previously, it was thought that

pink spot disease was caused by *Colletotrichum gloeosproides*. Results from recent surveys in the Lowveld area of Mpumalanga suggested that Mycosphaerella species also form part of the disease complex causing pink spot symptoms. This is the first report of *Mycosphaerella* species associated with guava in South Africa

Research focusing on Production Systems

Farmers can only realise the full yield potential of their crops and contribute to food production and food security if they use optimal production methods. To this end, the Agricultural Research Council conducts research on all aspects of crop production systems to ensure that South African farmers remain competitive in local and international markets.

Improved production of queen pineapple

Production of queen pineapples, *Ananas comosus*, is often unsatisfactory because of difficulties with plant propagation and low yield. Pineapples reproduce through suckers (small plants growing off of a mother plant). Researchers of the Agricultural Research Council investigating ways to improve sucker growth and quality, found that fertilising with ammonium sulphate after harvest and letting suckers grow for up to eight months on the mother plant resulted in longer and healthier suckers. When planted, these suckers survived better, the plants were healthier, gave a higher fruit yield, and produced longer, heavier and more suckers for the next growth cycle.

Plant mortality had a significant effect on fruit yield loss in these trials and can be eliminated by refinement of planting and fertilizing practices. Symptoms to watch out for include wilted plants, plants toppling over, suckers planted too deep, plants growing slowly, plants with funnel rot and plants that were dying back. Improved production of pineapples will impact on yield and profit margins, to the benefit of the farmers and the Industry.

Managing water stress in crops

South Africa is a dry country and the availability of water for agriculture is under increasing pressure. Crop production will only be sustainable with maximum efficiency of water use. The Agricultural Research Council conducts research to provide farmers with information to optimize irrigation on a variety of crops.

The macadamia industry has grown exponentially over the last few years. Research by the Agricultural Research Council has identified several specific measures of plant stress that can be used to guide irrigation strategies for macadamia crops. Field trials in different parts of South Africa tested various soil and plant stress parameters as indicators of plant water status. Researchers found that midday water stress in the trunks of macadamia trees can be used to calibrate irrigation systems. This information will help to improve yield and save water on South African macadamia farms.

Many South African plants are used in traditional medicine and also for the production of internationally marketed herbal remedies for the treatment of various ailments. These plants are increasingly being grown in commercial plantations to meet increased demand and prevent them from going extinct in the wild. The chemical composition and medicinal activity of a plant is affected by many environmental factors, including water stress. Researchers from the Agricultural Research Council tested the effects of different irrigation and nitrogen fertilizer levels on the indigenous medicinal plant *Pelargonium sidoides*. They showed that watering at 30% water availability provided the best yield; however, there was no difference in yield between the different rates of nitrogen fertilizer. Nuclear magnetic resonance (NMR) imaging showed that the chemical profile of *P. sidoides* was influenced by water stress, but not by nitrogen levels. The effect of water stress on medicinal activity is still to be investigated. This will inform cultivation strategies as part of the Agricultural Research Council's initiative to promote indigenous medicinal plant agriculture as a means of poverty alleviation in rural areas.

Optimising herbicide use for South African conditions

It is estimated that weed control in South Africa costs more than R100 million annually. Water quality differs significantly in the main small grain producing areas of South Africa, and it is known to affect the efficacy of herbicides. Many producers use borehole water for spraying. Borehole water can be classified as hard water, but it also tends to be brackish. When this water is used with certain herbicides, antagonism

occurs and the total percentage of weed control is significantly reduced.

Researchers of the Agricultural Research Council have identified the best combinations of herbicides for spraying small grain fields that include herbicides from most mode of action groups used in small grain production. Glyphosate, the most widely-used herbicide in South Africa, is also greatly affected by water quality. Extensive research proved that the addition of ammonium sulphate to glyphosate mixtures can significantly overcome the effect of poor water quality, but that correct choices must be made when choosing these products. This research enable farmers to minimize herbicide input costs while improving weed control.

Climate change poses serious threat for agricultural sector

The Agricultural Research Council is part of a broad international collaboration to model the impact of climate change on Southern African agriculture, which has provided a gloomy outlook for agriculture in the region.

The model, based on a wealth of data gathered from stations around Southern Africa, points to a steady increase in temperature in the region, along with erratic rainfall patterns. The model predicts productivity losses of 10-15% for commercial maize, farm revenue losses of up 30% per hectare, and poverty increases of 7-35%. However, it also predicted that adopting proper adaptation measures could almost completely prevent these losses. This information will inform strategies for the agricultural sector to mitigate or adapt to climate change.

Research focusing on Agro-processing and reducing post-harvest loss

Processing adds value to agricultural crops and also creates employment, thereby contributing to poverty alleviation. The Agricultural Research Council conducts research on storage, packaging, and increase shelf-life and provides training in aspects of storage, packaging, increased self-life as well as in the processing of a wide variety of crops and medicinal plants.

Sulphur dioxide sheets protect litchis against fungi

The Agricultural Research Council conducted a long-term study on the efficacy of slow-release sulphur dioxide (SO2) sheets in different litchi cartons to prevent post-harvest fungal infections in packed litchis. A standardized 'one sheet fits all carton types' slow release sulphur dioxide sheet (GrapetekTM) was found to significantly reduce fungal infections during the mid to late stages of the shelf life period. An interaction between the sheet and carton type was also recorded. Generally, well ventilated export cartons gave better results than poorly ventilated local market cartons. This new technology could vastly reduce fungal infections in litchi fruit being exported, thus increasing the profitability of the industry and ensuring higher forex returns for the country.

Getting the best out of *Moringa*

Moringa oleifera plants have antioxidant, antimicrobial and phytochemical properties and have attracted much attention for serving as alternative crops in marginal communities in developing countries. *M. oleifera*, or the horseradish tree, is a pan-tropical species that is known by such regional names as benzolive, drumstick tree, kelor, marango, mlonge, mulangay, nébéday, saijhan, and sajna.

The Agricultural Research Council tested 13 *Moringa oleifera* cultivars from Thailand, Taiwan, the USA and South Africa for antioxidant, antimicrobial and other chemical properties. A Thai cultivar had the highest antioxidant activity, while all cultivars showed good antibacterial activity and low antifungal activity. A Thai cultivar and a South African cultivar showed the highest level of phenols (bioactive chemicals). Overall, Thai cultivars were best suited to South African conditions. This information is crucial, as only plants with proven antioxidant, antimicrobial and other chemical properties should be used for further processing to ensure that the anticipated properties are in the final product

Agro-processing of medicinal plants

To facilitate research on best practices for processing medicinal plants, a blue-print agro-processing facility was installed at the Agricultural Research Council's premises at Roodeplaat. It consists of a pre-processing unit (washing, striping, sorting, etc.); a drying unit; a processing unit (grinding); a packaging unit (powder

filling, tea bag and capsule making machine); a quality control unit (shelf life tests, efficacy, safety, odour, colour, rancidity, tannin, dilatability, pulvis uniformity, solid weight in tinctures, fingerprinting and DNA bar-coding); a storage unit; an office; and ablution facilities. All the units in the facility conform to the World Health Organisation Guidelines on Good Agricultural Practises for Medicinal Plants (GAPMP) with regards to processing. The facility has the potential to generate income through services, such as determination of proximate nutritional content, mineral content, heavy metals content, phytochemical analysis and compound identification. Two replica facilities are being installed in Tooseng (Limpopo) and Hammanskraal (Gauteng), and will consist of similar functional units, except that they will not have a quality control unit.

From left to right: Capsule-making machine, freeze-dryer, and teabag-making machine installed at the Agricultural Research Council's blueprint agro-processing facility for medicinal plants.

Novel products created using indigenous African fruits

Indigenous fruit trees are ideally suited to semi-arid climatic zones, which make up a large part of South Africa. Indigenous crops can enhance food security, increase global competitiveness and increase diversification of the agricultural sector. There is enormous scope for the development of indigenous products or by-products containing indigenous fruits that could potentially attain niche status.

The Agricultural Research Council is supporting the development and commercialisation of indigenous fruit products through research and training. A number of products were developed and evaluated, namely fruit nectars, a variety of frozen products such as ice creams, sweets, jams, dried fruit rolls and liquors. The fruit nectars were made using pulp from various indigenous fruits. Fruit nectar blends of indigenous and conventional fruits such as mango, guava, litchi and apple were also produced. Pulp from four indigenous fruit species was used to produce a number of novel products including frozen yogurt, full cream and low fat ice cream, sorbets and sweets. All the products were reviewed by tasting panels and found to offer good potential for further commercial development. To this end, the Agricultural Research Council also provided training in fruit processing in a number of rural communities in the Eastern Cape.

Research to produce wines with more complex flavours

In an increasingly competitive global market, due to emerging wine producing countries such as India and China and the effects of global warming, providing the South African wine industry with more tools to improve wine complexity and quality is of critical importance. Research by the Agricultural Research Council showed that non-*Saccharomyces* yeasts used in combination with traditional commercial *Saccharomyces* yeasts produced wines with more complex flavours. Lactic acid bacteria also affected wine flavour and quality, but not as much as the non-*Saccharomyces* yeasts.

Research continues, but this knowledge will be used to help South African winemakers produce more complex, high quality wines that can compete successfully on the global market. Helping the wine industry to remain competitive and profitable will also contribute to retaining jobs in the industry.

Making Honeybush tea less bitter

Honeybush tea is produced from indigenous fynbos plants belonging to the genus *Cyclopia*. Although the industry is small compared to the rooibos tea industry, it contributes to job creation in the Western and Eastern Cape provinces. A number of health-promoting properties, associated with the phenolic composition of the plants, have been reported for *Cyclopia* spp extracts. This led to increased demand for honeybush tea. After harvesting, the plant material is typically subjected to a high-temperature oxidation process, commonly referred to as "fermentation", required for the development of the sought-after sensory properties of the herbal tea product. However, the levels of phenolic compounds in honeybush are significantly reduced during "fermentation".

Bitterness is a problem in honeybush tea, especially tea made from *Cyclopia genistoides*. Many of the phenolic compounds that are linked to the health-promoting properties of honeybush extracts also show an association with bitterness. The challenge is to maximise the retention of the phenolic compounds during "fermentation", whilst minimizing the bitter intensity of infusions. A bitterness prediction model, based on phenolic content and descriptive sensory analysis of *Cyclopia* herbal teas, was developed. A thermal degradation kinetic model was also developed to predict the levels of selected health-promoting compounds remaining after "fermentation" of the plant material. These models can be used in the evaluation of new selections of *C. genistoides* to identify selections with a low bitterness potential.

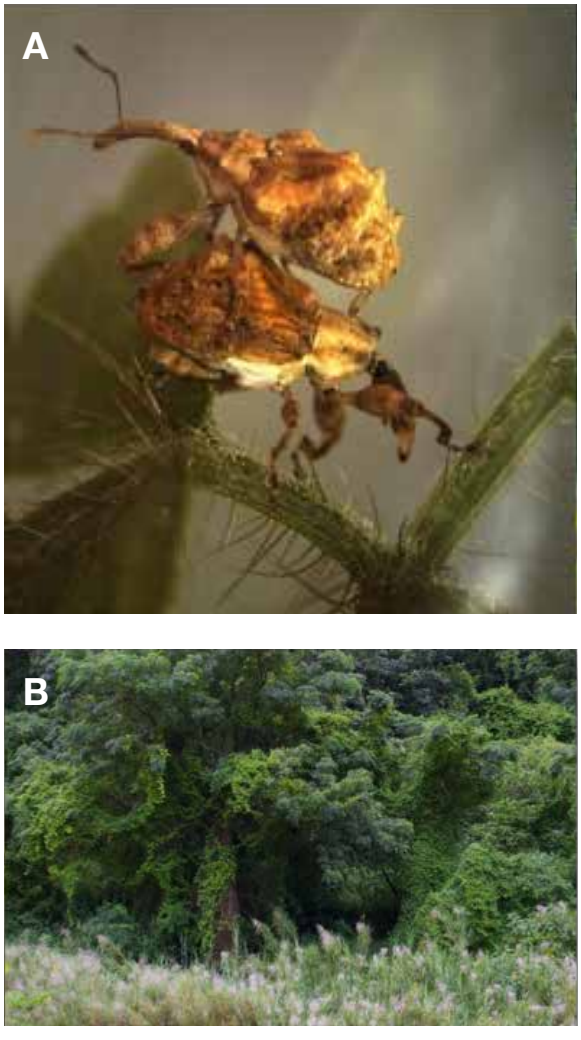
Research and services focusing on sustainable use, conservation and protection of natural resources

Conservation of our unique biodiversity requires control of invasive plant and animal species, taxonomic services to identify beneficial as well as pest organisms (insects, mites, spiders, fungi, bacteria) and the maintenance of reference collections and genebanks containing valuable plants and micro-organisms for breeding programmes.

New biological control agents for invasive plants released

Alien invasive plants threaten our unique biodiversity by crowding out indigenous plants and robbing the organisms that depend on them of their habitat and food sources. These plants also threaten agriculture; inedible or toxic weeds destroy grazing or taint the flesh and milk of livestock that consume it, weeds in cultivated crops must be controlled at great cost to farmers, while trees and shrubs in water catchments and river beds deplete scarce water sources. Water weeds choking up rivers and dams result in large scale die-off of fish and other aquatic life. Apart from cultivated fields and orchards, controlling invasive plants with herbicides is mostly not possible due to the large scale of infestations, inaccessible terrain and the negative impact of herbicides on the natural environment. Releasing diseases and insects from the invasive plants' countries of origin provides an environmentally sustainable option for controlling these plants.

Since late 2013, the Agricultural Research Council has released several new biocontrol agents from quarantine, which appear to be having the desired effect on several invasive plant targets. Biocontrol agents have been released for balloon vine (*Cardiospermum grandiflorum)*, lantana (*Lantana camara*), madeira vine (*Anredera cordifolia*), mexican sunflower and red sunflower (*Tithonia spp*.), parthenium weed (*Parthenium hysterophorus*), pompom weed (*Campuloclinium macrocephalum*), rooikrans (*Acacia cyclops*), silky hakea (*Hakea sericea*), water hyacinth (*Eichhornia crassipes*) and yellow bells (Tecoma stans). The biocontrol agents appear to be having an effect on balloon vine, lantana and rooikrans. The biocontrol agents for the other invasive species have become established, but there is no clear evidence of a controlling effect yet.



Seed-feeding weevils (A) released to control balloon vine (Cardiospermum grandiflorum) (B)

The Agricultural Research Council is also working on new biocontrol agents for chromolaena (*Chromolaena odorata*), honey mesquite (*Prosopis glandulosa*) and hydrilla (*Hydrilla verticillata)*. Biocontrol agents for these invasive species are currently in quarantine and will be released once host-specificity tests confirm that they do not pose a threat to indigenous or crop plants. Continued invasive plant monitoring and a biocontrol programme will lessen the environmental impact of invasive plants in South Africa.

Taxonomic identification services

The Agricultural Research Council's Biosystematics unit renders an indispensable taxonomic identification service not only to South Africa, but to the whole of the African continent. Correct identification of pests and diseases is crucial for crop and animal production. This unit has obtained two state-of-the-art microscope imaging systems through the National Equipment Programme. The new system will enable researchers to make digital records of collected specimens, streamlining the biological collections process and allowing for easier dissemination of taxonomic information. This new imaging system will also be available to users outside of the Agricultural Research Council.

The Biosystematics unit is also tasked with maintaining and updating National Reference Collections of insects, spiders, mites, nematodes, fungi, plant pathogenic and plant protecting bacteria, as well as plant pathogenic viruses. Good progress was made in creating a database of South Africa's biodiversity through meticulous documentation. The past year's activities have yielded a number of new species which may hold promise for biotechnological applications. During 2014, the collections team conducted surveys in grasslands as well as agricultural land within the grassland biome of South Africa. This process identified several new species of bee, as well as 35 nitrogen-fixing rhizobacteria, which may be useful for improved soil management.

Another major achievement was entering collection records into a central database. Researchers added 40 000 fungi, almost 200 000 nematodes, over 6000 parasitic mites, and 13 500 virus antisera. More than 12 000 dung beetle specimens were recorded, representing a major portion of Africa's dung beetle diversity. National Reference Collections also contributed to the International Barcoding of Life initiative by creating DNA barcodes for many South African fungal species.

Maintaining genebanks and germplasm collections

The Agricultural Research Council has built up unique germplasm collections and genebanks for cultivated crops as well as various indigenous food crops and medicinal plants. These collections provide essential material for the Agricultural Research Council's various breeding programmes to create cultivars suited to South African conditions and/or that provide South African farmers with a competitive edge in the market. Plant material is also made available to industry and private breeders, earning additional income for the Agricultural Research Council.

The National Small Grain Germplasm Collection has a total of 18 404 accessions, comprising of wheat (15 791 accessions), oats (1113), barley (1 006), rye (57) and triticale (437). In 2014, 2176 cultivars / lines were rejuvenated and 4434 lines were evaluated by pre-breeders, entomologists and pathologists for resistance to pests and diseases at different locations in South Africa. Accessions with good resistance were made available for use by South African breeders and researchers.

African vegetables are promising crops for the South African context as they are usually cheaper and less water-intensive to cultivate. The Agricultural Research Council's African Vegetable Genebank has over 700 cultivars of more than 60 different species of indigenous vegetables. These include amaranth (thepe, imbuya), spider flower (lerotho), jute (delele), nightshade (muxe), cowpea, amadumbi, cassava, Livingston potato and Hausa potato. Researchers have compared a number of cowpea and amaranth cultivars for various important agronomic traits, with the aim of finding good parent material for a breeding programme. This analysis included nutritional content. Other activities at the Genebank included seed production (over 80 kilograms of seed was produced in the last four years) and providing plant material and advice to various South African research projects and field trials.

The Agricultural Research Council has maintained and built upon a long-standing record of quality in potato breeding and quarantine services. These invaluable services allow the R4.5 billion South African potato industry to function effectively and ensure that

potatoes remain disease-free. In the last year, the Agricultural Research Council maintained more than 70 accessions for private clients in laboratory facilities and provided more than 50 000 samples for mass propagation to potato growers around South Africa. The Agricultural Research Council also quarantined and processed 23 new potato cultivars imported by private companies. An inspection by the Department of Agriculture, Forestry and Fisheries confirmed that the Agricultural Research Council's quarantine facilities continued to meet international standards.

A young researcher from the Agricultural Research Council collected DNA from around 200 pear cultivars and more than 500 apple cultivars in the Agricultural Research Council genebank collections. The resulting DNA fingerprints were compared to international fingerprints, revealing a number of mislabelled cultivars in South African collections. These have now been correctly identified. The pome fruit industry also asked the Agricultural Research Council to authenticate various cultivars and resolve mix-ups. This will give plant breeders more confidence in selecting breeding material.

The Agricultural Research Council has added a number of new cultivars to their collection of subtropical fruits. In total, 82 new cultivars were added to the genebank. Most of these were international macadamia cultivars, but pineapple, guava, papaya, granadilla, coffee, and several indigenous plants were also included. More macadamia cultivars and several strains of litchi are currently being grown in quarantine greenhouses in preparation for inclusion into the database. Other activities in this area include the release of several new virus-free citrus cultivars for general cultivation, and the distribution of large numbers of pecan and macadamia cuttings to nurseries around the country.

Translating research results to support agrarian transformation and efficiency and competiveness of agriculture sector

Transformation in the agricultural sector will only be successful if new farmers are empowered with the necessary knowledge and skills to compete on local and international markets. The Agricultural Research Council is committed to support this transformation by providing training in primary crop production as well as in agro-processing to add value to crops. Training is based largely on knowledge generated by research done by the Agricultural Research Council. In this financial year the ARC supported more than 9000 Small holder farmers of which crop division supported more than 2500 smallholder farmers. The farmers were supported in a range of production systems. Details are provided below of a number of these initiatives.

Sweet potatoes to counter malnutrition

Orange-fleshed sweet potatoes can play a vital role to address vitamin A deficiencies in certain South African populations. High quality, disease-free planting material improves household food security and increases economic returns for sweet potato farmers. The Agricultural Research Council supplied more than 2000 established plants, nearly 15 000 seedlings, and almost 1 000 cuttings to Department of Rural Development and Land Reform nurseries around South Africa. These orange-fleshed (Bophelo and Impilo) and white-fleshed (Ndou and Monate) varieties have all been confirmed as disease-free varieties by the Agricultural Research Council.

To promote the use of orange-fleshed sweet potato, the Agricultural Research Council provided training in the nutritional value, production practices and processing of orange-fleshed sweet potato to four groups of people in Eastern Cape rural areas as part of existing rural development projects. The Agricultural Research Council also made information about the new cultivars available through open days and at conferences such as the Africa for African Women's Conference.

ARC sweet potato cultivar Bophelo, the market leader in orange-fleshed sweet potato

Supporting rural development in the Eastern Cape

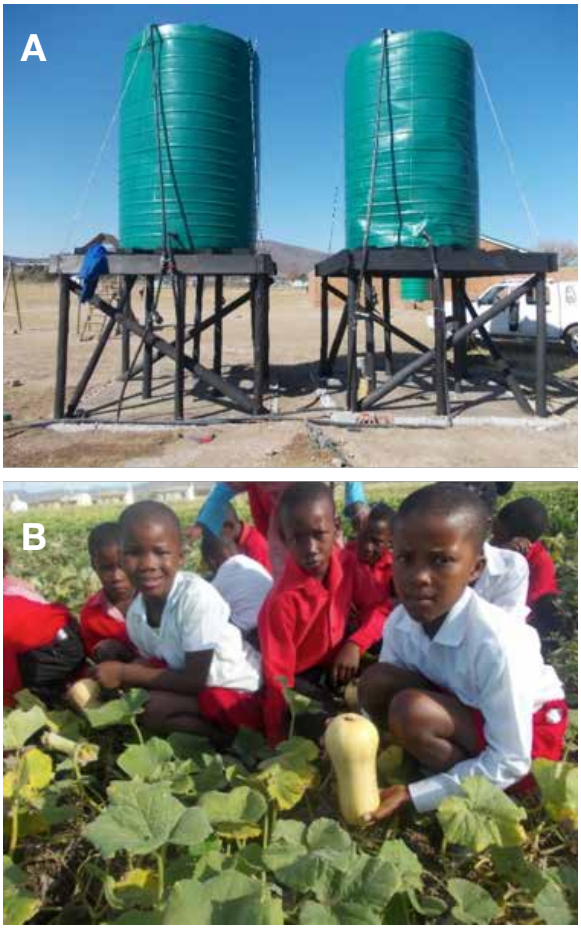
As part of the Integrated Village Renewal Programme IVRP) to improve the economic conditions in South Africa's rural areas, the Agricultural Research Council has provided technology transfer and skills development through training workshops.

The Agricultural Research Council distributed and planted more than 12 000 subtropical fruit trees in villages around South Africa in the last year, taking the total number of trees planted to 140 000. This has benefitted 48 villages in the Eastern Cape, 41 of which are village co-operatives. Technical training was provided to smallholder farmers in banana production, tree pruning, orchard layout and agricultural record-keeping. Furthermore, training and mentoring was provided to village monitors to better assist rural farming cooperatives.

In addition to training in primary fruit production, the IVRP also entails building either a packhouse, agro-processing facility or agri-centre in some of the villages. The agro-processing facilities are empowering local women through employment and product development. With training provided by the Agricultural Research Council, five villages in the Eastern Cape are now producing jams and marmalades from fruit grown in the area. These products are being sold to local shops and guesthouses. In five other villages, rural communities are producing soaps using essential oils from herbs grown near the village

Under the auspices of the IVRP, the Agricultural Research Council also provides management skills to smallholder cooperatives through training in basic bookkeeping, information on how to run a co-operative, and other administrative and financial skills. These skills will enable the co-operatives to remain profitable and become independent of government support in years to come. Most of the villages in the IVRP have completed the training and are currently registering their co-operative with the Agricultural Research Council.

In addition to the IVRP, the Agricultural Research Council is providing training to smallholder farmers in the Hankey area. The Agricultural Research Council, in collaboration with the Department of Science and Technology, also provided water storage facilities, drip irrigation systems and gardening tools to five schools in water-scarce areas of the Eastern Cape. The intervention will improve the quality, quantity and variety of vegetables produced in school gardens. Healthy fruit and vegetables for school feeding programmes contribute to better nutrition for learners.



Irrigation systems and tools (A) provided to schools in the Chris Hani district (Eastern Cape) improved production in school vegetable gardens (B).

Helping emerging wine farmers on the road to success

The Agricultural Research Council has been involved in training and technology transfer for emerging farmers of the Eksteenskuil community in the Northern Cape since 1997. Many of these farmers already cultivated raisin and some wine grapes, but they were hampered by the lack of capital for expansion. During the last three years more wine and raisin grape vineyards were established with funding from the Provincial Department of Agriculture and funding obtained from European Union by the Eksteenskuil

Agriculture Cooperation. Raisin grape farmers are selling their products to South African Dried Fruit (SAD) and Redsun raisin companies. Farmers who deliver grapes to Oranjerivier Wynkelders (OWK) also became members of this cooperative, which gives them access to its extension and support services. To ensure that these farmers derive the full financial benefit from cultivating wine grapes, the Agricultural Research Council presented annual training sessions since 2012 to train farmers to develop and prune their new vineyards. These training sessions have also been attended by emerging farmers from Releaboga on Kanoneiland. Improved vineyard management results in higher yield and higher grape quality, which means farmers get paid more for their grapes by the winery.

Weed management is a huge problem for these farmers, particularly as their vineyards are flood irrigated. Young vines overgrown by weeds take longer than normal to come into full production and weed competition decreases the yield of mature grapevines. To improve weed control, the Agricultural Research Council and Terason presented a workshop to train farmers how to calibrate a herbicide spray pump, how to ensure that the correct dosage is applied and how to handle and apply agrochemicals safely.

Certificates in the safe handling of agrochemicals were presented to participants who passed an exam. Many of these farmers' products are sold and exported through Fairtrade. These certificates will help to ensure market access for their products. Providing emerging farmers with knowledge and skills to manage their vineyards optimally will enable them to generate a higher income and improve their social and economic welfare. Improving and expanding their farming enterprises may also lead to further job creation in the community.

Farmers at Eksteenskuil suckering young grapevines.

Mamre gets new agricultural infrastructure projects

Seedling nursery established at Mamre in the Western Cape.

Building agri-parks for agricultural development

The Agricultural Research Council has launched a large-scale agricultural development programme in 14 of the poorest municipalities in South Africa. The project is establishing gardens, fruit and vegetable markets, processing facilities and nurseries to stimulate economic development.

After identifying the most promising areas for these agri-parks, the Agricultural Research Council project management team visited municipal and traditional authorities. The following designs have been developed: one large market, four vegetable nurseries, four mini markets and two agro-processing

facilities in Limpopo; two mini markets, one agro-processing facility and two vegetable nurseries in Mpumalanga; one large market, three mini markets, three agro-processing facilities and four vegetable nurseries in the Eastern Cape; and one large market, three mini markets, one agro-processing facility and four vegetable nurseries in the KwaZulu Natal.

Almost a million sweet potato plants and about 12000 fruit trees have already been distributed to agri-parks around the country. Natural resources for each area were audited to create crop suitability maps, and agricultural skills were audited to ascertain the training needs of each community.

The Agricultural Research Council provided training in nursery management, hydroponics, vegetable production, marketing, crop nutrition, control of pests, diseases and weeds, and irrigation for these Agri-Parks. In Limpopo, 406 people were trained; 100 in Mpumalanga; 336 in Eastern Cape and 300 in KwaZulu Natal. Retailers Fruit 'n Veg City and Woolworths have shown interest in buying fruit and vegetables from these recently-established agri-parks.

Enterprise development of sweet potatoes, African leafy vegetables and medicinal plants

The Enterprise Development projects are a joint venture by the ARC and the Department of Rural Development and Land Reform (DRDLR). The projects focus on the establishment of economically viable enterprises in six provinces, namely Eastern Cape, Gauteng, Limpopo, Mpumalanga, KwaZulu-Natal and North West. The medicinal plant project is also implemented in a seventh province, the Free State. The African leafy vegetable and medicinal plant projects commenced in April 2013, and the sweet potato project in November 2012, and are all envisaged to run for five years. The projects aim to address a number of key issues which affect the national economy, such as job creation and income generation, food security and malnutrition, poverty in rural areas, and rural development. Furthermore, the projects seek to achieve sustainable development, through empowering its beneficiaries and, hence, communities, to become self-sufficient and sustainable suppliers of good quality produce (fresh and/or processed) and planting material. The medicinal plant project has an additional objective of supporting environmental protection, because cultivation of medicinal plants relieves pressure on wild harvested plant populations.

The sweet potato project has established 14 vine nurseries and 184 sweet potato growers in the six provinces, where each beneficiary has planted between 0.5ha and 1ha of sweet potatoes. In establishing the enterprises, each farmer received 45 bags per ha of virus and disease tested vines, as well as training. Three farmers received 1 boom sprayer each, and the other forms of infrastructure for the farmers, such as fencing and irrigation material, are in the process of procurement. Vine growers have sold vines to sweet potato growers within and outside the project, and a total of **2 195 bags** (excluding sales of single vines) were sold in the 2014/2015 financial year. Sweet potato growers located in warmer areas, like Limpopo, KwaZulu-Natal and Gauteng, who planted before November, are currently selling their produce in both formal and informal markets. One of the project beneficiaries in Limpopo sold about 20 tonnes of sweet potato at an average of R3 000/t. Considering that farmers are getting some income from selling their produce, it can be safely said that the project has positively influenced income generation among farmers.

The African Leafy vegetables project has established 65 enterprises in the six provinces. All beneficiaries received training on their farms, where all members in group-managed enterprises were trained, and those in individual managed enterprises were also trained, together with their employees. Winter and summer indigenous vegetables like amaranth, cowpeas, kale, okra, corchorus, pumpkin leaves and Bambara nuts are produced. All of these plants are rich in micronutrients, therefore their consumption helps to address malnutrition. Project beneficiaries who sold their produce earned some income from the production of these vegetables.

(A and B) *Sweet potato vine nursery of Mr Dibetso, North West Province*

The medicinal plants project has established 12 beneficiaries in seven provinces who are growing Moringa, Artemisia afra, Artemisia annua, African ginger and Sutherlandia. In the 2014/2015 financial year, more than 2000 seedlings have been distributed to the beneficiaries and all beneficiaries received on-site training on their farms. Workshops that allow knowledge sharing between farmers and researchers are also held. A market survey carried out in Limpopo, Gauteng and North West showed that medicinal plant growers can earn a substantial income by selling their produce to formal markets rather than to informal markets. Therefore, meetings with formal processors have been arranged to identify possible market linkages. The project aims to increase the area cultivated by the current beneficiaries and to increase the number of beneficiaries per province. Beneficiaries will continue to get support in terms of inputs and mentorship, but in order to discourage dependency amongst farmers, those farmers receiving support in the second year are required to make a percentage contribution towards the purchase of planting material. Possibilities of value adding and the benefits thereof will be investigated.

Despite good progress, a number of challenges were encountered, including a lack of commitment by some farmers. Farmers who withdraw from the project after infrastructure development on their farms disrupt progress, therefore it is suggested that contracts be signed with beneficiaries to ensure their commitment to the project. Marketing challenges have slowed progress in production of medicinal plants and African leafy vegetables. Relatively few people are familiar with indigenous vegetables, implying the need for promotional campaigns. Processors of medicinal plants are particular about product quality and reliable delivery. This highlights the need for research aimed at standardizing production practices and quality control.

Overview and Highlights of Animal Sciences

The Animal Health, Production and Improvement Programme of the Agricultural Research Council largely supports the following:

- Strategic Goal 2 that aims to improve the productivity, production, competitiveness and sustainability of livestock based agriculture
- Strategic Goal 3 that aims to enhance the productive use and conservation of natural resources
- Strategic Goal 4 that aims to translate research results to support agrarian transformation and the efficiency and competitiveness of the agricultural sector in South Africa.

In addition, the division serves as the custodian of national assets and manages certain national services on behalf of the Department of Science and Technology and Department of Agriculture, Forestry and Fisheries like the National Animal Improvement Schemes which include the Kaonafatso ya Dikgomo Scheme, a special purpose vehicle to improve livestock productivity in the small holder or emerging farming sector.

Research is carried out on animal production and animal health. Although the main sites of operation for the Programme are at Irene, in the south of Pretoria and at Onderstepoort, in the north west of Pretoria, it has satellite stations that are strategically positioned in almost all the nine provinces of South Africa. Achievements attained by this Programme under various Agricultural Research Council research and development and service delivery programmes for the financial year 2014/15 are highlighted below.

Improved beef production efficiency with reduced carbon footprint

The livestock industry has often been unfairly cited in the popular media as one of the main culprits for global warming and the consequent climate change. This view or perception has motivated the researchers to pursue research that would provide unequivocal and objective answers to actual contribution of livestock towards global warming. Despite the lack of consensus on the actual contribution of livestock to greenhouse gases, there is general agreement that mitigation strategies for global warming should be sought. There is thus a need to investigate novel and alternative breeding objectives to improve the production efficiency of beef cattle, which can play a significant role in reducing enteric methane production from beef production in support of climate smart agriculture. The project sought to identify novelty traits that could be used as selection criteria to improve cow-calf efficiency and to describe cow efficiency in extensive systems that will support climate-smart beef production. The traits investigated were calf weaning weight as trait of the dam and kilogram calf weaned per Large Stock Unit (LSU); the latter trait being a measure that expresses performance per constant unit (LSU). The approach considered in this research is novel since no reference could be found in the literature where the mentioned traits as traits of the dam were considered in breeding objectives. The main conclusion from this study is that these traits can be used as possible selection criteria to increase the weaning weight of calves in relation to a cow LSU unit in extensive beef production systems. It is recommended that the combination of calf weight as a trait of the dam and dam weight are considered in selection index. Another alternative is to use the relationship between the weight of the calf produced and the estimated feed inputs required to sustain the cow using cow LSU. Normally, the traits in a selection index are weighed by their economic value. However, in this case the traits can be assigned weights that can be linked to carbon footprints or credits (sequestration) and not only economic weights.

Another trait investigated in this study was feed efficiency since it is one of the main profit drivers in a beef enterprise. Traditionally, feed efficiency is expressed as a ratio of feed to growth and this measure is referred to as feed conversion ratio (FCR). Feed efficiency expressed in this manner is however not an appropriate selection criteria since any attempt to increase growth rate would be associated with an increase in feed intake and therefore not lead to improvement in feed efficiency. Therefore, alternative efficiency traits have also been investigated, viz. residual feed intake (RFI), sometimes referred to as net feed intake; and residual daily gain (RDG). Whereas feed conversion ratio can be improved by either better growth or lower levels of intake or both, RFI is improved by reducing feed intake without changing growth. Selection for lower RFI differs from other feed efficiency traits such as feed conversion ratio and feed efficiency, since it is independent of growth and body weight, thus not leading to increased maintenance requirements in mature animals. There is also a positive correlation between RFI and methane production, meaning that low RFI animals produce less methane, thus reducing the carbon footprint of

beef. Likewise, selection for RDG will improve growth without affecting feed intake. Selection for both these traits will support climate-smart beef production. Both RFI and RDG hold benefits as "true" efficiency traits. RFI will decrease intake without affecting growth and RDG will improve growth without affecting feed intake. Unfortunately, selection based on RFI and RDG provide different ranking of animals. Thus, the use of a selection index is proposed as an outcome of this study as an approach for breaking this antagonism. However, applying economic weights to the estimated breeding value for average daily gain and daily feed intake directly is straightforward and likely to be most transparent to farmers when compared to selection indexes using residual measures of efficiency. These alternatives are under investigation and may be implemented as early as 2016 as more objective measure than currently used to identify bulls that qualify for the Agricultural Research Council's Special Performance Test Class Awards.

Afrikaner cattle under extensive beef production system

Braford cattle under extensive beef production system

Application of DNA technology in animal forensics

The Agricultural Research Council is applying science to combat stock theft. For instance, the Animal Genetics Laboratory of the Animal Production provides routine DNA profiling services to the livestock industry. Furthermore, this service is also rendered to the South African Police Service and Police services of other Southern African countries. For the year under review, 740 stock theft cases with 3832 exhibits were received from South African Police Service (SAPS). The exhibits included meat, blood, hair, blood stain from the clothes of suspects, blood stain from grasses and soil. Out of 740 cases, 569 cases with 2867 exhibits were completed and presented in the court for prosecutions. However, the results were inconclusive for 11 of the cases due to poor DNA sources in the exhibits. Majority of the cases were from sheep, followed by cattle disputes in communal farmers and also unbranded animals in the auctions. The recovery rate of cattle and horses are higher compared to other species because most cases are disputes of live animals, unlike most of the cases in sheep and goats where animals are mostly found or recovered after slaughter. Recently, the number of cases received by the laboratory has increased due to convictions resulting from the application of DNA technology. In addition, the Agricultural Research Council has entered into a 2-year contract for provision of DNA Forensic services to the SAPS.

Some of the stock theft case exhibits that the Agricultural Research Council assisted with

The role of herbivores in facilitating seed germination and seedling recruitment of woody plants

South Africa is richly endowed with natural grazing land and therefore livestock production is an important agricultural activity. However, the recent trends in bush encroachment presents a challenge for livestock production and threatens to reduce both the quality and quantity of available grazing material. In an effort to understand the mechanisms involved in woody plant encroachment, an experiment to evaluate the effects of livestock (goats, sheep and cattle), diet quality, seed characteristics, grass competition and fire on germination and seedling recruitment of seeds of woody plants was conducted. The results of the experiment suggested that seed passage through the digestive tract of goats and cattle compared to untreated seeds played an important role in improving germination through seed scarification. Additionally, diet quality and seed species also had important effects on seed germination. The interaction of animal species and size, diet quality, and seed characteristics all played a major role in recovery of viable and scarified seeds either alone or in combination. However, seed recovery by livestock does not guarantee seedling establishment, survival and recruitment. Fire and grass mowing treatments affected seedling emergence, seedling survival and recruitment, most probably because of reduced grass competition, thereby reducing competition for resources between grasses and seedlings. It is evident from this study that domestic ruminants (goats, sheep and cattle) and the interactions of associated diet and seed species with different characteristics play an important role in the recovery of viable seeds; together these may facilitate woody plant encroachment by enhancing seedling emergence. For this reason, herbivores have the potential to disperse viable seeds away from the parent tree, which will favour spreading of seeds where competition with adult trees is minimal. It is recommended that animals consuming woody plant seeds should be restricted to paddocks to reduce the possibility of woody plant encroachment throughout the ranch. Animals will consume pods of different woody plants; hence, they can only be restricted to paddocks for about 9 days. These results have significantly increased our understanding of mechanisms (especially on seed recovery by ruminants) underlying woody plant encroachment and will aid in developing management strategies for controlling bush encroachment in order to preserve the quality and quantity of the grasses in our rangelands.

Seed Germination, Seedling Establishment And Recruitment Experiment At Agricultural Research Council's Animal Production Experimental Farm In Roodeplaat

Seedling of Acacia nilotica, with seeds recovered from cattle, planted with no dung, grass, fire and trampling.

Small ruminant nutrition

Shortage of quality feeds is one of the major problems faced by smallholder livestock farmers and has a bearing on the profitability of this sector. Ruminants under this farming condition are fed on fibrous forages or agro-industrial by-products that are low in nutritional values. These animals are characterized by poor body conditions and reduced production. Fortunately, South Africa is rich in agro-industrial by-products such as pulps, potato wastes, non-conventional oil cakes (e.g. amarula oil cake, avocado oilcake, etc.) which can be used as supplements or alternative feed resources by these farmers. However, feeding

these resources to animals can be risky especially if they are not processed or treated before they are fed to the animals. These include the presence of anti-nutritional agents (e.g. mycotoxins, tannins, etc.) and possibly contamination by microbes. The objective of this research was to develop strategies to improve the feeding value of various forages and agro-industrial by-products. This includes the ensiling of forages (e.g. Lucerne, soybean, maize) and agro-industrial by-products (potato hash) with the aid of silage additives (enzymes and bacterial inoculants). It was observed that the addition of enzyme alone reduced the aerobic stability of silage and nutrient digestion by ruminants. However, the combination of enzyme and bacterial inoculant improved the nutritive value of forages. In addition, the use of traditional sealing film (polyethylene film used with tyres on top) was compared with silostop film (developed in Europe) during the ensiling of whole crop maize. Silage from the silostop was well preserved as indicated by visual observation and nutrient analysis. The implications of the results from this research are that: (i) the silostop technique will reduce costs involved in silage making because the silostop can be re-used and bacterial inoculation is not necessary. This will help smallholder farmers to overcome feed shortages and reduce nutrient losses through spoilage of the silage, (ii) the ensiling of by-products with the use of enzymes reduces the fiber fractions of the forage, hence can be fed to ruminants without adverse effects.

Enzymes and bacterial inoculants used

Sealing of silage bunker with either traditional film (black film with tyres) or silostop film (yellow film) for maize silage production. Trial conducted at Agricultural Research Council Animal Production farm section

The Agricultural Research Council's efforts to mitigate against or combat livestock diseases continue to make significant strides that contribute to the ideal of the country reaching self-sufficiency in livestock and poultry products. The following animal health highlights are examples of the support the ARC provides to the livestock industry in keeping it competitive.

Multipurpose vaccine for sub-Saharan Africa

The Agricultural Research Council succeeded in procuring the second phase of an international collaborative research grant, the Canadian International Food Security Research Fund grant, from the Canadian International Research Centre (IDRC) and the Canadian Department of Foreign Affairs, Trade and Development (DFATD). The primary objective of the research project is to develop new vaccines for livestock for use by subsistence and smallholder farmers in different parts of sub-Saharan Africa. The two main achievements in the first phase of the project were the development of a new attenuated lumpy skin disease (LSD) virus vaccine vector with a potential to protect sheep and goats against sheeppox and goatpox, respectively, and use of the vector to develop a LSD-Rift Valley fever-peste des petits ruminants (PPR) vaccine that protects sheep against PPR. Many smallholder farmers in Africa keep sheep and goats, the animal species most vulnerable to PPR. An effective vaccine will secure these animal assets of the smallholder farmers. Although the disease has not been reported in South Africa, the country will be better prepared to manage it, should

there be an incursion. A vaccine will most certainly limit spread of the disease to the locales of its initial occurrence, thereby lessening the threat of its entry into South Africa.

Because of the impressive progress in the first phase of this project which lasted for 3 years, the funding was extended this year for the next 41 months, ending in March 2018. This phase covers the final stages in development of the vaccine and its evaluation in target animals, manufacturing, uptake by intended beneficiaries, its compliance with regulations of the different countries in which the beneficiaries reside and field trials. Included in this phase are also large-scale training programmes and socio-economic studies. The value of the grant to Agricultural Research Council is R14m, with an additional R6m earmarked for the Human Sciences Research Council (HSRC) and R0,5m for Onderstepoort Biological Products (OBP), both institutions being integral collaborators in the project.

New synthetic vaccine for African horse-sickness

South Africa has a very big number of horses. Horses are important animals for work, sport and general utility, but they are susceptible to a number of diseases the most devastating one being African horse sickness. The disease is endemic in South Africa and occurs yearly. Therefore, there is a need to continuously improve the current vaccines used in managing this disease in South Africa.

The Agricultural Research Council had the first success in using a field isolate of African horse-sickness virus to prepare a synthetic virus by the reverse genetics system. The significance of the success in this approach to developing a vaccine means that the Agricultural Research Council is not confined to using only the historic strains of the virus, but that new isolates can also be used, as soon as they are found and isolated during disease outbreaks. This makes the vaccine genetically more relevant to the outbreak situations. Such vaccines are more likely to give better coverage than would otherwise be possible.

Sequence data with full coverage of the genomes of the 90 field isolates have been assembled for all the isolates. The analyses of this information reveals where important genetic variations have occurred over time and geographic location of each outbreak. Specific genes are now being targeted for detailed analysis of potential evidence of re-assortment and recombination events

Residue Testing

The Multi-hormone LC-MS/MS method to analyze synthetic steroids in serum and tissue, has been developed by the residue laboratory and is currently being validated. With the purchase of LC-MS/MS, the R2m worth of analysis previously outsourced will now be done internally at the Agricultural Research Council. The LC-MS/MS will greatly increase the sample throughput that will be handled by the residue laboratory.

The newly purchased state of the art LC-MS/MS to be used to analyse synthetic steroids in serum and tissue

Heartwater vaccine ready for production

Vaccination is one of the most effective ways of protecting animals against diseases. The Agricultural Research Council has been working to find safe and effective vaccines for heartwater, a devastating disease of cattle, sheep, goats and some wild ruminants. An attenuated (weakened) form of the organism responsible for this disease was found to be suitable for use as a vaccine. Trials of this live attenuated heartwater vaccine were conducted, during which it was shown that the vaccine is safe and protective. Because of these encouraging results, the production of its master seed and its storage, optimization of large scale production of the vaccine, and bacterial enumeration will be aligned

to Onderstepoort Biological Products (OBP) vaccine production and regulatory guidelines. A preliminary Standard Operating Procedure (SOP) for production of attenuated heartwater vaccine has been developed by the Agricultural Research Council, in readiness for use in collaboration with OBP. The SOP will ensure that there is no variation among batches of the vaccine produced.

Process and facility for production of Foot and Mouth Disease Vaccine

In 2010 the Agricultural Research Council embarked on a project to develop a new state-of-the-art foot and mouth disease (FMD) production process. Modern vaccine production uses the Suspension Production Process (SPP), as opposed to the obsolete Monolayer Production Process (MPP) previously used at the Agricultural Research Council. SPP technology has significant advantages over MPP in terms of production volume, contamination control and product quality. It has become the current standard best practice in the production of FMD vaccine. A major focus of the project was to implement a scalable SPP within the Agricultural Research Council. The primary objective of developing a suspension production process capable of consistently producing FMD antigens of the Southern African Territories (SAT) FMD viruses has been achieved. This SPP has been implemented using advanced fermenter technologies, allowing the Agricultural Research Council to produce limited volumes of FMD antigens for stockpiling. The SPP will be used as the basis of the design for the implementation of a production process in the new facility.

Previously, the Agricultural Research Council produced FMD vaccines using historic isolates adapted to be used in MPPs. The ability of some of these vaccine strains to protect vaccinated animals against challenge were found to be inadequate. To ensure that the new generation of vaccines are matched to the circulating field strains, isolates collected from recent FMD outbreaks were adapted to the production process. In addition to selecting isolates appropriate for use in South Africa, additional strains were also adapted based on the requirements of the broader Southern African Development Community (SADC) region. This effectively means that by using the newly adapted strains in the production of FMD vaccine the Agricultural Research Council will be able to supply a product tailored to the specific needs of the client, a service currently not available within the region.

A facility enabling large-scale SPP production does not currently exist in South Africa. The design of the new FMD vaccine production facility was delayed until the process development was at an advanced stage, because the outcome of the process development is what would inform the final design requirements. In 2014 the Agricultural Research Council appointed external consulting engineers to develop a concept layout and detailed design in preparation for construction of the new facility. This culminated in the development of an inception report detailing accurate user specification requirements, detailed design diagrams and a high level cost estimate. The Agricultural Research Council is now in a position to proceed with the final design and construction of the facility. During the construction of the new facility the Agricultural Research Council will be using existing infrastructure to produce limited quantities of FMD vaccines to establish a strategic stock pile to be used in the event of FMD outbreak. Once completed, the new FMD vaccine factory would be the most advanced production facility of its kind on the African continent and will be able to produce more that 20 million doses of vaccine for use in South Africa and the broader SADC region.

Agricultural Research Council facilitates the prioritization of Animal diseases in South Africa

Many diseases affect production and/or companion animals, to different degrees. Not all these diseases can be given equal attention, particularly when resources are limited. It therefore becomes necessary to know which among these diseases cause the greatest constraint to health, and thereby defeating maximal productivity, of animals. Such are the diseases with the greatest impact on livelihoods of the people who keep the animals.

South Africa/SADC Disease Prioritization workshop participants

During the (months of April and May) first quarter of 2014, the Agricultural Research Council convened a two day workshop, with participants from The Department of Agriculture, Forestry and Fisheries, University of Pretoria, SADC Secretariat, some SADC member states and the World Organisation for Animal Health (OIE), to deliberate on the relative (socio-economic) importance of animal diseases. After agreeing on a set of criteria, the participants were also able to draw on their professional and practical knowledge to rank the animal diseases according to the agreed criteria. The outcome was a document with a matrix of the ranking of animal diseases in South Africa and the SADC region. A draft of this document was printed in September 2014 and is currently under review by DAFF, the custodian, before it is released in the public domain.

Agro-processing, Food Technology and Safety Programme

The effect of a beta-agonist and animal age on quality of three beef muscles

Anabolic growth implants and beta agonists could be singled out as the two most commonly used metabolic modifiers used to improve feed efficiency, growth, yield and/or product quality in the South African beef production systems. Implants are known to improve growth efficiency by 5 to 10% and yield by 5%, and have been used since the establishment of the feedlot industry in South Africa in the seventies. The locally used beta agonist improve feed efficiency by 22% and carcass yield by 4% but also reduce tenderness significantly more than implants. As a result, beta agonists have significantly increased the variation in tenderness within the age class for young animals at least when the loin muscle is used as parameter. The consequence is that the classification of beef according to age to describe tenderness is probably not as effective as it was before the introduction of certain metabolic modifiers into the production system. While the effect of beta agonists on tenderness and other quality characteristics, such as colour and drip loss, have been extensively tested and the effect of variation in age on tenderness of at least some muscle in the carcass are known, no research has been conducted to investigate the relationship between beta agonists and age and its implication for beef classification.

Therefore, the specific objectives of this project were to: (i) investigate the effect of beta agonist on general quality and specifically tenderness of three muscles with different histological and physiological/ biochemical properties of young grain fed beef, (ii) determine the effect of animal age on quality of the same muscles, and (iii) determine if age alone is sufficient to accurately describe the quality of younger beef produced under grain fed and pasture conditions.

The main conclusion from the study was that age is a poor predictor of tenderness of low connective tissue cuts when beta agonist is used. However, age could be used to distinguish effectively between high connective tissue cuts. Apart from tenderness, typical flavours related to the diet of animals define the expected eating quality of beef of different ages and feeding regimes. These results have implications for the current red meat classification system and therefore provide useful information for consideration by the National Red Meat Classification Committee. Additionally, an important knowledge generated from this study is that grass fed beef has unique characteristics that should be exploited by producers with the potential of finishing beef cattle on natural pasture. In particular, this could be to the advantage of the small scale farmer for whom several initiatives have become available over the past years to join the commercial beef value chain.

Preparation of steaks for tenderness measurement

Smallholder Agriculture Development Programme

Integrated Community-based poultry value chain (PVC) for rural households

According to some estimates as many as 16 million South Africans live in dire poverty and the highest incident of this is in female-headed households in rural areas. An even higher proportion of the population is regarded as being food insecure, with malnutrition and even severe malnutrition threatening many of the country's children. Production of poultry meat and eggs for household consumption is regarded as an inexpensive way of providing animal protein to ensure healthy diets and thus help to combat malnutrition in our rural areas. The South African government in its effort to eradicate poverty and malnutrition in rural areas of different provinces has used poultry enterprises, with varying degrees of success. The Integrated Community-based Poultry Value Chain Project was initiated along similar lines. The aim of the Project which is a partnership between the Agricultural Research Council and the Department of Rural Development and Land Reform was to establish an integrated poultry value chain, to benefit rural communities through involvement in the construction of the necessary infrastructure and a lifetime of broiler and egg production enterprises to revitalise the moribund rural economies. It has the potential to irreversibly grow the village economy. The project is designed to establish smallholder enterprises operating in five business units: broiler, layers, hatchery, feedmill and abattoir. Community tradesmen and military veterans were involved in the construction of the layer and broiler houses. Beneficiaries who had no skills in production of layers or broilers received pre-production training in layer and broiler production during the project incubation phase. Layer beneficiaries were provided with two structures while broiler beneficiaries received six structures, all constructed in their own yards. The project has been implemented in all the nine provinces. The project will socially and economically develop smallholder and other resource poor farmers, enable them to participate meaningfully in the agricultural sector by stimulating food security, job creation and income generation.

Currently the project supports a total of 1026 direct beneficiaries in the nine provinces. Through this project, employment has been created for 19 young graduates who have skills in agriculture or marketing of agricultural products. The project also employed 62 military veterans and 268 community members in the construction of the broiler and layer houses. Additionally, 76 National Rural Youth Service Corps better known as NARYSECs were involved in construction of chicken houses.

Over 1146 houses in eight provinces are ready to receive chickens and 161 are already in production of chickens. To date the total number of constructed houses in the different provinces is as follows: Mpumalanga (201), Free State (114), Kwa Zulu Natal (193), Eastern Cape (136), Northern Cape (82), Limpopo (124), North West (137) and Gauteng (280). Construction of houses is underway in the Western Cape

Table1. Poultry Value Chain Business Unit sites in the nine provinces

Province	District Municipality	Local Municipality	Villages
Eastern Cape	Amathole	Ngqushwa	Zimbaba Village, Dlova village
Gauteng	City of Tshwane		Winterveldt
Free State	Thabo Mufutsanyane	Maluti a Phofung	Letsha le Maduke, Hasethunya, Ha Rankopane, Namahadi
Kwazulu-Natal	Ugu	Ezinqoleni	Ndimeni, Nodalane, Ncawusheni, Mthamvuna, Nduna, Hlomendlini, Thuvukezi, Shibe, Mahlubini, Mlozana: Nkulu, Shoshobane.
Limpopo	Capricorn	Blouberg	Sekhung, My Darling
Mpumalanga	Nkangala	DR JS Moroka	Sinotlelo village
Northern Cape	John Taolo Gaetsewe	Joe Morolong, Gasegonyana	Ditsoswaneng, Maruning, Maketlel, Logaganeng, Mapoteng & Kagung villages
North West	Dr Ruth Mompati	Kagisano Molopo	Tlhagameng, Phaposaneng, Kudunkgwane villages.
Western Cape	Eden	Mossel Bay	Brandwag, Great Bak, Friemersheim

The project established 161 enterprises in MP, KZN, GP, NW, NC, LP and FS provinces. At least three cooperatives are registered per site. Training on layer and broiler production, feed mill production, cooperative governance & management, business management and marketing of agricultural produce were conducted for the beneficiaries.

Weekly site visits by layer beneficiaries to selected houses that are in production take place to equip beneficiaries as part of pre-production training. Five mentors and marketers were trained in offering accredited courses and are in a process of being accredited by AgriSeta, which means in eight provinces we have staff that are compliant with AgriSeta training requirements as facilitators, assessors and moderators.

Bridging the gap between communal and commercial beef cattle through Assisted-Reproductive Technologies

About half of the national beef cattle herd is in the hands of communal and emerging farmers who are often located primarily in remote and inaccessible areas of the country. The contribution of this sector to country's beef production is rather limited as a result of a myriad of factors which include low reproduction. Previous attempts to improve fertility and productivity of the communal and emerging sectors have been hampered by lack of appropriate infrastructure to deliver assisted reproductive technologies since specialised laboratory conditions are required to deliver these technologies. The Germplasm Conservation and Reproductive Biotechnology research group came up with an idea of a mobile laboratory that would provide a conducive environment for the delivery of reproductive technologies to farmers in the most remote parts of the country. This idea was implemented through the development of the Agricultural Research Council Gametek Mobile Laboratory.

The Gametek is now routinely used in the provision of scientific service (e.g. on-site or village semen evaluation, embryo transfer and artificial insemination) to communal and emerging farmers in different provinces of the country. A total of 135 farmers from 3 provinces (i.e. KZN, Limpopo and Mpumalanga) have benefited from this project. In order to evaluate the improvement brought about by the introduction of the Agricultural Research Council Gametek Mobile Laboratory, pregnancy rate following oestrus synchronization and artificial insemination of

communal cattle breed with and without the use of the mobile laboratory were compared and results are presented in the figure below. An improvement from 40% to 60% was achieved through the use of Agricultural Research Council Gametek Mobile Laboratory. The mobile laboratory is definitely placing South Africa at the knifepoint of delivering technologies to smallholder farmers who were previously marginalized. Moreover, it is evident that these efforts will improve the profitability and long-term productivity of the communal sector, and further enhance this sector's contribution to the South African economy.

Pregnancy Rate of communal cows bred using or bred without using Assisted Reproductive Technology (ART) administered through the ARC Gametek Mobile Laboratory

This project was also involved in transfer of knowledge through training courses on cattle Artificial Insemination (AI). The AI course is certificated and successful trainees are eligible for registration as Artificial Inseminators. The beneficiaries to the training intervention included government officials and technicians. A total of 66 and 22 government officials from Limpopo and Kwa-Zulu Natal respectively were trained in cattle artificial insemination. This intervention will have a positive impact on emerging farmers since government officials are the primary source of technical information to farmers and their upskilling will assist with the efforts of improving the fertility status of the cattle in communal and emerging sectors.

Community members exploring equipment in the mobile laboratory

Calves born from artificial insemination

Smallholder livestock farmers benefit from participation in Kaonafatso Ya Dikgomo (KyD) Scheme

Animal products contribute approximately 41% to the agricultural GDP of South Africa. There are about 500 000 people employed in the livestock sector which translate to over 2 000 000 people that are directly or indirectly dependent on the livestock sector. According to many estimates up to as much as 40% of the livestock in the country is in the hands of resource poor farmers where its commercial value has not been fully exploited. It will be difficult for the country to reach the ideal of self-sufficiency in animal products without unlocking the economic potential of the livestock in the hands of resource poor farmers. Recent census results indicate that more than

600 000 agricultural households own cattle. Cattle are also an important contributor to food security because they account for 60% of edible products produced from livestock. The Agricultural Research Council has therefore implemented a dedicated programme to assist smallholder farmers to actively participate in the mainstream economy. In order to fast-track the adoption of technologies for improving general husbandry practices and overall productivity, KyD employs the Continuous Improvement and Innovation (CI&I). The use of CI&I has introduced a new culture of farmer-centred partnerships, with extension and research, towards profit optimisation. Notable achievements of the KyD scheme for the year under review are as follow:

- The programme has registered 8399 KyD participants on Integrated Registration and Genetic Information System (INTERGIS – national animal database) by the end of March 2015.
- There is evidence that participants of KyD have higher participation rate in the market and realised better prices, resulting in higher off-take rates.
    - An analysis of a cross-sectional data from 1000 producers show an off-take rate of 16%, which is a remarkably huge harvest of more than 5000 out of more than 33000 head of cattle.
- There are improved working relations between extension officials and Agricultural Research Council scientists, which is a major breakthrough in resolving the long standing impasse on extension methodologies in developing economies with potential technology transfer to other countries on the continent.
    - The farmer centred partnership between the Agricultural Research Council and extension was enhanced during 2014 with the establishment of an Interim National Advisory Council to extend the platform for dialogue between farmers and support services
- The programme has demonstrated its potential to contribute to national goals contained in the National Development Plan such as job creation by providing internship opportunities to 38 graduates boosting the available farmer support complement to 52.

The achievement above were possible due to high rate of awareness and interest among smallholder farmers about the project. The partnership between the Agricultural Research Council and the Provincial Departments of Agriculture (PDAs) was essential for the formation of farmer support teams comprising Agricultural Research Council, PDA and farmers. This mechanism enables the Agricultural Research Council field technicians to maintain the momentum of participation in the project, which is important for sustainability.

KyD cattle gathered to be dipped in Limpopo

Training and Extension Programme

Resuscitation of the training unit

An important aspect of Agricultural Research Council's Animal Health is to act as a fast track conduit of newly generated knowledge to the end users. This entails putting in place an effective training programme that informs relevant stakeholders about recent research findings and how they can be applied to solve problems in respective fields. The resuscitation of the training unit was done to largely satisfy this role. Initial estimates for the number of trainees ranged from 50-200 per year. However since its inception in September 2014, more 650 participants have been trained.

Overview and Highlights of Research and Innovation Systems

The work done by the Research and Innovation Systems division of the Agricultural Research Council primarily supports two of the organisations strategic goals namely:

- Strategic Goal 3: To enhance the productive use and conservation of natural resources, and
- Strategic Goal 4: To translate research results to support agrarian transformation and the efficiency and competitiveness of the agricultural sector in South Africa.

However, the research of this division also overlaps with the work done in the Animal and Crop Sciences division and thus supports strategic goal 1 of improving the productivity, production, competitiveness and sustainability of crop-based agriculture and strategic goal 2 of improving the productivity, production, competitiveness and sustainability of livestock-based agriculture.

The research in this division includes agricultural engineering, biotechnology, natural resource management, soil, climate and water. With a wide range of service, development and research functions, the division provides collaborative and support functions for technologies in areas such as genomics, phenomics, remote sensing, agricultural systems modelling and engineering systems.

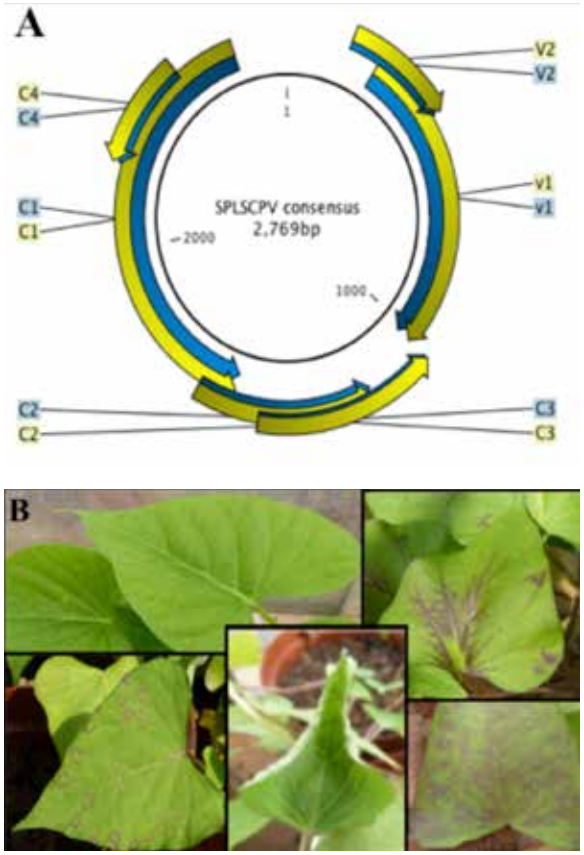
The main sites of operation for the division are in Onderstepooort, Silverton and Arcadia, all in Pretoria. The division is strategically positioned across most campuses of the Agricultural Research Council. Achievements attained by this division under various Agricultural Research Council programmes for the financial year 2014/15 are highlighted below.

Research Focusing on Biotechnology

New tools identify novel viruses

The Agricultural Research Council researchers have discovered several new viruses affecting South African sweet potatoes using next-generation sequencing (NGS) techniques. This project shows the value of NGS in agricultural research and expands the Agricultural Research Council's knowledge on sweet potato pathogens.

Genetic material from sick and healthy plants in the Western and Eastern Cape was collected and sequenced at the Agricultural Research Council facilities. This process identified a geminivirus in sick plants and two new badnaviruses in both sick and healthy plants. This is the first report of badnaviruses in South African sweet potato fields.



(A) The full-length genome of a DNA sweet potato virus (SPLCSPV) and (B) symptomatic plants collected from the Eastern and Western Cape provinces of the country.

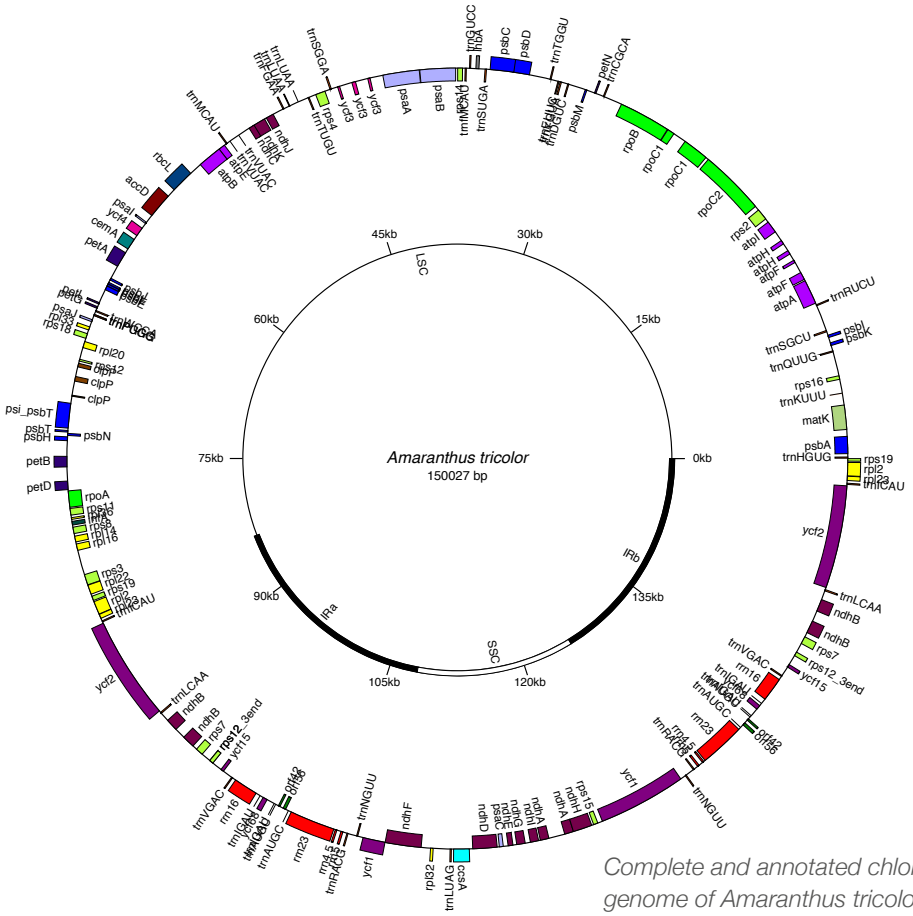
Defining the family tree for *Amaranthus* crops

The Agricultural Research Council has used next generation sequencing (NGS) to construct the chloroplast genome of local *Amaranthus* species.

Amaranthus has shown potential as both a leaf and a grain crop, and is indigenous to South Africa. The Agricultural Research Council researchers began by sequencing the full genome of a leafy amaranth (*A. tricolor*) and compared this sequence to South African collections of amaranth cultivars to identify common

genetic markers. Then they used this information, along with genetic sequence data from the chloroplast, to create a phylogenetic tree that showed how each *Amaranthus* entry is related to the others.

This will help researchers discover superior *Amaranthus* cultivars for commercial development.



Complete and annotated chloroplast genome of Amaranthus tricolor.

Understanding the role of genetic variation in Nguni cattle

A new Agricultural Research Council project has shown that Copy Number Variation (CNV), an evolutionary process where certain genes are copied, moved or deleted plays an important role in disease resistance and resilience to stress in Nguni cattle.

CNV was analysed in almost 500 Nguni cattle from various South African populations groups. Genes with variable copy number were associated with functions such as immune response, response to abiotic stress and biological regulation.

Further, the Agricultural Research Council researchers revealed that CNV divided Nguni cattle into five distinct population groups. This finding is in agreement with previous evidence for differences between Nguni cattle populations.

Research Focusing on Soil, Climate and Water

Renewable energy systems for cattle farmers

The Agricultural Research Council has furnished 14 smallholder cattle farmers with a biodigester system that has created jobs and will ultimately improve the economic success and sustainability of rural small-scale cattle farming.

The Biodigester System is fed with cow dung and other organic waste, and produces biogas for energy as well as an effluent that can be used to fertilise crops in fields and gardens. This will reduce farmers' dependence on wood and gas for heating, and reduce overall methane emissions from cattle farming.

Another aspect of the project provides the same farmers with training in conservation agriculture, and with information and training on weather and climate.

Biodigester installation with the outflow of digested cow dung (left) and a biogas stove at Maloka farm with desulphuriser to absorb odour, and a pressure gauge to measure biogas production (right).

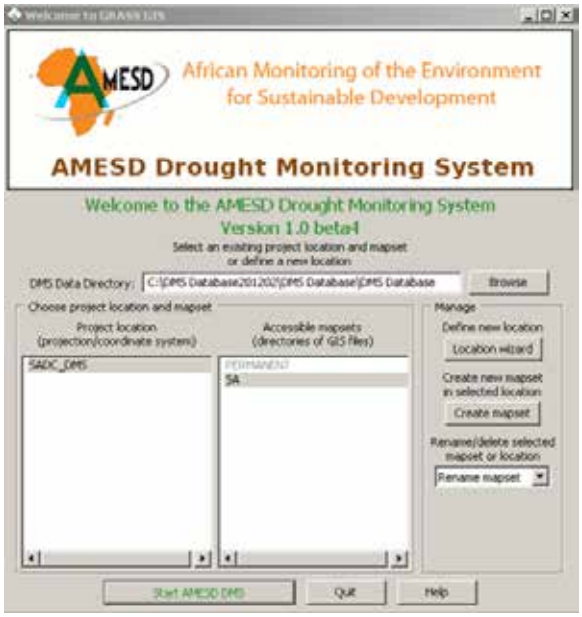
No-till planter sowing maize under CA technology (left) and Dr Mokhele Moeletsi (Senior Researcher) and Teboho Masupha (PDP student) collecting crop data for different maize cultivars (right).

Drought-monitoring software for Southern Africa

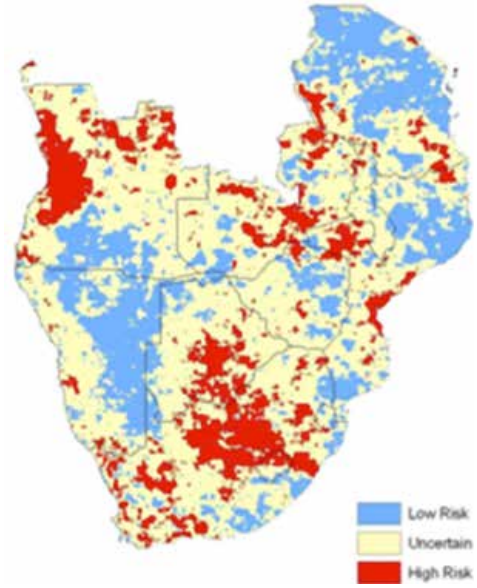
The Agricultural Research Council has built and launched the Drought Monitoring System (DMS), a free-to-use software package that can be used to monitor and report on drought in Southern Africa. The tool will help Southern African researchers to produce maps, tables and graphs from freely-available data on drought in the region.

The DMS is based on geographical information systems (GIS) software. It uses inputs such as remotely-sensed vegetation activity, rainfall estimates and seasonal forecasts, and can produce an array of outputs.

DMS is already in use by the Botswana Department of Meteorological Services, and researchers from various meteorological bodies have received training in the software. The Monitoring for Environment and Security in Africa (MESA) follow-up project is currently developing DMS further.



Starting interface of the African monitoring of the Environment for Sustainable Development (AMESD) Drought Monitoring System.



A simple drought-risk map, produced by the DMS, based on vegetation activity and rainfall estimates for the previous 3-month period and a seasonal forecast for rainfall in the coming 3 months.

Water conservation practices improve yields

The Agricultural Research Council trials of rainwater harvesting and other water conservation techniques have shown a 40% improvement in yield for both farms and household gardens in Limpopo. These practices could thus improve the economic conditions of Limpopo farmers and rural communities.

Practices such as in-field rainwater harvesting (IFRH), mechanised basins, Daling plough, roof water harvesting, pot-holing, contour bunds, infiltration pits, tied-ridges and temporary wells were compared to conventional farming practices on farms, while several of these techniques were also tested in home gardens.

Overall, IFRH was the most effective technique for both farms and gardens; roofwater harvesting was also effective for gardens and the Daling plough (a specialised plough for clay soils) and mechanised basins (a plough designed to rehabilitate veld) proved effective for farmers.

The Agricultural Research Council has provided formal and informal skills training for rural communities to promote these practices. The most successful techniques have already been implemented in more than 50 homesteads and four farming areas.

Construction of rainwater harvesting and construction structures in A) a homestead garden in Palapye, Botswana and B) a field in Insiza, Zimbabwe.

Getting the quelea bird under control

The Agricultural Research Council is developing a Decision Support System (DSS) to help to limit the crop damage caused by quelea bird, while lessening the environmental impact of quelea control strategies.

A 2 million-strong flock of the endemic quelea bird can cause up to R100 000 worth of crop damage in a single day. Current methods of control (pesticides and bombing of nest sites) are effective but also have a major environmental impact as secondary and even tertiary poisoning of non-target organisms has been detected.

To limit this impact, the Agricultural Research Council researchers are collecting geographical and ecological data on the quelea bird for a new DSS. Eco-

toxicological data on the impact of control strategies and estimated control costs are also being included. Other aspects of the project include a centralised database and a custom-built data capture tool.

Wetlands on the Maputaland Coastal Plain

The Maputaland Coastal Plain in the Umkhanyakude District is situated in north-eastern KwaZulu-Natal Province. The Maputaland Coastal Plain and underlying aquifer are two separate but inter-linked entities. This area with high permeable cover sands and low relief hosts a variety of important wetlands in South Africa (e.g. 66% of the recorded peatlands). The study area stretches from the Tembe Elephant Park in the west to the Kosi Bay lake system (iSimangaliso Wetland Park) in the east and borders Mozambique in the north.

The apparent distribution of wetlands varies in response to periods of water surplus or drought, and over the long term has been reduced by resource (e.g. agriculture, forestry) and infrastructure (e.g. urbanisation) development. The prolonged period of drought (2002-2013) and land-use impacts rendered these wetlands vulnerable. The specific consequences of drought and how they affect wetlands were unknown. Consequently this research attempted to determine spatial and temporal changes in the distribution of these wetlands, their susceptibility to human development, understand the landscape processes and characterise and classify the different wetland types.

The objectives of the project were to:

- Map the distribution of wetlands and their relation to other land-use using Landsat TM and ETM imagery acquired for 1992 and 2008 (dry years) and Landsat ETM for 2000 (wet year) along with ancillary data.
- Characterise the landscape processes shaping the dynamics of wetland type and their distribution using long-term rainfall records, SRTM DEM, position in the landscape, in situ water table levels and soil analysis and vegetation descriptions.
- Classify wetlands by applying a hydrogeomorphic wetland classification system.
- Identify priorities for wetland management.

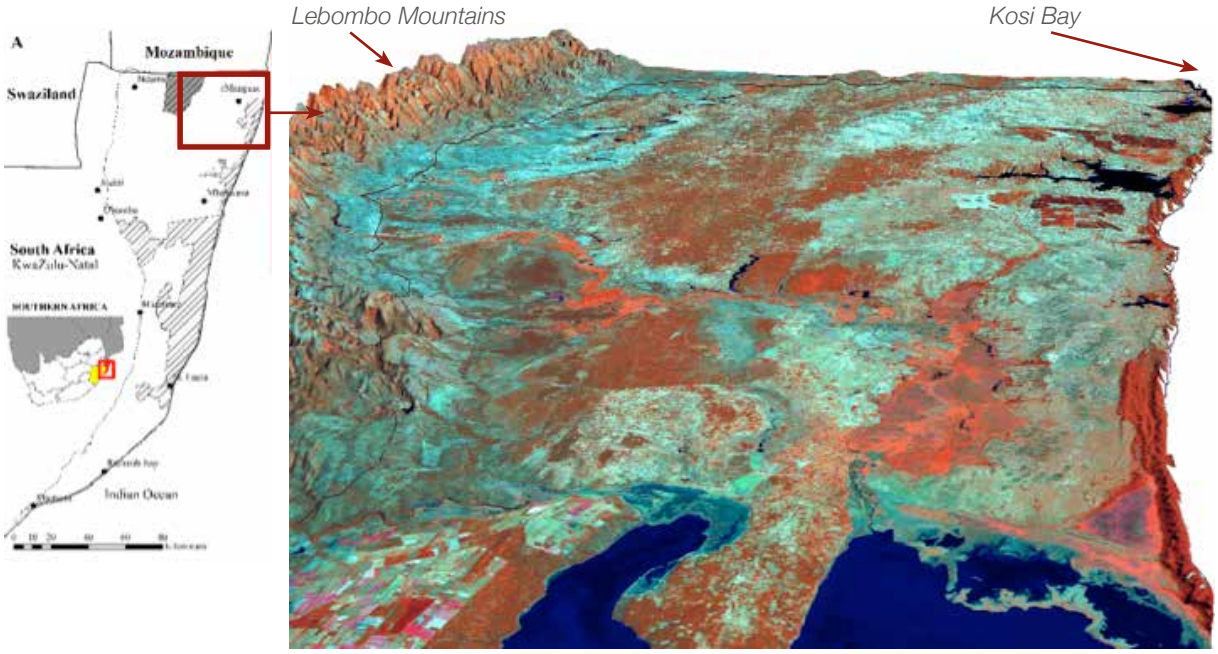
It is important to build a picture of the typical characteristics of different wetland types found on the Maputaland Coastal Plain in order to show differences as it has implications for management and conservation strategies. Therefore, a conceptual model was used to account for the available data and illustrate the relationship between depth to groundwater, wetland occurrence and wetland type found in the study area. Hydrology model output was used to support the interpretation of wetland distribution and function by interpolating *in situ* observations of depth to groundwater in space and time.

Some important research findings for the study area include:

1) Wetland character is related to regional and local hydrogeology as well as extreme rainfall events;
2) Wetland types, distribution and extent emanate from hydrological response – not dependent on rainfall or elevation but depth to water table;
3) Not all wetlands are aquifer dependent (some have perched or partially perched conditions); and
4) Delineation of wetland wetness zones (hydroperiod) is important for management e.g. permanent and temporary wetness.

Land-use activities such as agriculture (croplands), forestry (plantations), infrastructure (e.g. urbanisation) development coupled with water supply schemes and prolonged periods of drought have reduced the availability of groundwater, which can impact the groundwater-dependent ecosystems

Overall, this study made a useful contribution for a high priority wetland conservation area in South Africa and interest was received from the Department of Water and Sanitation, iSimangaliso Wetland Park, Ezemvelo KZN Wildlife and the Tembe Tribal Authority. Monitoring wetland dynamics is required to inform and support management and decision making related to natural resource utilisation including access to groundwater resources by local communities, outbreak of water-borne diseases like malaria and cholera, and determination of land-use zoning and planning for sustainable resource use.



Regional setting of the Maptaland Coastal Plain illustrated with a false colour Landsat image (2005) draped over a 20 m DEM

Research Focusing on Mechanisations and Engineering

The programme promotes utilisation of modern tools, structures and equipment in the agricultural production system. It conducts research into agricultural mechanisation technologies to increase the productivity and efficiency of agriculture. The aim of mechanisation and engineering research and development is to develop and test appropriate farm machinery and equipment to improve the timeliness of farm operations and to reduce the drudgery of farming activities. This improve the quality of work and products, leading to enhance output and economic competitiveness of the farm.

New irrigation system saves water and improves productivity

Moistube Irrigation (MTI) is a new technology introduced in South Africa, which utilizes the membrane technology by using an artificial semi-permeable membrane to imitate the biological semi-permeable membrane. This subsurface irrigation technology where water is applied directly to the plant root zone thus reducing water losses through deep percolation and evaporation has been evaluated and introduced into several projects to determine its functionality. It is seen by many as a possible solution for small holder farmers to address both the cost of irrigation systems as well as the water use efficiency on the farm. The project aimed at increasing the usage of water saving technologies in Gauteng Province while increasing food security and household income.

Testing of irrigation systems

The Agricultural Research Council operates two highly sophisticated irrigation test laboratories with permanent test benches for micro sprayers, drippers, sprinklers, filters and hydraulic valves. Tests have been performed on these products by measuring pressures, flow rates, volumes and the functionality of the equipment. This has been complimented with the testing of 26 in-field irrigation systems in Limpopo, Mpumalanga and North West provinces. This evaluation program and research help to improve water- and energy-efficiency.

(A and B) ARC researchers conducting in-field irrigation evaluations.

Inside the ARC irrigation laboratory – a researcher at the dripper test bench.

Research into drainage systems

With funding from the Water Research Commission, the Agricultural Research Council is conducting research into drainage systems for South African farms. The aim of this work is to develop technical and financial guidelines to assess various surface and sub-surface drainage systems for use under South African conditions. By introducing and transferring of the correct technical and cost estimating procedures to the end user, it assist with optimizing the profitability and financial feasibility of the drainage enterprise at farm level and protecting our natural resources.

Maintenance manholes for a sub-surface drainage system.

Promoting water management

This project researched, developed and implemented a programme to improve standards for agricultural water use efficiency in Gauteng Province. It was done through training of officials and farmers to improve their knowledge on irrigation equipment usage and management. This project not only enhanced their skills but it also optimised the natural resources in the Province.

Farmers receiving efficient water management training from the ARC.

Water Resource Management Services for Provinces

Various investigations, planning and design of irrigation systems were rendered to Provinces on request. Recommendations and design specifications were made for the revitalisation of the irrigation systems as part of a farm revitalisation project for small scale farmers. It provided well deigned irrigation systems and assisted with food security.

Well-designed and managed sprinkler irrigation system

Development of a rural livelihood water base funding framework

A framework was developed for the Department of Water Affairs that outline new programmes that the Department should embark on in order to have a significant positive impact on the development of rural areas for the betterment of rural people and improved food security including the graduation of emerging farmers to become commercial farmers.

Mechanising cassava agriculture

The Agricultural Research Council project is aiming to mechanise cassava production, thus unlocking commercial cassava agriculture in South Africa. This will have a long-term effect on the economy through job creation, improved food security, and the potential for cassava as a biofuel crop.

The project is conducting field trials to see which parts of South Africa are best suited to large-scale cassava cultivation. The Agricultural Research Council researchers are also comparing the human effort required for manual and mechanical coppicing, cutting, planting, weeding and harvesting of cassava. To this extent, the Agricultural Research Council held demonstrations and farmers' days to demonstrate the mechanical harvesting technology.

Mechanical cassava harvesting demonstration during a farmers' day at Thohoyandou in March 2015.

New equipment for conservation agriculture farmers

The Agricultural Research Council has boosted conservation agriculture (CA) in South Africa by providing farmers with specialised equipment. This will help farmers implement CA practices and help to make their farms more productive. Conservation agriculture aims to increase a famer's profit margins by reducing the number of field operations, conserving natural resources such as soil and water, and availing more time to managing the production process rather than engaging in physical work.

Fifteen no-till planters and 15 boom sprayers were donated to emerging farmers in Limpopo, Mpumalanga, Eastern Cape and KwaZulu Natal. Farmers received training when the equipment was delivered to them, and training will continue this year to ensure that the equipment is used correctly and effectively. The donated equipment is also aimed at helping farmers adopt CA whose uptake has generally been low and slow for a country whose soils are prone to degradation coupled with lack of adequate rainfall to sustain crop production under rainfed conditions.

Farmer training on calibration, operation and maintenance of no-till planters and boom sprayers.

Development of a new rooibos sprayer

The Agricultural Research Council researchers have developed and field-tested a new prototype precision sprayer specifically designed for rooibos farming. Currently three of the sprayers are being field-tested by rooibos farmers. Preliminary tests are promising, and if results of the extensive field-testing are positive the sprayer is likely to be adopted widely by rooibos farmers. The adoption of this sprayer is likely to improve and increase the productivity of rooibos farming thus creating jobs, increasing rooibos farmers' income and expanding the areas of rooibos farming in the country.

ARC researcher with the precision sprayer prototype.

Promoting essential oil production

The Agricultural Research Council has conducted research into and training days for the production of essential oils, which represent an untapped market for economic development in South Africa.

The researchers of the Council are testing promising indigenous plants and grasses by studying the oil yield, optimum plant maturity for maximum oil yield for different plants/grasses, density for optimum extraction, and optimum operating parameters including pressure and temperature. At the same time, farmers' days have been held around the country to introduce smallholder farmers to distillation equipment and processes for essential oils. The effect of these demonstrations, it is hoped will be the increased interest in the production of essential oils by the communities across all the provinces in the country where the raw materials (grasses/plants) are found.

Farmers receiving a lecture on distillation of essential oils.

Biodigesters for smallholders

The Agricultural Research Council has installed 35 biodigesters on small farms in the Free State province. Presently, performance of the installed digesters is being evaluating on-site. The evaluation will ensure that the biodigester project provides tangible improvements in production, productivity and sustainability of the biogas for the benefit of the rural communities.

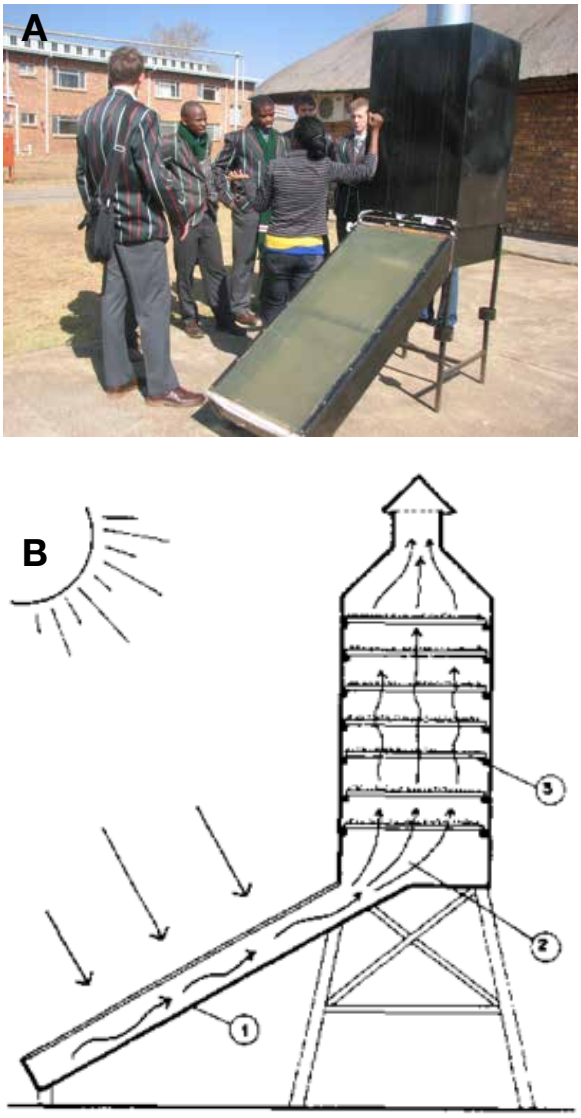
Biodigesters produce biogas and manure from organic waste (mostly cow dung), potentially resulting in energy savings for the households using them. The Agricultural Research Council is monitoring technical aspects such as temperature, daily biogas production, biogas consumption rates and animal manure

treatment effectiveness. Monitoring will also cover social aspects like user-satisfaction and monthly savings as a result of using the biodigester.

Installing a biogas digester

New low-cost vegetable dryer

The Agricultural Research Council is advancing a prototype solar vegetable dryer that incorporates a wind ventilation system. This low-cost technology will simplify fruit and vegetable processing on a small scale, which is ideal for rural South African producers.



A) Ms Kuthadzo Mugodo demonstrates the prototype solar drier to school learners B) A schematic diagram of the solar dryer.

Overview and Highlights of Agricultural Economics and Capacity Development

The work done in the Agricultural Economics and Capacity Development division of the Agricultural Research Council predominantly supports strategic goal 4 of translating research results to support agrarian transformation and the efficiency and competitiveness of the agricultural sector in South Africa. This is achieved through an analysis of research activities to allow the Agricultural Research Council to optimally exploit its intellectual property, maximise the utilisation of R&D outputs and transfer technology to farmers and agribusinesses.

The division consists of Commercialisation, Economic Analysis, Smallholder Agricultural Development and Marketing units, all of which operate from the central office in Pretoria. The division is strategically positioned as it supports the Agricultural Research Council's work across the organisation. Achievements attained by this division under various Agricultural Research Council programmes for the financial year 2014/15 are highlighted below.

Introducing new cultivars – Plant Breeders Rights licenced

The Agricultural Research Council's Office of Technology Transfer (OTT), established under the organisation's Intellectual Property Management Policy, is responsible for the protection and commercialization of technologies developed by the Agricultural Research Council. It pursues social outcomes in the exploitation of R&D outcomes and increase the Agricultural Research Council's income through the exploitation of technical improvements and innovations. To this end the OTT has sought to ensure a balance between economic and social returns for the ARC. The process engages scientists' research and development outputs, ensures the protection thereof and applying appropriate legislative frameworks. To date, the ARC has over 350 registered Plant Breeders' Rights, some of which are being exploited locally and globally. The Agricultural Research Council has licensed 33 plant cultivars in the last year as part of its technology commercialisation plan. These were 29 protea cultivars, 3 tomato lines and 1 ryegrass variety, all of which capitalise on South African biodiversity.

The incubator programme – empowering new farmers in commercial production

The Agricultural Research Council collaborates with various partners to run incubation programmes covering a number of South Africa's agricultural economy needs. These are specifically focussed on helping smallholder farmers to be competitive and sustainable, thus promoting job creation and economic development.

A notable success of the programme this year was a new partnership between the Agricultural Research Council and fresh produce retailer *Fruit 'n' Veg City* to help rural co-operatives get their product to market. This collaboration will have an impact on many Agricultural Research Council programmes around the country.

A data collection process for enterprise development has been launched to track the performance of this and similar initiatives. This system will be used to monitor the Agricultural Research Council's interventions in the long-term. The Agricultural Research Council is also providing training and technical support to Small Enterprise Development Agency (SEDA) projects, with a focus on the biodiesel sector.

Two new field sample collection kits for the SAPS animal crimes unit developed

The two sample collection kits developed by the Agricultural Research Council for the South African Police Services will provide investigators with relevant tools at crime scenes, in collecting samples for forensic genetic analysis and the determination of game animal species and sex respectively. The animal genetic unit is also proposing to develop an analysis kit optimised for the forensic analysis of hair samples rather than blood samples.

A fund for product development is now available to help commercialise the Agricultural Research Council's research outputs. The Agricultural Research Council is currently sourcing long- and short-term investors to support these initiatives.

Monitoring the impact of research projects

The Agricultural Economics and Capacity Development Unit conducted several studies on the impact of various Agricultural Research Council projects this year. These studies are invaluable in providing evidence for the scientific and social impact of the Agricultural Research Council initiatives, and provide evidence of the need for investment in agriculture research.

Biological control programme saves the country millions

The Agricultural Research Council study into the cost-effectiveness of biological control has shown that current efforts by the organisation will lead to savings of R200 million per year for the next 20 years. This demonstrates the key role that biological control plays in the South African economy. The study also found that in the long term, biological control is much more cost-effective than traditional control of invasive plants through removal. This is despite a lag of approximately 20 years before biological control pays off the cost of research and intervention.

Return on investment for fruit and vegetable research established

The Agricultural Research Council researchers have documented a high return on investment (ROI) for research in the plum, peach and vegetable sectors, which means that these industries have grown significantly as a result of investment in research in the organisation. These results show that money is well-spent on research that supports the agricultural sector of the economy.

For plums, the Agricultural Research Council demonstrated a 14.5% return on Agricultural Research Council investment, while for peaches and nectarines the ROI was even higher at 56%. For vegetables, from 1980-2012, the industry grew by R39 for every R100 of investment in the Agricultural Research Council.

Huge potential for new vaccine indicated by economic fallout of recent Rift Valley Fever outbreaks

The Agricultural Research Council has assessed the economic effects on South African farmers of the recent Rift Valley fever (RVF) outbreak (2008-2010). The outbreak led to major losses, directly through loss of stock, and indirectly through knock-on effects on herd and farm performance.

Economic losses were estimated at a total of R295.3 million: R174.9 million in the Northern Cape, R77.9 million in the Eastern Cape and R42.3 million in the Free State. Perhaps more importantly, herd size, weaning rate, and number of offspring also declined following the outbreak, and overall mortality rose.

An important finding of this study was that the average revenue loss was halved in those farms that vaccinated their livestock against RVF – approximately R24 000 revenue loss compared to more than R50 000 losses on unvaccinated farms. Revenue losses suggest that there is significant value in investment in improved vaccines, which the Agricultural Research Council is currently developing, and the correct vaccination protocols.

Potential for silk production in South Africa assessed

An investigation found that there is a R50 million silk import market in South Africa, both in the form of raw and processed silk. There is currently only one silk production and harvesting enterprise in South Africa, due to a lack of competitive advantages for silk production. There is very little infrastructure and technology in place, and the environmental conditions are not favourable for silk production in South Africa. The Agricultural Research Council also demonstrated that it would be incredibly difficult to compete with the long-established Asian silk production industry. The report has shown that a silk industry in South Africa is not economically viable. This means that funding can be focused on other, more successful ventures.

Determining the potential of rice production in South Africa

An Agricultural Research Council study has found that South Africa has a very small area naturally suited to rice farming, and that even in this area, the yield would not be high enough to justify planting it as a commercial crop at this stage. The study concludes that a locally-developed rice cultivar with high yields would be the only feasible way to farm rice in South Africa. Yet, given the size of the rice market in South Africa, and its potential impact on the country's trade balance should rice be grown successfully locally, an investment in rice breeding, resulting in a rice variety with the required yields, would be a worthwhile investment. Hence the feasibility of a rice breeding programme is currently being investigated.

The cost and benefit of Plant Breeder's Rights

The Agricultural Research Council has calculated that if a newly-developed Agricultural Research Council maize cultivar makes up 5% of the total area of maize planted, the maize breeding programme will be financially sustainable and would no longer require public funding. This demonstrates the value of developing Plant Breeder's Rights (PBR), and suggests a new way to finance the research work of the Agricultural Research Council. The discovery was the result of a study into the actual costs of producing a new cultivar (and obtaining PBR) at the Agricultural Research Council. The cost for a maize cultivar was calculated to be R35-57 million, while for a dry bean or groundnut cultivar the cost was around R29 million over a 12-year period.

Serving society through knowledge dissemination

In the Economic Analysis unit, scientists were involved in various knowledge dissemination activities over the year. These included a peer-reviewed paper on the economic viability of Sisal Production in Limpopo published in the Journal of Development and Agricultural Economics. There were also seven paper presentations at two national conferences (The Combined Congress on Crops, Soil, Horticulture, and Weed Sciences and the Agricultural Economics Association of South Africa). The papers dealt with the results of recently completed impact studies, including a study on returns to plum breeding; investment in peach and nectarine research, and the contribution of the ARC to horticultural enterprise development in the Eastern Cape. Seven international conference papers were also delivered at two events (The 3rd Global Climate Smart Conference in Montpellier, France and a conference for Agricultural Economics and Environmental Research in Istanbul, Turkey). The papers dealt with the 2008/2010 Rift Valley fever outbreaks in South Africa; fruit breeding investments in South Africa; and increasing vegetable research investments in South Africa for climate-smart vegetable research. A popular article titled "Real cost of Rift Valley fever outbreak emerges was published in the Farmer's Weekly.

Farmer profiling focus initiated

The Agricultural Research Council has tapped the experience of senior leaders in the organisation to develop a template for profiling farmers. The template will be used to objectively monitor various projects and initiatives of the Agricultural Research Council. Subsequently, the Agricultural Research Council researchers applied the template to several studies of farmers and agricultural enterprises in South Africa to benchmark and field-test the new profiling tool. These were surveys on dry bean, avocado and macadamia farmers, as well as surveys of participants in a biogas initiative and an agro-processing project. In the longer term, these profiling efforts will establish the ARC as an authority on farmer typologies and development status in South Africa.

Increased consultation with industry stakeholders

The Agricultural Research Council has provided short consultations to stakeholders on a range of topics over the last year, in areas including agronomic modelling, plant and animal diseases, agricultural economics and knowledge generation. The Agricultural Research Council economists provided technical input for a number of stakeholder engagement tools, including questionnaires and surveys, and provided technical assistance with agronomic modelling and several reports on productivity aspects of the agricultural sector.

Presence of the Agricultural Research Council in the media

Over the year, the Agricultural Research Council was featured in 832 articles and interviews in various print and digital media outlets. Advertising efforts emphasised food security issues during World Food Day, encouraged women and youth to work in agricultural research, and promoted the smallholder cattle farmer improvement programme Kaonafatso ya Dikgomo.

Exhibitions were held at SA Grain's Nampo Harvest Day Expo, the Department of Science and Technology's Scifest Africa, The Royal Show, the Rand Easter Show, the 17th Brahman Congress, a career expo at Unisa, the Department of Agriculture, Forestry and Fisheries (DAFF) Female Entrepreneur of the Year, the African Farmers Workshop and Expo, the Limpopo Agricultural Show, DAFF's 6th Biennial Landcare Conference, World Food Day, the Forum for Agricultural Research in Africa Celebrations, a global Youth Entrepreneurship Summit and many more.

Other events to engage with the public included the launch of the 2013/14 Annual Report, Beef Awards, the Bien Bonne Agri Cape Week and the launch of a draught-tolerant maize cultivar that garnered extensive media coverage.

Senior Manager: Training at Agricultural Research Council, Dr Yolisa Pakela-Jezile managing the ARC stall during the 1st General Assembly of CCARDESA in Gaborone, Botswana.

Deputy Minister of Agriculture, Forestry and Fisheries, Honourable General Bheki Cele and ARC Chief Executive Officer, Dr Shadrack Moephuli, during the launch of the ARC's newest drought-tolerant maize cultivar.

Agricultural Research Council training programmes yield results

The Agricultural Research Council has provided extensive training for smallholder farmers and extension officers around South Africa. These efforts will help South African rural agriculture contribute significantly to the economy.

In the last year, 8 500 smallholder crop farmers were trained in the principles of conservation agriculture. This training covered topics such as plant health, soil health, and seed business development, and gave participants the chance to be involved with the Agricultural Research Council research trials in conservation agriculture.

Farmers also participated in exchange programmes, where new smallholder farmers learnt from experienced and successful crop farmers.

The other major focus for the Agricultural Research Council training was on extension officers; these are the Agricultural Research Council employees that help deliver agricultural services to small communities through advice, problem solving and management of smallholder farms and co-operatives. The Agricultural Research Council developed an accredited skills programme in partnership with Limpopo Department of Agriculture and the University of Fort Hare.

Entitled the “Extension Big Five”, the programme covered situation analysis (Rhino), economic analysis (Lion), managing yourself as an extensionist (Elephant), managing project groups (Buffalo) and extension management (Leopard). Fifteen trainers and 140 extension officers from Limpopo province benefitted from the course, as well as 28 officials from the Gauteng Department of Agriculture and Rural Development.

Extension officers trained on the Extension Big Five Course in Bushfellows, Marble Hall

(A and B) Farmer exchange visits: Bakwena-ba-Mohlabetse Commercial Properties Association on the Agri-Dwala and Genade Hoop farms.

Overview and Highlights of Administration and Corporate Affairs

Supporting the core business divisions, the Agricultural Research Council has several strategic functions, namely human resources; marketing and communications; finance; information technology and communication; infrastructure management; risk and planning; and internal audit, all organised under the Administration and Corporate Affairs division and led by different executives and managers. These groups operate from the Agricultural Research Council's central office in Pretoria, with other colleagues deployed in various campuses. This division supports Strategic Goal 5 of achieving good governance, financial sustainability and a high performing and visible organisation.

The various units in this division operate mainly from the head office but have representatives in all other Agricultural Research Council locations. Achievements attained under the Administration and Corporate Affairs programme for the financial year 2014/15 are highlighted below:

Administration and Corporate Affairs Programme

Human Resources

Despite the many challenges encountered during the year under review, HR managed to achieve and sometimes exceed expectations in its key result areas and associated operational areas. By far the most noteworthy achievements were in the following areas:

1. Organisational design and structure implementation
2. Employee engagement survey
3. Capacity building
4. Agricultural Research Council Professional Development Programme (PDP) interventions

Admittedly, additional work and attention is required before we can conclusively pronounce completion of the following intended outcomes:

1. Succession Planning
2. Mentoring and Coaching
3. Management Development

Training and development of employees continued to be a focus of the human resources strategy within the Agricultural Research Council. Such training and development includes formal training at tertiary institutions as well as the use of external funding partners to expand the number of graduates and postgraduates in science, engineering and technology areas of agricultural research. During the period under review the Agricultural Research Council engaged 232 students in the Agricultural Research Council pipeline development programme. All the participants are also studying, so as to fill critical and scarce skills gaps identified by the organisation. The Agricultural Research Council is satisfied with its initiatives to build capacity and develop agricultural research professionals, which makes an impact on growing the agricultural sector. However, we acknowledge that further work is required to address the national critical skills shortage within this sector. One significant success is that the number of employees enrolled for formal training has increased by 62% from the previous financial year.

Agricultural Research Council PDP students

ARC PDP PROGRAM			
Study Program	**Male**	**Female**	**TOTAL**
Post Doc	6	10	16
PhD	28	39	67
D Tech	1	2	3
MSc	56	116	172
M Tech	7	12	19
BSc Hons	3	2	5
BSc	5	3	8
B Tech	2	0	2
BSc Engineering	5	2	7
N Dipl	24	15	39
TOTAL	**137**	**201**	**338**

Internships (Externally Funded)

Qualification	Male	Female	Total
B Comm	2	2	4
B Tech	1	0	1
BSc/Diploma	4	8	12
N6 Certificate	1	0	1
Total	**8**	**10**	**18**

SAASTA Interns

Qualification	Male	Female	Total
BSc Hons	2	0	2
BSc	0	2	2
N Diploma	0	1	1
Total	**2**	**3**	**5**

Number of Employees per study programme:

FORMAL TRAINING									
Study Program	Male				Female				TOTAL
	A	C	I	W	A	C	I	W	
PhD	28	6	0	13	25	0	1	27	**100**
MSc	14	3	0	3	13	1	3	7	**44**
BSc Hons	1	0	0	0	4	2	0	1	**8**
BSc	1	0	0	0	2	1	0	0	**4**
D Tech	0	0	0	0	1	0	0	0	**1**
M Tech	4	1	0	0	5	0	0	0	**10**
B Tech	7	1	0	0	16	0	1	0	**25**
NDipl	7	0	0	1	1	0	0	1	**10**
N Dipl Public Relations	1	0	0	0	3	0	0	0	**4**
MBA/MBL/MPHIL/									
MCom	2	0	0	0	2	0	0	0	**4**
B Degree	4	0	0	1	3	0	0	0	**8**
Prof Certificate	4	0	0	1	11	1	0	0	**17**
TOTAL	**73**	**11**	**0**	**19**	**86**	**5**	**5**	**36**	**235**

Informal training

Number of employees enrolled for informal training

Quarter	Male	Female	Total
Q1	79	94	173
Q2	383	328	711
Q3	148	165	313
Q4	50	98	148
Total	**660**	**685**	**1345**

Qualifications

Qualifications of existing research capacity

Staff qualifications	End of 2014/15 Financial Year	End of 2013/14 Financial Year	% of Permanent employees (2361)	% of Research staff (873)
Research staff and salaried students with PhD degrees (excluding Executives & SMRs)	205	174	8.68%	23.48%
Research staff and salaried students with Masters degrees (excluding Executives & SMRs)	243	238	10.29%	27.84%
Professional Veterinarians & Engineers	23	19	0.97%	2.63%

Employee Relations

The Labour Relations environment, both on collective and individual levels, has been sound in the period under review. The table below represents information for the entire 2014/2015 financial year. It shows that of the total staff complement of more than 4143, only nine (9) employees were dismissed. The low number of dismissal is indicative of disciplined employees who adhere to policies. The statistics show a high number of CCMA conciliations and settlements. This is as a result of a group referral to the CCMA by fixed term contract employees, it is therefore not a reflection of an unstable labour relations environment.

Summary of labour relations activities

Case Type	Year to date
DISCIPLINARY CASES	
Number of cases handled	31
Number of cases concluded	25
Number of cases not concluded	6
Acquittals	4
Warnings	12
Dismissals	9
GRIEVANCES	
Number of cases handled and concluded	9
CCMA AND LABOUR COURT	
Number of Cases referred to CCMA	36
Number of Arbitrations	4
Cases settled	28
Outstanding CCMA cases	4
Matters at the Labour Court (from previous F/Y)	3

Union membership

The Agricultural Research Council remains highly unionised with 1994 employees out of a total of 2361 permanent employees belonging to unions. The breakdown of membership reflects that 7 senior managers (GG14) have union membership.

Union membership breakdown

Union	Membership	Percentage of permanent workforce (2361)
Solidarity	648	27.45%
Nehawu	1346	57.01%
Sub total	1994	84.46%
Non-Unionised employees	367	15.54%

Agricultural Research Council Retirement Funds

The Agricultural Research Council has two retirement funds, namely the Agricultural Research Council Pension fund (ARCPF), and the NEHAWU National Provident Fund (NNPF), as participating employer in this umbrella scheme. Membership to the two funds is as follows:

ARCPF	NNPF	Employees with no pension fund membership
1307	888	166

Employment Equity Demographics

During the year under review the Agricultural Research Council headcount was 4143, which includes temporary employees. Of the total permanent employees, 74% are black and 40% are female. The equity figures in the Agricultural Research Council remain stable, as these percentages remained unchanged from the previous year.

EE Demographics - Total Employees per Occupational level: 31/03/2015

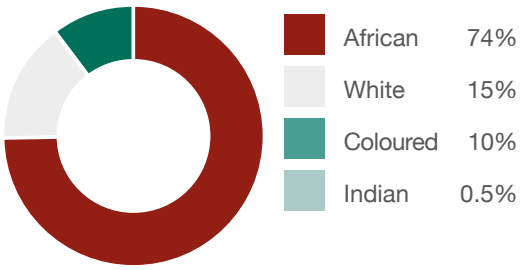
Occupational level	Male				Female				Foreign Nationals		Total	% Black	% Female
	African	Coloured	Indian	White	African	Coloured	Indian	White	Male	Female			
Top Management	4	0	1	0	0	0	0	0	1	0	6	83%	0%
Senior Management	10	1	0	5	2	0	0	1	1	0	20	65%	15%
Professionally qualified and experienced Specialists and Middle Management	111	11	4	152	84	5	6	122	28	5	528	42%	42%
Skilled Technical and Academically qualified workers, Junior Management, Supervisors, Foremen and Superintendents	195	27	2	86	185	6	4	98	2	3	608	69%	49%
Semi-skilled and discretionary decision making	163	38	0	11	126	31	1	85	0	0	455	79%	53%
Unskilled and defined decision making	494	58	0	8	163	19	0	2	0	0	744	99%	25%
TOTAL PERMANENT	**977**	**135**	**7**	**262**	**560**	**61**	**11**	**308**	**32**	**8**	**2361**	**74%**	**40%**
TEMPORARY EMPLOYEES (CONTRACT)	**790**	**111**	**0**	**24**	**748**	**89**	**1**	**13**	**5**	**1**	**1782**	**98%**	**48%**
GRAND TOTAL	**1767**	**246**	**7**	**286**	**1308**	**150**	**12**	**321**	**37**	**9**	**4143**	**84%**	**43%**

ARC Employment Demographics

African Male	42.7%	Indian Male	0.2%
African Female	31.6%	Indian Female	0.3%
Coloured Male	5.9%	White Male	6.9%
Coloured Female	3.6%	White Female	7.8%

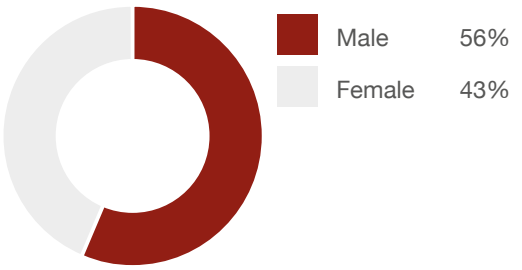
The figures above exclude the category of foreign nationals

ARC Capacity per race



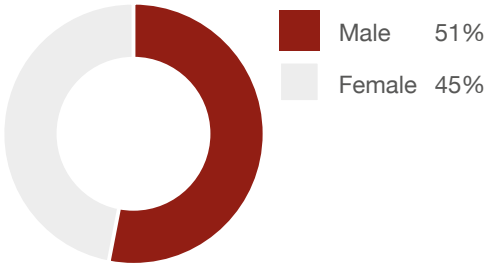
The figures above exclude the category of foreign nationals

ARC Capacity per gender



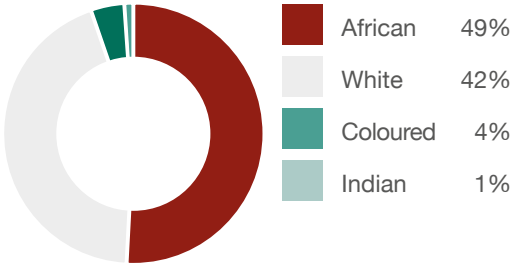
The figures above exclude the category of foreign nationals

ARC Scientific Capacity per gender



The figures above exclude the category of foreign nationals

ARC Scientific Capacity per race



The figures above exclude the category of foreign nationals

Staff Turnover

For the period 1 April 2014 to 31 March 2015, the Agricultural Research Council appointed 151 permanent employees. Out of the appointments during this time, 41% (62) were for the Core Business categories of the Agricultural Research Council. During this period, 168 permanent employees exited the Agricultural Research Council and 41% of these exits were from the Core business categories of the Agricultural Research Council, 30% were due to retirement or early retirement, and 47% were due to voluntary resignations.

The staff turnover rate for 2014/15 is 3.83%, which is a slight increase from the 2013/14 rate of 3.57%. Despite this slight increase, the Agricultural Research Council turnover rate is low compared to market benchmarks – a normal turnover rate can be as high as 15% per annum. At the Agricultural Research Council, the turnover rate for researchers was 4.33%, and 6.42% for research technicians. However, due to the lack of a critical mass of highly skilled scientists, engineers and technicians in South Africa, each resignation within these employment categories significantly impacts on the organisation's performance and ability to pursue critical projects.

Turnover rates per Occupational level and ARC SET Groupings

Occupational Level	Year to date Turnover rate
Top Management	0.00%
Senior Management	4.17%
Professionally qualified and experienced Specialists and Middle management	5.39%
Skilled Technical and Academically qualified workers, Junior Management, Supervisors, Foremen and Superintendents	5.21%
Semi-skilled and discretionary decision making	3.87%
Unskilled and defined decision making	1.54%
TOTAL	**3.83%**

ARC SET Groupings	Year to date Turnover rate
Research Team Managers	5.45%
Researchers	4.33%
Research Technicians	6.42%
TOTAL	**5.29%**

Termination reasons per qualification: Accumulated figures for the 2014/15 financial year

Termination reason	PhD/DSc	M- degree	Other degree	Diploma	Non degree	Total
Death					10	**10**
Dismissals			3		5	**8**
Normal retirement (Age 65)	2	3	1	3	23	**32**
Early Retirements		2		1	15	**18**
Medical unfit retirement					3	**3**
Absconded			1	1	1	**3**
End of contract	2	4	5		3	**14**
VOLUNTARY RESIGNATIONS						
Better salary / Better service conditions	4	3	10	6	4	**27**
Unpleasant working conditions / Personal problems	1		1		2	**4**
Moving/Emigration	1	1	3	3	1	**9**
Pursue different career / Own business	1	1	1	2	3	**8**
No specific reason provided	3	4	7	5	4	**23**
Limited career opportunity	1	2		1		**4**
Nature of work			1			**1**
Become Housewife			1			**1**
Interpersonal problems		1	1	1		**3**
Total number of Voluntary resignations	**11**	**12**	**25**	**18**	**14**	**80**
Total	**15**	**21**	**35**	**23**	**74**	**168**

Recognition and Awards

- Ms MH Mapeka received an award for the best oral presentation in the category of Animal Production and Biotechnology at the 7th Gauteng Agriculture and Rural Development Annual Research Symposium held on the 4th June 2014 at Roodevallei Hotel and Conference centre in Tshwane. The title of the presentation was *"Application of assisted Reproductive Technologies to upgrade emerging farmer's cattle: Synchronization and Timed Artificial insemination of cows in Gauteng"*.
- Ms MC Mokolobate was awarded the second prize for her poster during the Agricultural Research Council Professional Development Programme Conference that was held on 27 June 2014, Pretoria, South Africa. The title of the poster was "*Improved cow efficiency to reduce the carbon footprint of beef*".
- Ms Y Sanarana received a best poster award at the DST/NRF Global Change Conference held from 1st to 4th December, 2014, at Nelson Mandela Metropolitan University in Port Elizabeth. The title of the poster was "*Genetic diversity and population structure of four SA Nguni cattle ecotypes*". The authors were Sanarana Y, van Marle-Köster E, Visser C, Mapholi N & Maiwashe A.
- Ms N Ramatsoma received the best poster award at the DST/NRF Global Change Conference held from the 1st to 4th December, 2014, at Nelson Mandela Metropolitan University in Port Elizabeth. The title of her poster was "*Genetic and environmental estimates of live weight in Gauteng and Western Cape herds*". The authors were Ramatsoma NI, Banga CB, Lehloenya KC & Gibson R.
- Dr P Strydom has been added to the SARChi Chair in Meat Science: Genomics to Nutriomics, which is shared by Universities Stellenbosch and Fort Hare.
- Prof TL Nedambale was appointed as a member of the Academic Advisory Committee for the Animal Production programme of the Department of Animal Sciences in the Faculty of Science, Tshwane University of Technology.
- Prof TL Nedambale was appointed as an Adjunct Professor at the University of Venda in its Department of Animal Science.
- Mr W P Steyn is an Executive Committee Member of SASAT.
- Ms K Hannweg serves on the Scientific Committee for IHC 2014 to be held in Australia. She is also a Council Member of ISHS as South African representative and serves as an ISHS Awards Committee Member.
- Ms T. Beelders is currently enrolled for her 2nd year as a PhD student funded by the NRF. She was one of four recipients of the Young Researcher Award for best oral presentation during the 62nd International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research (GA2014), 31 August – 4 September 2014.
- Ms T. Beelders was also awarded a doctoral fellowship in Indigenous Knowledge Systems (IKS) during the 12th Annual Women in Science Awards (WISA) held in Sandton, Johannesburg on the 15th of August 2014.
- Steyn W.P. 2014. 2nd Best Poster. 32nd SASAT Congress, 2-5/09/2014
- Dr de Beer was also selected to serve on the International Committee of the 8th International Conference on Countercurrent Chromatography (23-25 July 2014, London, UK) as the only member from Africa.
- Daneel M.S. 2014. IFNS Member of Executive Committee of the Nematology Society of South Africa (NSSA)
- Grove T. 2014. Member of organizing committee of the 3rd International Symposium of Tephritid (Fruit fly) Workers of Europe Africa and the Middle East (TEAM) to be hosted in South Africa, Stellenbosch in 2016
- Hannweg K.F. 2014. ISHS Council Member (South African representative)
- Hannweg K.F. 2014. Scientific Committee for IHC2014 to be held in Brisbane Australia
- South African Society for Agricultural Technologists (SASAT). Mr Francois Kruger won the best oral presentation award for his presentation entitled "An investigation into early detection methods for Ceratonia *siliqua* L.". He also received the associated floating trophy which was won by the Agricultural Research Council representative for the second year running.
- Dr Annemie Erasmus, Mabel du Toit, Jeanre Rudman and Elrine Huyser represented the Entomology department of the Agricultural Research Council at the 13th International Symposium on the Biosafety of Genetically Modified Organisms (ISBGMO13), 9 – 13 November 2014. Two of the posters presented at the congress were awarded first and second

prize, respectively, for the best posters presented at the congress.

- Mr Mlamuli Motsa, an Agricultural Research Council PDP student, studying towards his D. Tech degree at TUT, was awarded the Faculty Award for Junior Researcher 2014.
- D de Beer. Appointed on the Editorial Board of an Elsevier journal, namely LWT-Food Science and Technology
- E Joubert. Recognition from Stellenbosch University for her high number of scientific papers published in peer-reviewed accredited journals during 2013 in the form of a monetary award.
- NRF Ratings 2015 were awarded to the following PPRI Staff:
  - Dr Ansie Dippenaar-Schoeman (B2)
  - Dr Connal Eardley (B3)
  - Dr David Simelane (C2)
- Dr S Schoeman was awarded by the Agricultural Writers Association as the Mpumalanga Agriculturist of the year.
- Dr Vicki Tolmay was awarded the Board Floating Trophy for the best paper presented at the Combined Congress held in George from 19-22 January 2015. Her presentation was entitled "Registration of five South African spring wheat germplasm lines resistant to Russian wheat aphid; stem-, leaf- and stripe rust" and was made on behalf of a large team of people involved in the development of the germplasm over a period of nearly 20 years. The others involved in the research are Scott L. Sydenham, Willem H.P. Boshoff, Wimpie du Toit, Barend S. Wentzel, Chrissie W. Miles, Emma Mollo, Ms Cathy de Villiers, Lerato Mabe, Bongiwe Nhlapho and Wessel du Toit.
- Cronje RB. Received award for the best poster presented at the SASHS Combined Congress 2015. 22 January 2015, George.
- Hannweg K. 2015. Runner-up SASHS Award for Best Published Paper in a peer-reviewed ISI-rated Journal for the paper entitled: Hannweg, K., Sippel, A. and Bertling, I. (2013) A simple and effective method for the micropropagation and in vitro induction of polyploidy and the effect on floral characteristics of the South African iris, Crocosmia aurea. South African Journal of Botany, 88, 367-372
- Hajari E. 2015. Member of Subcommittee to Advisory Committee on Genetically Modified Organisms in South Africa. Ministerial appointment by Department of Agriculture, Forestry and Fisheries.
- Penter M.G. 2015. Elected president of the SASHS for a 2 year term
- Tramonto, George" received the Daan Retief Trophy for the best presentation by a researcher under the age of forty.
- Prof Brad Flett was awarded the "Applied Plant Pathology Award" by the southern African Society of Plant Pathology during their 2015 biannual Congress. The award recognised the impact of his research on the management of maize ear rot and its application to farmers.
- Dr Goddy Prinsloo received the award for the best popular publication in 2014 in Wheat Focus (Koringfokus) magazine.
- Ms Durand was invited speaker at ASA-CSSA-SSSA annual meeting in California in 2014.
- Dr M Craven was awarded the Daan Retief Trophy for the best presentation by a researcher under the age of forty during the Combined Congress in George, Western Cape.
- Miss Sylvia Phokane winning two prizes at the PDP Conference held in Pretoria on 27 June 2014. (1) Best Oral Presentation by MSc students and (2) Best Overall Winner.
- Prof TJ Tsilo was appointed as an Adjunct Professor at the University of Venda in its Department of Plant Production.
- Prof TJ Tsilo was appointed Associate Editor and Editorial Board member of the Crop Science, the journal of the Crop Science Society of America, in January 2015.

Information and Communication Technology

This section provides an overview of the work performed during the 2014/15 financial year against a performance background framed by the continued delivery of the Information and Communication Technology (ICT) strategy, particularly the implementation of key ICT projects. The continuous drive to improve operational efficiencies while achieving compliance also remained the focus areas in the reporting period.

Improving ICT general controls and governance was a priority, along with providing support for the Enterprise Resource Planning (ERP) solution that went live in September 2014. Several smaller yet significant ICT Infrastructure initiatives were also delivered successfully.

ICT Infrastructure

Having completed the ICT Infrastructure refresh project during the previous year, several initiatives were undertaken during the 2014/15 financial year to continue improving the performance of the core ICT platform. These included the upgrade of communications infrastructure to improve the user experience of the new ERP solution.

Enterprise Resource Planning Solution

The ERP solution was implemented and deployed live in September 2014. At the close of the 2014/15 financial year, the project was completed and a support contract (service level agreement) negotiated and implemented to provide operational and business support for the ERP solution.

Challenges were experienced with the quick adoption of the new system owing to user acclimatisation and the timing of the implementation, which coincided with the financial year-end.

The external service provider SLA and internal ICT support jointly respond to these transition challenges through on-site support. Ad-hoc training is also provided while a new training plan is being developed to cover all areas of the new system and all the users.

Lastly, the development of two R&D databases, as a pilot for the consolidation of existing R&D databases, is complete. One of the focus areas during the coming financial year is to consolidate more R&D databases onto a common platform.

Infrastructure Management

This section provides an overview of key work activities performed during the 2014/15 financial year by the Infrastructure section. The implementation of the Asset Management Plan has remained a focal point. Some of the key work activities undertaken during the year include, among others, the implementation of some aspects of the Asset Management Plan, enhancing the use of vehicles through the Fleet Management system across the Agricultural Research Council, various construction projects and improving the implementation and compliance to the Occupational Health Safety Act.

Asset Management Plan

As part of income generation in line with the approved Asset Management Plan, a portion of Umthiza Experimental Research Farm in East London has been leased out, adding to the surplus capacity leased out to third parties.

A plan to revive Musina Research Farm for research and income generation was developed and is under review. The plan targets a public-private partnership approach towards reviving the utilisation of the farm for commercial production. A private farmer is currently active in the Musina area, also as a current lessee on the Agricultural Research Council's Musina farm.

In line with the approved Asset Management Plan, which among other things talks about alternative use as part of optimising the use of assets, the following projects were approved for implementation:

a The conversion of the guest-house at Corporate Office into office space
b The conversion of old, unused laboratories at the Animal Production Campus in Irene, Pretoria, into office space
c The conversion of office space into an Environmental Surveillance Laboratory at the Agricultural Research Council, Campus for Soil, Climate and Water in Arcadia, Pretoria.

Fleet Management System

Having implemented the Fleet Management system in the previous financial year, the focus has continued to be around optimum management of fleet services in order to reduce the costs associated with fleet operations. The Fleet Management Policy is under review to ensure alignment with changing business operational needs.

Construction Projects

The following projects were undertaken during the 2014/15 financial year:

a. The conversion of the guest-house at the Corporate Office into office space, which will be completed early in the first quarter of the new financial year;
b. Upgrading of security and access control at Corporate Office;
c. Construction of a quarantine facility at the

Agricultural Research Council campus focusing on plant protection research at Roodeplaat, which will be completed and operational in the first quarter of the new financial year;

d. The installation of a boundary fence on a portion of Umthiza Experimental Farm; this is a protective measure against previously-experienced illegal land invasions;
e. The erection of security fencing for Nietvoorbij Farm in Stellenbosch;
f. The construction of a multi-purpose training facility at the Vegetable and Ornamental Plants campus at Roodeplaat, Pretoria which is planned for completion by the end of the first quarter of the new financial year.

Occupational Health & Safety

During the 2014/15 financial year, an Occupational Health and Safety (OHS) Act awareness workshop was conducted during the induction course held at Central Office.

A total of 25 Safety, Health and Environment (SHE) Representatives were trained and 4 SHE Committees were established. A further total of 20 SHE committee meetings were held during the financial year under review. Delegation of duties in terms of OHSA Section 16(2) were approved, recorded & finalised for the Senior Managers: Research.

An emergency plan has been developed and is currently under review for approval. The OHS Policy is also under review, while an environmental policy has also been developed during the course of the year.

Emergency Procedures & an OHS Policy Statement have been developed, approved and are displayed at the Agricultural Research Council Central Office and Agricultural Engineering in Silverton. Further compliance rollouts of these procedures and policy statements will be completed in the first half of the new year at all the Agricultural Research Council campuses.

Security

During period under review the Agricultural Research Council experienced a high number of security incidents. These range in magnitude and severity from employees reporting lost computers out of their own vehicles or homes, to break-ins at offices where a variety of asset losses and damage to property have been experienced.

In total, 34 cases of loss, damage or theft were reported, with a total of 69 computer equipment varieties affected as follows: 28 laptop computers, 15 desktop computers and 26 computer peripherals. The incidents range from theft from vehicle (11), theft from home/hotel (5), theft from the Agricultural Research Council premises (15) and armed robbery (3).

Lastly, the Agricultural Research Council experienced an illegal land invasion at Umthiza Research farm in East London during the year under review. The case took time to resolve, but it was eventually resolved through legal processes at court.

Knowledge Dissemination

Knowledge creation is the bigger part of the work the Agricultural Research Council is involved in. In order to showcase its work and the impact thereof, it is important for the Agricultural Research Council to share the knowledge it creates from its research. The organisation bridges the gap between its research and practice by disseminating the findings of its research to a range of target stakeholders through among other channels publishing of journal articles by researchers, documenting of thesis by students, publishing of chapters in books by researchers and presenting papers at conference proceedings by researchers. Some of the knowledge dissemination interventions for 2014/15 include the following:

Knowledge Dissemination

Journal Articles

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Corporate Governance

Report on Governance

ARC Board

The ARC Council appointed by the Executive Authority (the Minister responsible for the ARC) in terms of the provisions of the *Agricultural Research Council Act, 1990 (Act no. 86 of 1990)* governs the ARC.

Members of the ARC Board

The members of the Board serving in the year under review were:

Mr J Godden
(Chairperson - term ended 31 August 2014)
Prof S Vil-Nkomo
(Chairperson –appointed, effective from 1 September 2014)
Prof M Kahn
Deputy – (Chairperson- appointed, effective from April 2015)
Mr JH McBain
Dr W Jansen van Rijssen
Dr J Chitja
Prof F Swanepoel
Ms D Msomi
Mr M Dyasi
Prof L Hoffman
Mr G Martin
Mr R Nicholls
Ms J Mashiteng
Ms D Ndaba
Mr C Kneale
Mr A Bishop
Mr I Motala
Dr SR Moephuli
(President and CEO)

Responsibilities of the Board

The statutory functions of the ARC Council are determined in terms of the provisions of the *Agricultural Research Council Act, 1990 (Act No 86 of 1990)* and the *Public Finance Management Act, 1999 (Act No 1 of 1999)* (the PFMA).

These include the following: To be the Accounting Authority; approval of the corporate business plan, strategic plan and the policies of the ARC; and setting of performance targets for the organization.

The Council is responsible inter alia for preparing the Annual Financial Statements that accurately reflect the ARC's financial position and results at the end of the financial year, which is set at 31 March each year. The Office of the Auditor-General is responsible for reporting on the Annual Financial Statements of the ARC.

In the year under review, applicable accounting standards were adhered to and adequate accounting records and an effective system of internal control were maintained. Appropriate accounting policies, supported by reasonable and prudent judgments and estimates were applied on a consistent basis. Detailed delegations as required by the PFMA were in place.

Board Members' Remuneration

Council members, who are not Government officials, receive fees for the services they render to the ARC in accordance with the relevant tariffs as determined by National Treasury and approved by the Minister of Agriculture, Forestry & Fisheries.

Members of the Audit & Risk Committee are remunerated in accordance with an agreed tariff set by the ARC.

Detailed information on fees, emoluments, bonuses and Subsistence and Travel claims paid to Council members, Audit & Risk Committee members and executive members as required per Treasury Regulation 28.1.1 is provided in note 21 of the notes to the Annual Financial Statements.

Board Members' Interests in Contracts

None of the Board members are involved in / have any interest in contracts entered into in the year under review.

Public Finance Management Act

The ARC is fully committed to comply with the provisions of the Public Finance Management Act (PFMA). The Internal and External auditors continue to provide the Council with assurance on the degree of compliance with the PFMA.

Materiality Frame

In accordance with the PFMA and Treasury Regulation 28.1.5 the ARC has developed a Framework of acceptable levels of materiality and significance.

During the year under review, the following Council members attended the six (6) Council meetings scheduled:

Council member	No. of meetings attended
Mr J Godden (term ended 31 August 2014	3
Prof S Vil-Nkomo – Chairperson, wef 1September 2015	6
Prof M Kahn – Deputy Chairperson, wef April 2015	5
Dr W Jansen van Rijssen	5
Dr J Chitja	5
Prof F Swanepoel	5
Ms D Msomi	2
Mr M Dyasi	6
Prof L Hoffman	5
Mr G Martin	4
Mr R Nicholls	3
Ms J Mashiteng	6
Ms D Ndaba	6
Mr C Kneale	6
Mr A Bishop	6
Mr I Motala	5
Dr SR Moephuli (President and CEO)	5

Statement of Adherence

The ARC, as Public Entity, confirms its commitment to the principles of transparency, integrity and accountability as advocated in the King III report on Corporate Governance. The ARC Council takes note of the principles contained in the King III Report and will ensure that the ARC complies with these principles to the extent that they apply.

Corporate Structure and Responsibility

In the governance of the ARC, the Council is responsible for policymaking and control while the ARC President has been delegated the responsibility for the day-to-day execution of the policies and objectives as directed by the Council. The members of the Council are appointed by the Minister of Agriculture, Forestry & Fisheries on the basis of their expertise in the fields of agriculture, business, financial management, law, research, technology development and technology transfer in the field of agriculture, as prescribed by the *Agricultural Research Act, 1990 (Act No. 86 of 1990)*. Council members are appointed for a maximum period of three years and eligible for re-appointment. With the exception of the President and CEO of the ARC none of the members of the Council hold an executive position in the ARC. The Council exercises full and effective control over the ARC and monitors its Executive Management Committee. The Council may obtain independent professional advice if deemed necessary.

Governance Structures

In order to comply with these principles, the ARC has and continues to design and implement appropriate governance structures across the organization. ARC acknowledges that, for it to set up an effective governance framework, robust governance structures need to be in place. The following Council Committees operate as at 31 March 2014 together with their respective terms of reference in the form of Committee Charters:

Executive Committee

During the year under review one Executive Committee meeting was held.

Council member	No. of meetings attended
Dr SR Moephuli (CEO)	**4**
Mr JWA Godden (Chair – term ended)	**1**
Prof S Vil-Nkomo - Chairperson	**9**
Ms O Msomi	**3**
Prof M Kahn – Deputy Chair	**10**

Council member	No. of meetings attended
Ms J Mashiteng	**9**
Prof F Swanepoel	**8**

Human Resources & Remunerations Committee (Five (5) meetings held)

Council member	No. of meetings attended
Prof S Vil-Nkomo (Former Chairperson)	2
Prof F Swanepoel (Chairperson)	5
Mr M Dyasi	5
Mr G Martin	5
Ms D Ndaba	5
Mr JWA Godden - term ended 31 August 2014	2

Research, Development & Evaluation Committee (Five (5) meetings held)

Council member	No. of meetings attended
Prof M Kahn (Chairperson)	5
Dr J Chitja	3
Dr W Jansen van Rijssen	4
Prof L Hoffman	2
Mr JWA Godden (additional member term ended 31 August 2014)	1
Prof F Swanepoel	1

Finance & Investment Committee (four (4) meetings held)

Council member	No. of meetings attended
Ms D Msomi (Chairperson)	2
Mr I Motala	4
Ms J Mashiteng	4
Mr C Kneale	4

Audit & Risk Committee

The Audit & Risk Committee comprised of five independent members and three members of Council. A specialist independent member chairs the Audit Committee.

The independent members are:

Mr V Naicker (Chairperson)
Mr L Mangquku
Mr H McBain
Ms J Bruinders
Ms K Mokoena

The Council members on the Audit & Risk Committee as at 31 March 2014 are:

Mr A Bishop
Mr R Nicholls.

During the year under review the following Audit & Risk Committee members attended six (6) scheduled meetings:

Council member	No. of meetings attended
Mr V Naicker (Chairperson, reappointed)	5
Mr L Mangquku (Deputy Chairperson)	5
Mr H McBain	5
Ms J Bruinders	6
Ms K Mokoena	5
Mr A Bishop	5
Mr R Nicholls	3
Prof S Vil-Nkomo (additional member until – 1 Sep 2014)	2

Roles of Governance Committees

The ARC's Council Committees are charged with certain functions and operate within clearly defined terms of reference and continue to assist the Council's governance function on the following principles:

Ethical standards

In terms of its Code of Conduct, the ARC states its core values as: "The ARC is an organisation of **integrity**, which manages resources in a **responsible** and **accountable** manner through harnessing the **creativity** of its personnel to achieve excellence in its field of expertise."

The ARC has embarked on implementing its Code of Conduct across the organization, in a manner that would result in ethical standards being embedded in the culture of the ARC.

Internal control systems

To enable the ARC to meet its responsibility to provide reliable financial information, the ARC maintains accounting systems and practices adequately supported by a system of internal controls. These controls are designed to provide reasonable assurance that transactions are concluded in accordance with management authority and that the assets are adequately safeguarded.

The Internal Audit Function monitors the effectiveness and efficiency of the internal control systems, report their findings and make recommendations to management and the Audit Committee of the Council and monitor whether corrective action has been taken. These controls focus on critical risk areas in line with the principles of the cost of control versus the benefit thereof.

Stakeholders

The ARC has introduced structures of corporate governance on different strategic levels to manage the interface with its various stakeholders.

Employees

The ARC has a variety of structures for employee participation in respect of issues that affect them directly. These structures were established to ensure the disclosure of relevant information, consultation and negotiations on issues of mutual interest as referred to in the relevant Labour Legislation. A significant percentage of ARC employees are Unionized.

Remuneration

The remuneration of Council members is determined in accordance with section 10 of the Agricultural Research Act, 1990 (Act No 86 of 1990) as well as National Treasury. Council determines the levels of remuneration of executive management with reference to market trends and affordability.

The Human Resources & Remunerations Committee of the Council oversees all strategic human resources practices and interventions on behalf of the Council. All recommendations by the Committee are finally approved by the full ARC Council. Council approved the remuneration of the independent Audit committee members.

Environment, health and safety

The ARC strives toward compliance to all environmental, health and safety legislation in its activities. The majority of the activities of the ARC do not pose a significant threat to the environment. The ARC also has a corporate policy to address all environmental risks as a component of its risk management system.

Risk Management

Risk Management is one of the general responsibilities of the ARC Council as Accounting Authority and one of the main functions of the Executive Management Committee (EMC).

Council approved an updated Risk Management Strategy for implementation by Management.

Risk management in the ARC is an ongoing process and is focused on identifying, assessing, managing and monitoring all known forms of significant risk across all business units. This has been in place for the year under review and up to the date of approval of the annual report and financial statements. ARC systems have been put in place to review aspects of economy, efficiency and effectiveness. Management is involved in a continuous process of improving procedures to ensure effective mechanisms for identifying and monitoring risks, such as skills, technology, contracting, HIV/AIDS, reputation, Parliamentary Grant, legislative compliance, professional liability and general operating risks. Equal consideration is given to matters of safety, health and the environment as to the more obvious risks, such as financial risks.

There is a documented and tested process in place, which will allow the ARC to continue its critical business process in the event of a disastrous incident impacting on its activities.

Strategic Direction

The ARC Council approved a new Strategic direction for the ARC. The Strategic Direction took into account the Strategic objectives of the ARC, which have been adapted and refined in accordance with Government Policy as well as emerging local and international trends.

Audit and Risk Committee Report

Report of the Audit Committee

We are pleased to present our report for the financial year ended 31 March 2015.

Audit Committee and Attendance

The function of the Audit and Risk Committee (Committee) of the Agricultural Research Council (ARC) is to assist the Council of the ARC in discharging its duties relating to the safeguarding of assets, the operation of adequate systems, control processes and the preparation of financial reports and statements.

These tasks are conducted in line with all applicable legal requirements and accounting standards as prescribed in the Public Finance Management Act of 1999 (Act no.1 of 1999) (the PFMA). The Committee operates in terms of a written Terms of Reference (The Audit and Risk Committee Charter) which provides clear guidelines with regards to membership, authority and responsibilities. The Audit & Risk Committee Charter was reviewed and updated recently to accommodate new and extended responsibilities.

The membership of the Committee as at 31 March 2015 comprised of 5 (five) independent external members and two members of Council and their attendance is reflected in the table below.

Qualifications of existing research capacity Attendance at meeting

Name of Member:	11/02/14	23/05/14	23/07/14[SP]	12/08/14	11/11/14	10/02/15
Mr VK. Naicker	√	√	√	√	X	√
Mr H McBain	√	√	√	√	X	√
Mr L Mangquku	√	√	X	√	√	√
Ms J Bruinders	√	√	√	√	√	√
Ms P Mokoena	√	√	X	√	√	√
Mr A Bishop (ARC Council)	√	√	√	X	√	√
Mr R Nicholls (ARC Council)	√	X	√	√	√	X
Mr S Vil-Nkomo	X	√	√	-	-	-

***SP refers to Special Meeting**

The CEO, CFO, Internal Audit Manager and the Chief Risk Officer have a standing invitation to attend the meetings of the Committee. For the year under review the Committee met five times to discharge its mandate outlined in its charter. These meetings were well attended by Committee members. The Auditor General and Internal Audit Service Providers are invited to attend all the meetings of the Committee. The ARC Company Secretary acts as secretary of the Committee as well.

The Committee hereby also, confirms that Members of the Audit Committee met with Senior Management of the ARC, Internal Audit and the Auditor-General, individually and collectively, to address risks and challenges facing the ARC. A number of in-committee meetings were held to address control weaknesses within the ARC.

Audit and Risk Committee responsibility

The Audit Committee confirms that it has complied with its responsibilities arising from section 38(1)(a) of the PFMA and Treasury Regulation 3.1.13. including the adoption of formal terms of reference as its Audit Committee Charter and has regulated its activities in compliance with this Charter and has discharged all its responsibilities as contained therein.

The effectiveness of internal control and Information and Communication Technology (ICT) Governance

The Committee directs, monitors and evaluates the activities of the Internal Audit Function. The Internal Audit Function is managed by the Head of Internal Audit, who is assisted by an independent service provider acting as the internal auditors.

In the conduct of its duties, the Committee has, inter alia, reviewed the following:

- The effectiveness of the internal control systems;
- The operational risk areas covered in the scope of internal and external audits;
- The adequacy, reliability and accuracy of financial information provided to management and other users of such information;
- Any accounting and auditing concerns identified as a result of internal and external audits;
- Compliance with legal, accounting and regulatory frameworks;
- The activities of the Internal Audit Function, including its annual work program, co-ordination with external auditors, the reports of significant investigations and the response of management to specific recommendations;
- Where relevant, the independence and objectivity of external auditors.

The system of internal control applied by the Council over financial risk management is effective, efficient and transparent. In line with the PFMA and the King III Report on Corporate Governance requirements, Internal Audit provides the Committee and management with assurance that the internal controls are appropriate and effective. This is achieved by means of the risk management process, as well as the identification of corrective actions and suggested enhancements to the controls and processes, reports of the Internal Auditors, the Audit report on the Annual Financial Statements and the management report of the Auditor General.

The following areas will continue to be high on the monitoring and evaluation agenda for the forthcoming year in our continuous efforts to improving the internal control environment and ensuring sound financial management:

- Human Resource Management
- Supply Chain Management;
- Financial Reporting Controls;
- Pre-determined Performance Objectives; and
- Asset Maintenance
- ICT Governance.

The Audit Committee also reviewed the progress with respect to the ICT Governance in line with the ICT Framework issued by the Department of Public Services and Administration. Although there was significant progress on the ICT internal control, the Audit Committee together with management has identified priority areas for improvement in implementation of the Disaster Recovery Plan and the Business Continuity Plan. This continues to be a high priority initiative for ARC

Internal Audit

The Audit Committee was satisfied that the Internal Audit plan fairly represented assurance required in managing the risk profile and control environment of the of the Entity and identified a number risk-based, mandatory, performance, computer and follow-up audits to be performed during the year.

The Audit Committee has noted considerable improvement in the communication between the Executive Management, the AGSA and the Internal Audit Function, which has strengthened the Corporate Governance initiatives within the Entity.

Risk Management

The Audit Committee is satisfied that the risk management is at an advanced level within the Council and continues to receive attention and refinements in line with its business model. Embedding of risk and governance around risk

Forensic Investigations

Investigations into alleged financial irregularities, financial misconduct and fraud were completed during the year under review. Various measures were recommended, including taking action against the identified officials and this was in the process of finalisation. The recommendations are at various stages of implementation.

Evaluation of Annual Financial Statements

The Audit Committee has:

- Reviewed and discussed the audited Annual Financial Statements to be included in the Annual Report, with the AGSA and the Accounting Officer;
- Reviewed the Audit Report of the AGSA;
- Reviewed the AGSA's Management Report and Management's response thereto;
- Reviewed the Entity's compliance with legal and regulatory provisions; and
- Reviewed significant adjustments resulting from the audit.

During the year under review the ARC implemented a new ERP system which exposed financial reporting inaccuracies, causing delays in the completion of the year-end audit. In the process a number of financial misstatements were identified by the AG requiring corrections to be made by management. Management has provided assurances that all internal control weaknesses arising from the implementation of the ERP system are in the process of being rectified.

The Committee has once again taken note of the concerns of the Auditor General, more notably the emphasis on the lack of follow up on prior audit findings, and accepts that there is further room for improvement in the accounting function and elements of the internal control environment. As in previous years the Committee will ensure that the internal audit plan addresses these issues and will monitor the implementation of the recommendations of the Auditor General's Report.

The Committee notes the potential future difficulties associated with the on-going status of the ARC as this is highly dependent on the extent of support from Government and the extent of the Parliamentary Grant. Nevertheless the Committee considers that the statement relating to the on-going status of the organization contained in the Annual Financial Statements is appropriate.

The Audit Committee has once again noted the constraints to achieve certain targets as identified by management. These constraints continue to adversely impact upon the ARC achieving certain objectives. The most important factor impacting past and future performance is the under-funding of the organization. Such continuous under funding places a considerable strain on the financial resources of the ARC, which in turn places at risk the ARC's ability to fulfill its mandates.

The monitoring of the Council's performance is a key function of management, executive management and the Council. The Committee has no direct line responsibility for the Council's performance measurement. However, the Committee has ensured, principally through the internal audit function, that the systems of performance measurement and reporting, as well as the systems of internal control that underpin the performance management framework of the Council, remain robust and are addressed routinely in the audit plans. The Committee also obtained assurance from management and internal audit that the Council's performance management system adequately and effectively report appropriate and relevant information.

The Committee will continue to exercise its oversight responsibilities to ensure adequate reporting on performance information and the continued strengthening of the internal control environment which will include continuous monitoring of the IT

systems and the ERP implementation. The Committee has taken note of the Performance Information Report which compares the actual performance of the organization against the approved Business Plan for the financial year, the strategic objectives, key performance indicators and targets set.

In Conclusion

The Committee congratulates Management on achieving an unqualified audit and wishes to express to the Council, CEO and staff of the ARC, its sincere appreciation for the commitment shown during the year. I would further like to thank all members of the Committee for their contribution and the professional way in which meetings were conducted.

Vishnu Naicker
Chairperson of the ARC Audit & Risk Committee
31 March 2015

Annual Financial Statement

Index

The reports and statements set out below comprise the annual financial statements presented to the Parliament:

Report of the Auditor-General

Report of the Auditor-General to Parliament on the Agricultural Research Council

Report on the Financial Statements

Introduction

1. I have audited the financial statements of the Agricultural Research Council set out on pages 126 to 173, which comprise the statement of financial position as at 31 March 2015, the statement of financial performance, statement of changes in net assets and cash flow statement for the year then ended, as well as the notes, comprising a summary of significant accounting policies and other explanatory information.

Accounting authority's responsibility for the financial statements

2. The accounting authority is responsible for the preparation and fair presentation of these financial statements in accordance with South African Standards of Generally Recognised Accounting Practice (SA Standards of GRAP) and the requirements of the Public Finance Managements Act (Act No. 1 of 1999) (PFMA), and for such internal control as the accounting authority determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor-General's responsibility

3. My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with International Standards on Auditing. Those standards require that I comply with ethical requirements, and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

4. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

5. I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Opinion

6. In my opinion, the financial statements present fairly, in all material respects, the financial position of the Agricultural Research Council as at 31 March 2015 and its financial performance and cash flows for the year then ended, in accordance with SA Standards of GRAP and the requirements of the PFMA.

Emphasis of matter

7. I draw attention to the matter below. My opinion is not modified in respect of this matter.

Restatement of corresponding figures

8. As disclosed in note 33 to the financial statements, the corresponding figures for 31 March 2014 have been restated as a result of an error discovered

during the period 2014-15 financial period, in the financial statements of the public entity for the year ended 31 March 2014.

Report on other legal and regulatory requirements

9. In accordance with the Public Audit Act of South Africa, 2004 (Act No. 25 of 2004) (PAA) and the general notice issued in terms thereof, I have a responsibility to report findings on the reported performance information against predetermined objectives for selected programmes presented in the annual performance report, compliance with legislation and internal control. The objective of my tests was to identify reportable findings as described under each subheading but not to gather evidence to express assurance on these matters. Accordingly, I do not express an opinion or conclusion on these matters.

Predetermined objectives

10. I performed procedures to obtain evidence about the usefulness and reliability of the reported performance information for the following selected programmes presented in the annual performance report of the public entity for the year ended 31 March 2015:
    - Programme 1: Crop production, improvement and protection programme on page 175.
    - Programme 2: Animal health, production and improvement on page 175.
    - Programme 3: Natural resources management on page 176.

11. I evaluated the reported performance information against the overall criteria of usefulness and reliability.

12. I evaluated the usefulness of the reported performance information to determine whether it was presented in accordance with the National Treasury's annual reporting principles and whether the reported performance was consistent with the planned programmes. I further performed tests to determine whether indicators and targets were well defined, verifiable, specific, measurable, time bound and relevant, as required by the National Treasury's Framework for managing programme performance information (FMPPI).

13. I assessed the reliability of the reported performance information to determine whether it was valid, accurate and complete.

14. I did not raise any material findings on the usefulness and reliability of the reported performance information for the following programmes:
    - Programme 1: Crop production, improvement and protection programme
    - Programme 2: Animal health, production and improvement
    - Programme 3: Natural resources management.

Additional matter

15. Although I raised no material findings on the usefulness and reliability of the reported performance information for the selected programmes, I draw attention to the following matter:

Achievement of planned targets

16. Refer to the annual performance report on pages 174 to 177 for information on the achievement of the planned targets for the year.

Compliance with legislation

17. I performed procedures to obtain evidence that the public entity had complied with applicable legislation regarding financial matters, financial management and other related matters. My material findings on compliance with specific

matters in key legislation, as set out in the general notice issued in terms of the PAA, are as follows:

Annual financial statements

18. The financial statements submitted for auditing were not prepared in accordance with the prescribed financial reporting framework as required by section 55(1)(a) and (b) of the PFMA. Material misstatements on intangible assets, property, plant and equipment, trade and other receivables, inventory, trade and other payables, exchange revenue, related parties and commitments identified by the auditors in the submitted financial statement were subsequently corrected by management, resulting in the financial statements receiving an unqualified audit opinion.

Expenditure management

19. Although the accounting authority implemented controls to prevent irregular expenditure, these controls were not always effective in preventing irregular expenditure, as required by section 51(1)(b)(ii) of the PFMA.

Internal control

20. I considered internal control relevant to my audit of the financial statements, annual performance report and compliance with legislation. The matters reported below are limited to the significant internal control deficiencies that resulted in the findings on compliance with legislation included in this report.

Leadership

21. Management and the accounting authority did not adequately oversee financial reporting to ensure accurate financial information.

22. Action plans to implement audit recommendations did not address the risks with regards to the entire control environment. As a result, material audit findings reported in previous years recurred.

Financial and performance management

23. Management did not implement adequate record keeping in a timely manner to ensure that complete, relevant and accurate information was accessible and available to support financial reporting. This was mainly due to inadequate controls over the compilation of financial statements. Management did not adequately review the annual financial statements for completeness and accuracy prior to their submission for auditing.

Auditor General.

Pretoria
31 July 2015

General Information

Country of incorporation and domicile	South Africa
Nature of business and principal activities	Conduct research, develop technology, and to transfer technology that promotes agriculture and industry.
Registered office	1134 Park Street Hatfield 0083
Business address	1134 Park Street Hatfield 0083
Postal address	P O Box 8783 Pretoria 0001
Controlling entity	Department of Agriculture, Forestry and Fisheries
Economic entity	Department of Agriculture, Forestry and Fisheries
Auditors	Auditor General of South Africa
Secretary (Acting)	Ayanda Ndamase

Accounting Authority's Statement

Accounting Authority's Statement of Responsibility and Approval of Annual Financial Statements

Appropriateness of Going Concern

The financial statements presented are prepared on the assumption that ARC is a going concern and will continue in operation for the foreseeable future. The ARC Council has reviewed the organisation's financial budgets for the period 31 March 2016 and is satisfied that adequate resources exist to continue business for the foreseeable future. The Council believes that the going concern basis is appropriate and confirms that there is neither the intention nor the need to liquidate or curtail materially the scale of ARC's operations. The ARC Council is of the opinion that the ARC is financially sound and will continue to operate as a going concern.

Statement of Responsibility

The Council which is the Accounting Authority of the Agricultural Research Council (ARC) is responsible for the preparation, integrity and fair presentation of the annual financial statements of the ARC.

The annual financial statements for the year ended 31 March 2015 presented on pages 128 to 173 have been prepared in accordance with:

- The Agricultural Research Act No. 86 of 1990 as amended;
- The Public Finance Management Act No. 1 of 1999;
- Standards of Generally Recognised Accounting Practice.

They are based on appropriate accounting policies which have been consistently applied and which are supported by reasonable and prudent judgements and estimates.

The ARC Council is also responsible for the ARC's system of internal controls. These are designed to provide reasonable, but not absolute, assurance as to the reliability of the annual financial statements and to adequately safeguard, verify and maintain accountability of assets. These controls are monitored throughout the ARC by management and employees, in an attempt to address the segregation of authority and duties with available resources. Processes are in place to monitor internal controls, to identify material breakdowns and implement timely corrective action.

The Council and ARC Management treat corporate governance matters seriously and whenever any instances of non compliance to regulation are uncovered or reported, appropriate disciplinary measures in terms of policy and legislation are instituted.

The annual financial statements were approved by the Council on 29 July 2015 and are signed on its behalf:

Prof S Vil Nkomo
Chairperson

Dr SR Moephuli
President and CEO

Statement of Financial Performance

as at 31 March 2015

Figures in Rand	Note(s)	2015	2014
Revenue			
Revenue from exchange transactions			
Sale of goods in agricultural activities	3	50 619 713	40 576 845
Rendering of services	3	335 852 315	406 746 009
Royalty income	3	9 239 683	8 222 774
Rental of facilities and equipment	3	11 141 530	10 614 551
Interest received	4	32 193 291	30 588 292
Dividends received	4	48 328	102 053
Total revenue from exchange transactions		439 094 860	496 850 524
Revenue from non-exchange transactions			
Transfer revenue			
Government grants	5	919 260 611	865 755 406
Total revenue	3	1 358 355 471	1 362 605 930
Expenditure			
Employee costs	7	(760 364 180)	(685 234 670)
Depreciation and amortisation	7	(47 017 287)	(31 108 610)
Impairment	6	(530 601)	(19 937 793)
Finance costs	7	(3 939)	(76 451)
Lease rentals on operating lease	7	(15 051 913)	(15 177 004)
Bad debts	7	852 283	(6 367 510)
Operating and administrative expenses		(502 934 202)	(469 020 562)
Total expenditure		(1 325 049 839)	(1 226 922 600)
Operating surplus	7	33 305 632	135 683 330

Statement of Financial Position

as at 31 March 2015

Figures in Rand	Note(s)	2015	2014
Assets			
Current Assets			
Inventories	8	12 416 141	18 868 650
Receivables from exchange transactions	9	113 970 927	122 242 630
Cash and cash equivalents	10	508 235 613	480 212 232
		634 622 681	621 323 512
Non-Current Assets			
Investment property	11	98 648	-
Equipment, land and buildings	12	895 430 538	849 425 897
Intangible assets	13	46 131 196	30 476 774
Heritage assets	14	223 167	221 000
Investments	15	5 262 113	4 327 554
		947 145 662	884 451 225
Total Assets		1 581 768 343	1 505 774 737
Liabilities			
Current Liabilities			
Payables from exchange transactions	16	267 718 498	228 645 794
VAT payable	17	12 788 499	7 802 063
Provisions	18	87 262 602	92 485 926
		367 769 599	328 933 783
Non-Current Liabilities			
Employee benefit obligation	19	20 230 000	16 641 000
Deferred Income: Parliamentary Grant	20	192 596 947	192 596 947
		212 826 947	209 237 947
Total Liabilities		580 596 546	538 171 730
Net Assets		1 001 171 797	967 603 007
Capital fund	21	109 593 403	109 593 403
Insurance reserve		2 631 579	2 368 421
Accumulated surplus		888 946 815	855 641 183
Total Net Assets		1 001 171 797	967 603 007

Statement of Changes in Net Assets

as at 31 March 2015

Figures in Rand	Capital fund	Insurance reserve	Accumulated surplus	Total net assets
Balance at 01 April 2013	109 593 403	2 368 421	719 957 853	831 919 677
Changes in net assets				
Surplus for the year	-	-	135 683 330	135 683 330
Total changes	-	-	135 683 330	135 683 330
Balance at 01 April 2014	109 593 403	2 368 421	855 641 182	967 603 006
Changes in net assets				
Surplus for the year	-	-	33 305 633	33 305 633
Increase in reserve	-	263 158	-	263 158
Total changes	-	263 158	33 305 633	33 568 791
Balance at 31 March 2015	109 593 403	2 631 579	888 946 815	1 001 171 797
Note(s)	21			

Cash Flow Statement

as at 31 March 2015

Figures in Rand	Note(s)	2015	2014
Cash flows from operating activities			
Receipts			
Sale of goods and services		370 072 286	425 514 647
Grants		955 361 630	885 793 100
Interest income		32 193 291	30 588 292
Dividends received		48 328	102 053
		1 357 675 535	**1 341 998 092**
Payments			
Employee costs		(760 364 180)	(685 234 670)
Suppliers		(459 405 483)	(526 303 357)
Finance costs		(3 939)	(76 451)
		(1 219 773 602)	**(1 211 614 478)**
Net cash flows from operating activities	22	137 901 933	130 383 614
Cash flows from investing activities			
Purchase of equipment, land and buildings	12	(92 707 857)	(119 384 197)
Proceeds from sale of equipment, land and buildings		1 226 334	1 277 237
Purchase of other intangible assets	13	(18 394 862)	(28 788 533)
Purchases of heritage assets	14	(2 167)	-
Net cash flows from investing activities		(109 878 552)	(146 895 493)
Net increase/(decrease) in cash and cash equivalents		28 023 381	(16 511 879)
Cash and cash equivalents at the beginning of the year		480 212 232	496 724 111
Cash and cash equivalents at the end of the year	10	508 235 613	480 212 232

Accounting Policies

1. Basis of preparation

The annual financial statements have been prepared in accordance with the Standards of Generally Recognised Accounting Practice (GRAP), issued by the Accounting Standards Board in accordance with Section 91(1) of the Public Finance Management Act (Act 1 of 1999) as amended and Agricultural Research Act No. 86 of 1990.

These annual financial statements have been prepared on an accrual basis of accounting and are in accordance with historical cost convention as the basis of measurement, unless specified otherwise. They are presented in South African Rand.

1.1 Critical accounting policies with key management judgement

Certain critical accounting policies require the use of judgement in their application or require estimates of inherently uncertain matters. Although the accounting policies are in compliance with Statements of Generally Recognised Accounting Standards (GRAP), a change in the facts and circumstances of the underlying transactions could significantly change the implication of the accounting policy and the resulting financial statement impact.

Listed below are those policies that the Council believe are critical and require the use of complex judgement in their application:

Post retirement medical benefits and defined pension benefits

The accounting for post retirement medical and end of service benefits requires the Council to make certain assumptions that have a significant impact on the expenses and liabilities that are recorded for these employment benefits. These assumptions are included in the notes to the annual financial statements.

Because of the typically long-term nature of the entity's obligations in its post employment benefit schemes, and the short term volatility of financial markets, the Council recognises any impact of a modification of such assumptions over the expected remaining active life of beneficiaries.

The accounting for defined benefit pension benefit requires the Council to make certain assumptions that have a significant impact on the expenses and liabilities that are recorded for these employment benefits.

Equipment land and buildings

Residual values and estimated useful lives are assessed on an annual basis. The residual values of vehicles are estimated on published second hand vehicle values as well as trading history. The residual values of all other assets are estimated to be zero.

Land and buildings residual values are estimated using market conditions that will exist at end of the useful life. This includes management using its estimates between the periods where a sworn valuer is not used for valuation.

The estimates relating to equipment land and buildings are included in the plant and equipment accounting policy.

1.2 Government grants

Government grants (Revenue from non exchange transactions).

Government grants are recognised when it is probable that future economic benefits will flow to the public entity and these benefits can be measured reliably. The grants are recognised as income to the extent that there are no further obligations arising from the receipt of the grants.

Government grants received for the purpose of giving immediate financial support with no future related costs are recognised as revenue in the period in which they become receivable.

Government grants relating to specific expenditure are recognised in the year during which the expenses are incurred.

1.3 Investment property

Investment property is property held to earn rentals or for capital appreciation or both, rather than for:

- use in the production or supply of goods or services or for
- administrative purposes, or
- sale in the ordinary course of operations.

Cost model

Investment property is carried at cost less accumulated depreciation and any accumulated impairment losses. Depreciation is provided to write down the cost, less estimated residual value over the useful life of the property, which is as follows:

Item	Useful life
Buildings	50 years

1.4 Equipment, land and buildings

Buildings and infrastructure in the course of construction for production, rental or administrative purposes, or for purposes not yet determined, are carried at cost, less any recognised impairment loss. Cost includes professional fees, acquisition costs, construction and, for qualifying assets, borrowing costs are capitalised in accordance with the ARC accounting policy. These assets are depreciated on the same basis as other buildings and depreciation commences when the assets are ready for their intended use. Buildings under construction are not depreciated. Buildings and or infrastructure available for use are accounted for at cost less accumulated depreciation and accumulated impairments.
Equipment, infrastructure, motor vehicles, and aircraft is stated at cost less accumulated depreciation and any accumulated impairment losses.

Depreciation is charged so as to write off the cost of assets to its residual value over their estimated useful lives, using the straight-line method. Equipment, land and buildings is depreciated when it is in a location and condition for it to be operating in the manner it is intended. If the residual value exceeds the carrying amount depreciation will be stopped.

The useful lives of items of equipment, land and buildings have been estimated as stated below:

Depreciation is calculated on a straight line basis over the useful life of the asset as follows:

Item	Average useful life
Land	Not depreciated
Buildings	40-50 years
Machinery & Farming Equipment	15-35 years
Office Furniture & Equipment	5-15 years
Motor vehicles and air craft	4-10 years
Computer equipment	3-10 years
Infrastructure	10-50 years
Laboratory equipment	15-35 years

Gains and losses on disposal are included in the statement of financial performance and are determined by comparing net sales proceeds with carrying amount.

The assets' residual values, useful lives and methods of depreciation are reviewed and adjusted if appropriate at each financial year-end.

The carrying amount of equipment, land and buildings is derecognised on disposal or when no future economic benefits are expected from its use or disposals:

1.5 Intangible assets

An intangible asset is recognised when:

- it is probable that the expected future economic benefits or service potential that are attributable to the asset will flow to the entity; and

Accounting Policies
(continued)

- the cost or fair value of the asset can be measured reliably.

The entity assesses the probability of expected future economic benefits or service potential using reasonable and supportable assumptions that represent management's best estimate of the set of economic conditions that will exist over the useful life of the asset.

Where an intangible asset is acquired through a non-exchange transaction, its initial cost at the date of acquisition is measured at its fair value as at that date. An intangible asset is regarded as having an indefinite useful life when, based on all relevant factors, there is no foreseeable limit to the period over which the asset is expected to generate net cash inflows or service potential. Amortisation is not provided for these intangible assets, but they are tested for impairment annually and whenever there is an indication that the asset may be impaired. For all other intangible assets amortisation is provided on a straight line basis over their useful life.

The amortisation period and the amortisation method for intangible assets are reviewed at each reporting date.

Reassessing the useful life of an intangible asset with a finite useful life after it was classified as indefinite is an indicator that the asset may be impaired. As a result the asset is tested for impairment and the remaining carrying amount is amortised over its useful life.

1.6 Heritage assets

Heritage assets are assets that have a cultural, environmental, historical, natural, scientific, technological or artistic significance and are held indefinitely for the benefit of present and future generations.

Class of heritage assets means a grouping of heritage assets of a similar nature or function in an entity's operations that is shown as a single item for the purpose of disclosure in the annual financial statements.

An impairment loss of a cash-generating asset is the amount by which the carrying amount of an asset exceeds its recoverable amount.

An impairment loss of a non-cash-generating asset is the amount by which the carrying amount of an asset exceeds its recoverable service amount.

An inalienable item is an asset that an entity is required by law or otherwise to retain indefinitely and cannot be disposed of without consent.

Recoverable amount is the higher of a cash-generating asset's net selling price and its value in use.

Recoverable service amount is the higher of a non-cash-generating asset's fair value less costs to sell and its value in use.

Value in use of a cash-generating asset is the present value of the future cash flows expected to be derived from an asset or cash-generating unit.

Value in use of a non-cash-generating asset is the present value of the asset's remaining service potential.

Recognition

The entity recognises a heritage asset as an asset if it is probable that future economic benefits or service potential associated with the asset will flow to the entity, and the cost or fair value of the asset can be measured reliably. The ARC will identify heritage assets as assets that have a cultural, environmental, historical, natural, scientific, technological or artistic significance and are held indefinitely and mainly for the benefit of present and future generations.

Initial measurement

Heritage assets are measured at cost.

Where a heritage asset is acquired through a non-exchange transaction, its cost is measured at its fair value as at the date of acquisition.

Subsequent measurement

After recognition as an asset, a class of heritage assets is carried at its cost less any accumulated impairment losses.

After recognition as an asset, a class of heritage assets, whose fair value can be measured reliably, is carried at a revalued amount, being its fair value at the date of the revaluation less any subsequent impairment losses.

If a heritage asset's carrying amount is increased as a result of a revaluation, the increase is credited directly to a revaluation surplus. However, the increase is recognised in surplus or deficit to the extent that it reverses a revaluation decrease of the same heritage asset previously recognised in surplus or deficit.

If a heritage asset's carrying amount is decreased as a result of a revaluation, the decrease is recognised in surplus or deficit. However, the decrease is debited directly to a revaluation surplus to the extent of any credit balance existing in the revaluation surplus in respect of that heritage asset.

Derecognition

The entity derecognises heritage asset on disposal, or when no future economic benefits or service potential are expected from its use or disposal.

The gain or loss arising from the derecognition of a heritage asset is determined as the difference between the net disposal proceeds, if any, and the carrying amount of the heritage asset. Such difference is recognised in surplus or deficit when the heritage asset is derecognised.

Transitional provision

The entity adopted the heritage assets standard in 2013. The adoption of heritage assets standard was made in accordance with its transitional provision as per Directive 2 of the GRAP Reporting Framework.

According to the transitional provision, the entity is not required to measure heritage assets for reporting periods beginning on or after a date within three years following the date of initial adoption of the Standard of GRAP on Heritage assets. Heritage assets have accordingly been recognised at provisional amounts, as disclosed in note 14. The transitional provision expires on 2015/06/30. The ARC has provisionally measured the heritage asset at an estimated value of R 223 167.

1.7 Financial instruments

Classification

The entity classifies financial assets and financial liabilities into the following categories:

- Financial instruments at cost
- Financial instruments at fair value through surplus or deficit
- Financial instruments at amortised cost

Classification depends on the purpose for which the financial instruments were obtained / incurred and takes place at initial recognition. Classification is re-assessed on an annual basis, except for derivatives and financial assets designated as at fair value through surplus or deficit, which shall not be classified out of the fair value through surplus or deficit category.

Accounting Policies
(continued)

Subsequent measurement

Financial instruments at fair value through surplus or deficit are subsequently measured at fair value, with gains and losses arising from changes in fair value being included in surplus or deficit for the period.

Net gains or losses on the financial instruments at fair value through surplus or deficit dividends and interest. Dividend income is recognised in surplus or deficit as part of other income when the entity's right to receive payment is established.

Loans and receivables are subsequently measured at amortised cost, using the effective interest method, less accumulated impairment losses.

Financial liabilities at amortised cost are subsequently measured at amortised cost, using the effective interest method.

Financial assets

Investments are recognised and derecognised on trade date where the purchase or sale of an investment is under a contract whose terms require delivery of the investment within the timeframe established by the market concerned, and are initially measured at fair value, plus transaction costs, except for those financial assets classified as at fair value through profit or loss, which are initially measured at fair value.

Financial assets are classified into the following specified categories: financial assets 'at fair value through surplus or deficit', 'held-to-maturity' investments, and 'loans and receivables'. The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition.

Effective interest method

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts (including all fees on points paid or received that form an integral part of the effective interest rate, transaction costs and other premiums or discounts) through the expected life of the financial asset, or, where appropriate, a shorter period. Income is recognised on an effective interest basis for debt instruments other than those financial instrument designated as at FV.

Financial instrument at FV

Financial assets are classified as at FVTSD where the financial asset is either held for trading or it is designated as at FVTSD.

A financial asset is classified as held for trading if:

- it has been acquired principally for the purpose of selling in the near future; or
- it is a part of an identified portfolio of financial instruments that the ARC manages together and has a recent actual pattern of short-term profit-taking; or
- it is a derivative that is not designated but is effective as a hedging instrument.

A financial asset other than a financial asset held for trading may be designated as at FVTPL upon initial recognition if:

- such designation eliminates or significantly reduces a measurement or recognition inconsistency that would otherwise arise; or
- the financial asset forms part of an entity of financial assets or financial liabilities or both, which is managed and its performance is evaluated on a fair value basis, in accordance with the ARC's documented risk management or investment strategy, and information about the entitling is provided internally on that basis; or
- it forms part of a contract containing one or more embedded derivatives.

Financial assets at FVTSD are stated at fair value, with any resultant gain or loss recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any dividend or interest earned on the financial asset. Fair value is determined in the manner described in note 28.

Impairment of financial instruments

Financial assets, are assessed for indicators of impairment at each financial position date. Financial assets are impaired where there is objective evidence that, as a result of one or more events that occurred after the initial recognition of the financial asset, the estimated future cash flows of the investment have been impacted.

For unlisted shares classified as AFS, a significant or prolonged decline in the fair value of the security below its cost is considered to be objective evidence of impairment.

For all other financial assets, including redeemable notes classified as AFS and finance lease receivables, objective evidence of impairment could include:

- significant financial difficulty of the issuer or counterparty; or
- default or delinquency in interest or principal payments; or
- it becoming probable that the borrower will enter bankruptcy or financial re-organisation.
- A significant or prolonged decline in an equity instrument below its cost.

For certain categories of financial instrument, such as trade receivables, assets that are assessed not to be impaired individually are subsequently assessed for impairment on a collective basis. Objective evidence of impairment for a portfolio of receivables could include the Entity's past experience of collecting payments, an increase in the number of delayed payments in the portfolio past the average period of 60 days, as well as observable changes in national or local economic conditions that correlate with default on receivables.

For financial instrument carried at amortised cost, the amount of the impairment is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted at the financial asset's original effective interest rate.

The carrying amount of the financial instrument is reduced by the impairment loss directly for all financial instrument with the exception of trade receivables, where the carrying amount is reduced through the use of provision for doubtful debts account. When a trade receivable is considered uncollectible, it is written off against the provision for doubtful debts account. Subsequent recoveries of amounts previously written off are recognised as income in the statement of financial performance. Changes in the carrying amount of the allowance account are recognised in profit or loss.

With the exception of AFS equity instruments, if, in a subsequent period, the amount of the impairment loss decreases and the decrease can be related objectively to an event occurring after the impairment was recognised, the previously recognised impairment loss is reversed through profit or loss to the extent that the carrying amount of the investment at the date the impairment is reversed does not exceed what the amortised cost would have been had the impairment not been recognised.

In respect of AFS equity securities, impairment losses previously recognised through profit or loss are not reversed through profit or loss. Any increase in fair value subsequent to an impairment loss is recognised directly in equity.

Derecognition of financial assets

The ARC derecognises a financial asset only when the contractual rights to the cash flows from the asset expire; or it transfers the financial asset and substantially all the risks and rewards of ownership of the asset to another entity. If the ARC neither transfers nor retains substantially all the risks and rewards of

Accounting Policies
(continued)

ownership and continues to control the transferred asset, the ARC recognises its retained interest in the asset and an associated liability for amounts it may have to pay. If the ARC retains substantially all the risks and rewards of ownership of a transferred financial asset, the ARC continues to recognise the financial asset and also recognises a collateralised borrowing for the proceeds received.

1.8 Leases

A lease is classified as a finance lease whenever the terms of the lease transfers substantially all the risks and rewards incidental to lease. All other leases are classified as operating leases. The determination whether an arrangement contains a lease and the classification of the lease is based on the substance of the transaction at inception date.

Assets held under finance leases are recognised as assets of the ARC at their fair value at the inception of the lease. The determination of whether an arrangement contains a lease and the classification of the lease is based on the substance of the transaction at inception date.The assets are capitalised if the minimum lease payments are 85% or more of the assets' fair value at inception of the lease. The corresponding liability to the lessor is included in the statement of financial position as a finance lease obligation.

Lease payments are apportioned between finance charges and reduction of the lease obligation so as to achieve a constant rate of interest on the remaining balance of the liability.

Finance charges are charged to surplus or deficit, unless they are directly attributable to qualifying assets, in which case they are capitalised in accordance with the ARC's general policy on borrowing costs (see below). Leased assets are depreciated over lesser of the useful life and the lease period.

Rentals payable under operating leases are charged to surplus or deficit on a straight-line basis over the term of the relevant lease. Benefits received and receivable as an incentive to enter into an operating lease are also spread on a straight-line basis over the lease term.

The determination of whether an arrangement is, or contains a lease, is based on the substance of the arrangement at inception date of whether the fulfilment of the arrangement is dependent on the use of a specific asset or assets or the arrangement conveys a right to use the asset. The classification of the lease is determined using GRAP 13 (Leases).

Operating leases - lessor

Operating lease revenue is recognised as revenue on a straight-line basis over the lease term.

Initial direct costs incurred in negotiating and arranging operating leases are added to the carrying amount of the leased asset and recognised as an expense over the lease term on the same basis as the lease revenue. The aggregate cost of incentives is recognised as a reduction of rental revenue over the lease term on a straight-line basis.

The aggregate benefit of incentives is recognised as a reduction of rental expense over the lease term on a straight-line basis.

Income for leases is disclosed under revenue in statement of financial performance.

1.9 Inventories

Consumable stores are valued at the lower of cost and current replacement cost. Livestock is valued at the lower of cost or net realisable value. Cost of work in progress and finished goods includes direct costs and an appropriate allocation of overheads based on normal production levels.

Farm produce resulting from research, is not accounted for as inventories and the income resulting

from the sale of these products is brought to account in the year in which it is sold. Excess farm produce harvested for resale is treated as inventory and valued at fair value less estimated point of sale costs.

Vaccines for foot-and-mouth disease are at lower of cost and net realisable value.

Net realisable value represents the estimated selling price less all estimated costs of completion and costs to be incurred in marketing, selling and distribution.

1.10 Non-current assets held for sale and disposal groups

Non-current assets and disposal groups are classified as held for sale if their carrying amount will be recovered principally through a sale transaction rather than through continuing use. This condition is regarded as met only when the sale is highly probable and the asset (or disposal group) is available for immediate sale in its present condition. Management must be committed to the sale, which should be expected to qualify for recognition as a completed sale within one year from the date of classification.

Non-current assets held for sale (or disposal group) are measured at the lower of its carrying amount and fair value less costs to sell.

A non-current asset is not depreciated (or amortised) while it is classified as held for sale, or while it is part of a disposal group classified as held for sale.

Interest and other expenses attributable to the liabilities of a disposal group classified as held for sale are recognised in surplus or deficit.

1.11 Impairment of non financial assets

At each reporting date, the ARC reviews the carrying amounts of its tangible and intangible assets to determine whether there is any indication that those assets have suffered an impairment loss. If any such indication exists, the recoverable amount of the asset is estimated in order to determine the extent of the impairment loss (if any). Where it is not possible to estimate the recoverable amount of an individual asset, the ARC estimates the recoverable amount of the cash-generating unit to which the asset belongs.

Recoverable amount is the higher of fair value less point of sale costs to sell and value in use. Fair value is determined by reference to the market. In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset.

If the recoverable amount of an asset (or cash-generating unit) is estimated to be less than its carrying amount, the carrying amount of the asset (cash-generating unit) is reduced to its recoverable amount. An impairment loss is recognised immediately in surplus or deficit.

Where an impairment loss subsequently reverses, the carrying amount of the asset (cash-generating unit) is increased to the revised estimate of its recoverable amount, but so that the increased carrying amount does not exceed the carrying amount that would have been determined had no impairment loss been recognised for the asset (cash-generating unit) in prior years. A reversal of an impairment loss is recognised immediately in surplus or deficit, unless the relevant asset is carried at a revalued amount, in which case the reversal of the impairment loss is treated as a revaluation increase.

1.12 Cash and cash equivalents

For the purpose of the cash flow statement, cash and cash equivalents comprise cash on hand and short-term deposits held on call with banks, all of which are available for use by the ARC. Cash equivalents comprise of highly liquid investment

Accounting Policies
(continued)

that are convertible to cash with insignificant risk of changes in value.

1.13 Employee benefits

Short-term employee benefits

The cost of all short-term employee benefits is recognised during the period in which the employee renders the related service. The provisions for employee entitlements to wages, salaries and annual leave represent the amounts for which the ARC has a present obligation to pay as a result of employees' service provided to the reporting date. The provisions have been calculated at undiscounted amounts based on current wage and salary rates.

Defined contribution plans

Payments to defined contribution retirement benefit plans are charged as an expense as they fall due.

Payments made to industry-managed (or state plans) retirement benefit schemes are dealt with as defined contribution plans where the entity's obligation under the schemes is equivalent to those arising in a defined contribution retirement benefit plan.

Defined benefit plans

For defined benefit plans the cost of providing the benefits is determined using the projected credit method.

Actuarial valuations are conducted on an annual basis by independent actuaries separately for each plan.

Consideration is given to any event that could impact the funds up to the end of the reporting period where the interim valuation is performed at an earlier date.

Past service costs are recognised immediately to the extent that the benefits are already vested, and are otherwise amortised on a straight line basis over the average period until the amended benefits become vested.

Gains or losses on the curtailment or settlement of a defined benefit plan are recognised when the entity is demonstrably committed to curtailment or settlement.

When it is virtually certain that another party will reimburse some or all of the expenditure required to settle a defined benefit obligation, the right to reimbursement is recognised as a separate asset. The asset is measured at fair value. In all other respects, the asset is treated in the same way as plan assets. In surplus or deficit, the expense relating to a defined benefit plan is presented as the net of the amount recognised for a reimbursement.

The amount recognised in the statement of financial position represents the present value of the defined benefit obligation as adjusted for unrecognised actuarial gains and losses and unrecognised past service costs, and reduces by the fair value of plan assets.

Any asset is limited to unrecognised actuarial losses and past service costs, plus the present value of available refunds and reduction in future contributions to the plan.

Long-term employee benefits

Long service leave

The liability for employees' entitlements to long service leave represents the present value of the estimated future cash outflows resulting from employees' services provided to the reporting date.

In determining the liability for employee benefits, consideration has been given to future increases in wage and salary rates, and ARC's experience with staff turnover.

Retirement benefits

Pension fund

The ARC contributes to one defined benefit plan and two defined contribution plans. The contributions to the defined contribution plans are charged against income as incurred.

The projected unit credit method is used to determine the present value of the defined benefit obligations, the related current service cost and, where applicable, past service cost.

Actuarial gains and losses are recognised as income or expense when the net cumulative unrecognised actuarial gains and losses for each individual plan at the end of the previous reporting period exceeded 10% of the higher of the defined benefit obligation and the fair value of the plan assets at that date. Recognition of asset is limited to contribution refunds or reduced contribution.

These gains and losses are recognised over the expected average remaining working lives of the employees participating in the plans.

Past service costs are recognised as an expense on a straight-line basis over the average period until the benefits become vested. To the extent that the benefits are already vested, past service costs are recognised immediately. Any asset resulting from valuation of this plan is limited to unrecognised actuarial loss and present value of available refunds and reduction in future contribution plans.

Post-retirement medical benefits

The ARC provides post-retirement medical benefits to qualifying employees. The expected costs of these benefits are determined using an accounting methodology similar to that of defined benefit pension plans, with actuarial valuations carried out every year. Contributions are made to the relevant funds over the expected service lives of the employees entitled to those funds. The estimated cost of providing such benefits is charged to the statement of financial performance on a systematic basis over the employees' working lives within the ARC.

Actuarial gains and losses are recognised as income or expense when the net cumulative unrecognised actuarial gains and losses for each individual plan at the end of the previous reporting period exceeded 10% of the higher of the defined benefit obligation and the fair value of the plan assets at that date.

The amount recognised in the statement of financial position represents the present value of the post-retirement medical aid contribution as adjusted for unrecognised actuarial gains and losses and reduced by the fair value of the plan assets. Any asset resulting from this calculation is limited to unrecognised actuarial losses and the present value of available refunds and reductions in future contribution plans.

1.14 Provisions

Provisions are recognised when the ARC has a present legal or constructive obligation as a result of a past event, and it is probable that the ARC will be required to settle the obligation and the amount can be estimated reliably. Provisions are measured at the Council's best estimate of the expenditure required to settle the obligation at the reporting date, and are discounted to present value where the effect is material.

1.15 Research and development expenditure

Expenditure on research is recognised as an expense when it is incurred. Development costs incurred will be capitalised when they satisfy the definition of an intangible asset as contemplated in GRAP 31 (Intangible Assets).

Accounting Policies
(continued)

1.16 Related parties

The entity operates in an economic sector currently dominated by entities directly or indirectly owned by the South African Government. As a consequence of the constitutional independence of the three spheres of government in South Africa, only entities within the national sphere of government are considered to be related parties.

Management are those persons responsible for planning, directing and controlling the activities of the entity, including those charged with the governance of the entity in accordance with legislation, in instances where they are required to perform such functions.

Close members of the family of a person are considered to be those family members who may be expected to influence, or be influenced by, that management in their dealings with the entity.

Only transactions with related parties not at arm's length or not in the ordinary course of business are disclosed.

1.17 Revenue from exchange transactions

Diagnostic services

Due to the short lead time and the nature of the diagnostic tests, the diagnostic revenue is recognised at the completion of the diagnostic tests.

Royalty income

Royalty income is recognised when the royalty accrues to the ARC.

Research revenue

When the outcome of a research can be estimated reliably, research revenue and research costs associated with the research are recognised with reference to the stage of completion of the research at the reporting date. The stage of completion is determined using costs or scientific estimate and or milestone achieved as set in the project.

An expected loss on research is recognised in the statement of financial performance immediately.

When the outcome of research cannot be estimated reliably, revenue is recognised only to the extent of research costs incurred for which it is probable that the costs will be recovered. Research costs are recognised as expenses in the period they are incurred.

Excess farm produce revenue

Revenue is recognised when significant risks and rewards of ownership are transferred to the buyer, when costs can be measured reliably and when receipt of the future economic benefits is probable.

Investment income

Investment income comprises of interest income and is accrued on a time proportion basis, taking into account the principal outstanding and the effective interest rate over the period to maturity.

Dividends income

Dividends income comprise of dividends accrued. The dividends income is recognised when the shareholders right to receive income is established.

1.18 Foreign currency

Transactions in foreign currencies are recorded at the rate of exchange ruling at transaction date. Monetary assets and liabilities denominated in foreign currencies are translated at the rate of exchange ruling at the reporting date. Gains and losses arising on translation are credited to or charged against income.

1.19 Insurance reserve

In terms of the ARC policy to cover a portion of vehicle, non-vehicle, stated benefits and fire and allied perils insurance claims, a risk assessment is made annually in conjunction with the insurance brokers in order to determine the extent of the self-insured amount to be credited to the reserve.

In determining the amount to be credited, the principle of maximum insurance cover at the lowest possible cost is applied.

The portion of claims borne by the ARC is accounted for against the reserve. Any shortfalls on the reserve are written off against accumulated surplus in the year in which it originated and any surplus is carried over to the following year.

1.20 Irregular, fruitless and wasteful expenditure

Irregular expenditure means expenditure incurred in contravention of, or not in accordance with, a requirement of any applicable legislation, including:

- The Public Finance Management Act 1999 (Act No 1 of 1999) as amended, or
- Any legislation providing for procurement procedures in Government.

Fruitless and wasteful expenditure means expenditure that was made in vain and could have been avoided had reasonable care been exercised.

All irregular, fruitless and wasteful is accounted for as expenditure in the statement of financial performance and where recovered, it is subsequently accounted for as income in the statement of financial performance.

1.21 Offset

Transactions are offset when such offsetting reflects the substance of the transaction or event. Where a legally enforceable right of offset exists for recognised financial assets and financial liabilities, and there is an intention to settle the liability and realise the asset simultaneously, or to settle on a net basis all related financial effects are offset.

Notes to the Annual Financial Statements

for the year ended 31 March 2015

2. New standards and interpretations

2.1 Standards and interpretations issued, but not yet effective

The entity has not applied the following standards and interpretations, which have been published and are mandatory for the entity's accounting periods beginning on or after 01 April 2015 or later periods:

Standard/ Interpretation:	Effective date: Years beginning on or after	Expected impact:
GRAP 18: Segment Reporting	01 April 2015	Immaterial
GRAP 105: Transfers of functions between entities under common control	01 April 2015	Immaterial
GRAP 106: Transfers of functions between entities not under common control	01 April 2015	Immaterial
GRAP 107: Mergers	01 April 2015	Immaterial
GRAP 20: Related parties	01 April 2016	Immaterial
GRAP 7 (as revised 2010): Investments in Associates	01 April 2015	Immaterial
GRAP32: Service Concession Arrangements: Grantor	01 April 2016	Immaterial
IGRAP17: Service Concession Arrangements where a Grantor Controls a Significant Residual Interest in an Asset	01 April 2016	Immaterial
DIRECTIVE 11: Changes in measurement bases following the initial adoption of Standards of GRAP	01 April 2016	Immaterial

3. Revenue

Figures in Rand	2015	2014
External earnings	50 619 713	40 576 845
Rendering of services	335 852 315	406 746 009
Royalty income	9 239 683	8 222 774
Rental of facilities and equipment	11 141 530	10 614 551
Interest received - investment	32 193 291	30 588 292
Dividends received	48 328	102 053
Government grants	919 260 611	865 755 406
	1 358 355 471	1 362 605 930

Figures in Rand	2015	2014
The amount included in revenue arising from exchanges of goods or services are as follows:		
External earnings	50 619 713	40 576 845
Rendering of services	335 852 315	406 746 009
Royalty income	9 239 683	8 222 774
Rental of facilities and equipment	11 141 530	10 614 551
Interest received - investment	32 193 291	30 588 292
Dividends received	48 328	102 053
	439 094 860	496 850 524
The amount included in revenue arising from non-exchange transactions is as follows:		
Transfer revenue		
Parliamentary grant	919 260 611	865 755 406
(a) Parliamentary grant		
Grant received during the financial year	955 361 630	885 793 100
Allocated to income received in advance	(80 400 615)	(44 299 596)
Received in the prior year	44 299 596	24 261 902
	919 260 611	865 755 406
(b) External earnings		
Gross revenue	511 147 342	621 879 864
Less: Received in advance (note 16)	(103 724 668)	(155 719 685)
	407 422 674	466 160 179
External earnings		
Total exchange revenue	439 664 293	496 850 524
Interest and dividends	(32 241 619)	(30 690 345)
	407 422 674	466 160 179

Notes to the Annual Financial Statements

for the year ended 31 March 2015

4. Investment revenue

Figures in Rand	2015	2014
Dividend revenue		
Listed financial assets - Local	48 328	102 053
Interest revenue		
Bank	32 193 291	30 588 292
	32 241 619	30 690 345

5. Government grants

Figures in Rand	2015	2014
Operating grants		
Government grant (operating)	840 280 217	773 512 094
Capital grants		
Government grant (capital)	78 980 394	92 243 312
	919 260 611	865 755 406

6. Impairment of assets

Figures in Rand	2015	2014
Impairments		
Equipment, land and buildings	530 601	19 937 793

An impairment review was completed during 2015 financial year.The review revealed impairments to land and buildings which are either not in use or maintained inadequately.

Impairment reversal included in the prior year relate to impairment conditions which reversed in the prior year.

7. Operating surplus

Operating surplus for the year is stated after accounting for the following:

Figures in Rand	2015	2014
Remuneration, other than to employees, for:		
Council fees (Note 27)	2 074 757	1 387 069
Auditors	5 092 494	4 590 870
	7 167 251	5 977 939
Operating lease charges		
Premises		
Contractual amounts	4 636 428	1 198 567
Motor vehicles and air craft		
Contractual amounts	958 339	2 670 088
Equipment		
Contingent amounts	9 457 146	11 308 349
	15 051 913	15 177 004
Amortisation on intangible assets	2 740 441	-
Bad debts recovered/(written off)	(852 283)	6 367 510
Depreciation on property, plant and equipment	44 250 060	31 108 610
Employee costs	760 364 180	685 234 670
Finance costs - suppliers	3 939	76 451
Depreciation on investment property	26 786	-
Impairment on property, plant and equipment	530 601	19 937 793

8. Inventories

Figures in Rand	2015	2014
Work in progress	372 325	204 426
Finished goods	12 043 816	18 664 224
	12 416 141	18 868 650

Notes to the Annual Financial Statements

for the year ended 31 March 2015

9. Receivables from exchange transactions

Figures in Rand	2015	2014
Trade debtors	100 046 713	87 044 308
Staff debtors	7 491 015	1 938 634
Deposits	287 831	827 689
Provision for bad debts	(10 669 031)	(11 741 972)
Prepaid expenses	729 319	7 216 049
Other debtors	16 085 080	36 957 922
	113 970 927	122 242 630

Services rendered by the ARC are generally on a cash basis and mostly settled in 30 days. Trade receivables are stated at amortised cost.

Of the receivables balance at the end of the year, R 60.8 million is due from the largest customer and R 25 million is due from second largest customer and the R 12,4 million is due from third largest customer, the fourth and fifth largest customers owe 14% and 6% of the total balance respectively. There are no other customers who represent more than 5% of the total balance of trade receivables.

Staff debtors are made up of travel advances and salary advances. These are recovered on a monthly basis by employees paying back the amount owed or ARC deducting the amount owed from the employee salary.

Trade receivables past due but not impaired

The ageing of amounts past due but not impaired is as follows:

Figures in Rand	2015	2014
30 to 59 days	17 499 479	28 974 553
60 to 89 days	3 025 359	1 006 218
90 to 119 days	1 061 033	723 272
120 to 149 days	3 156 997	583 034
150+ days	2 180 833	11 937 045
Balance at the end of the year	26 923 701	43 224 122

Reconciliation of provision of impairment of trade and other receivables

As at 31 March 2015, receivables at nominal value of R10 889 689 (2014: R11 741 972) were impaired and provided for. Receivables that have passed due and not impaired represent slow paying clients. Movement in the provision for impairment of receivables were as follows:

Figures in Rand	2015	2014
Opening balance	11 741 972	5 656 193
Raised during the year	-	6 085 779
Reversed during the year	1 072 941	-
Balance at the end of the year	10 669 031	11 741 972

The receivable's impairment was estimated based on irrecoverable amounts and reference to the past default. The concentration of credit risk is limited due to customer base being large and unrelated. Accordingly Council members believe that there is no further credit provision required in excess of the current allowance for doubtful debts.

10. Cash and cash equivalents

Cash and cash equivalents consist of cash on hand and balances with banks and investments in money market instruments.

Cash and cash equivalents included in the cash flow statement is made as follows:

Figures in Rand	2015	2014
Cash on hand	133 665 660	98 230 745
Short-term bank deposits	374 569 953	381 981 487
	508 235 613	480 212 232

11. Investment property

	2015			2014		
	Cost / Valuation	Accumulated depreciation and accumulated impairment	Carrying value	Cost / Valuation	Accumulated depreciation and accumulated impairment	Carrying value
Investment property	125 434	(26 786)	98 648	-	-	-

Reconciliation of investment property - 2015

	Opening balance	Transfers from PPE	Total
Investment property	-	98 648	98 648

This investment property is located in the Eastern Cape province, Queenstown and is being let out to the South African Police Service for rental income. This property was transfered from equipment, land and buildings to investment property.

Notes to the Annual Financial Statements

for the year ended 31 March 2015

12. Equipment, land and buildings

	2015			2014		
	Cost	Accumulated depreciation and accumulated impairment	Carrying value	Cost	Accumulated depreciation and accumulated impairment	Carrying value
Land	117 648 063	(5 012 085)	112 635 978	117 648 063	(5 012 085)	112 635 978
Buildings	489 829 714	(148 883 038)	340 946 676	480 829 465	(137 963 370)	342 866 095
Leasehold property	-	-	-	250 450	(247 946)	2 504
Machinery & farming equipment	88 789 277	(31 616 234)	57 173 043	83 702 720	(31 394 729)	52 307 991
Motor vehicles and aircraft	77 530 226	(40 445 532)	37 084 694	70 067 866	(34 274 616)	35 793 250
Office equipment	34 853 727	(26 174 248)	8 679 479	33 605 636	(24 162 496)	9 443 140
Computer equipment	51 551 393	(32 464 338)	19 087 055	49 373 719	(26 489 460)	22 884 259
Infrastructure	23 589 031	(3 209 838)	20 379 193	18 269 556	(2 563 280)	15 706 276
Laboratory equipment	313 218 336	(98 589 327)	214 629 009	286 584 506	(85 044 589)	201 539 917
Non-current assets held for sale	-	-	-	482 023	-	482 023
Assets under construction	84 815 411	-	84 815 411	55 764 464	-	55 764 464
Total	1 281 825 178	(386 394 640)	895 430 538	1 196 578 468	(347 152 571)	849 425 897

Reconciliation of equipment, land and buildings - 2015

	Opening balance	Additions	Disposals	Write off	Transfer to investment property	Depreciation	Impairment	Total
Land	112 635 978	-	-	-	-	-	-	112 635 978
Buildings	342 866 095	9 341 079	(230 052)	-	(98 648)	(10 401 196)	(530 602)	340 946 676
Leasehold property	2 504	-	-	-	-	(2 504)	-	-
Machinery & farming equipment	52 307 991	9 458 114	(21 804)	(315 229)	-	(4 256 029)	-	57 173 043
Motor vehicles and aircraft	35 793 250	8 814 103	(404 641)	(6)	-	(7 118 012)	-	37 084 694
Office equipment	9 443 140	1 295 777	(13 124)	(990)	-	(2 045 323)	-	8 679 479
Computer equipment	22 884 259	2 326 518	(21 658)	(72 606)	-	(6 029 458)	-	19 087 055
Infrastructure	15 706 276	5 591 914	-	-	-	(918 997)	-	20 379 193
Laboratory equipment	201 539 917	26 829 405	(53 032)	(181 955)	-	(13 505 326)	-	214 629 009
Non-current assets held for sale	482 023	-	(482 023)	-	-	-	-	-
Assets under construction	55 764 464	29 050 947	-	-	-	-	-	84 815 411
	849 425 897	92 707 857	(1 226 334)	(570 786)	(98 648)	(44 276 845)	(530 602)	895 430 538

Reconciliation of equipment, land and buildings - 2014

	Opening balance	Additions	Transfer to Held for sale	Write off	Added to asset register	Reclassification	Depreciation	Impairment	Total
Land	112 635 978	-	-	-	-	-	-	-	112 635 978
Buildings	356 161 944	5 760 391	-	(30 014)	61 474	1 618 125	(768 032)	(19 937 793)	342 866 095
Leasehold property	2 504	-	-	-	-	-	-	-	2 504
Machinery & farming equipment	45 464 175	12 260 139	(209 791)	(234 438)	380 093	(1 454 979)	(3 897 208)	-	52 307 991
Motor vehicles and air craft	24 197 518	17 777 879	(8 984)	(40 730)	-	(640 470)	(5 491 963)	-	35 793 250
Office equipment	9 060 091	2 928 844	(36 568)	(94 150)	-	(223 008)	(2 192 069)	-	9 443 140
Computer equipment	23 407 853	5 537 609	(36 712)	(16 225)	-	(422 152)	(5 586 114)	-	22 884 259
Infrastructure	13 156 584	2 530 352	(3)	(29 994)	1 461 680	(265 620)	(1 146 723)	-	15 706 276
Laboratory equipment	159 700 000	46 229 669	(189 964)	(384 259)	6 822 868	1 388 104	(12 026 501)	-	201 539 917
Non-current assets held for sale	484 213	-	(2 190)	-	-	-	-	-	482 023
Assets under construction	38 131 265	26 359 314	-	-	(8 726 115)	-	-	-	55 764 464
	782 402 125	119 384 197	(484 212)	(829 810)	-	-	(31 108 610)	(19 937 793)	849 425 897

Notes to the Annual Financial Statements

for the year ended 31 March 2015

Other information

Figures in Rand	2015	2014
Property, plant and equipment fully depreciated and still in use (Gross carrying amount)		
Laboratory equipment	13 294	16 872
Vehicles	458	424
Computer equipment	1 959	2 023
Office furniture and equipment	34 067	36 801
Machinery and farming equipment	3 203	1 720
Infrastructure	25	2
	866	3 323
	53 872	61 165

Reconciliation of assets under construction 2015

	Buildings	Laboratory equipment	Computer Equipment	Infrastruc-ture	Other PPE	Total
Opening	30 381 696	5 104 818	13 414 444	5 027 646	1 835 860	55 764 464
Additions	5 918 133	20 275	213 321	118 438	22 780 780	29 050 947
Subtotal	36 299 829	5 125 093	13 627 765	5 146 084	24 616 640	84 815 411
	36 299 829	5 125 093	13 627 765	5 146 084	24 616 640	84 815 411

Reconciliation of assets under construction 2014

	Buildings	Laboratory equipment	Computer equipment	Infrastruc-ture	Other PPE	Total
Opening Balance	16 513 483	7 087 939	12 566 345	1 461 680	501 818	38 131 265
Additions	13 929 687	4 839 747	848 099	5 027 646	1 714 135	26 359 314
	30 443 170	11 927 686	13 414 444	6 489 326	2 215 953	64 490 579
Transfers to complete items	(61 474)	(6 822 868)	-	(1 461 680)	(380 093)	(8 726 115)
	30 381 696	5 104 818	13 414 444	5 027 646	1 835 860	55 764 464

13. Intangible assets

	2015			2014		
	Cost / Valuation	Accumulated amortisation and accumulated impairment	Carrying value	Cost / Valuation	Accumulated amortisation and accumulated impairment	Carrying value
Computer software	48 871 636	(2 740 440)	46 131 196	30 476 774	-	30 476 774

Reconciliation of intangible assets - 2015

	Opening balance	Additions	Amortisation	Total
Computer software	30 476 774	18 394 862	(2 740 440)	46 131 196

Reconciliation of intangible assets - 2014

	Opening balance	Additions	Total
Computer software	1 688 241	28 788 533	30 476 774

14. Heritage assets

	2015			2014		
	Cost / Valuation	Accumulated impairment losses	Carrying value	Cost / Valuation	Accumulated impairment losses	Carrying value
Historical buildings	223 167	-	223 167	221 000	-	221 000

Reconciliation of heritage assets 2015

	Opening balance	Additions	Total
Historical buildings	221 000	2 167	223 167

Reconciliation of heritage assets 2014

	Opening balance	Total
Historical buildings	221 000	221 000

Notes to the Annual Financial Statements

for the year ended 31 March 2015

Heritage assets consist of a building. This building is currently a museum displaying Sir Arnold Theilers office and the equipment which he used when he started veterinary science in Onderstepoort. Arnold Theiler is regarded as the father of veterinary science in South Africa. ARC is still in the process of determining the value of the equipment used by Sir Arnold Theiler.

15. Investments

Figures in Rand	2015	2014
At fair value		
Capevin (KWV unbundling)		
510 409 shares market price R 9.26 (2014: 510 409 shares at R 7.30)	4 726 388	3 725 987
KWV Holdings LTD (KWV unbundling)		
51 041 shares market price R 6.51 (2014: 51 041 shares at R 7.80)	332 277	398 119
	5 058 665	4 124 106
At cost		
De Doorns Winery		
9 880 shares at R0.55 (2014: 9 880 shares at R0.55)	5 434	5 434
Lutzville 2009 Co-operative Limited		
107 000 shares at R0.01each (2014: 107000 shares at R0.01 each)	1 070	1 070
Burpak Limited		
1 948 shares at R1.00 each (2014: 1 948 shares at R1.00 each)	1 948	1 948
Lutzville Vineyard Co-operative		
44 867 shares at R1.00 each (2014: 44 867 shares at R1.00 each)	44 867	44 867
Lutzville Vineyard Co-operative		
1 070 000 shares at R0.01each (2014: 1 070 000 shares at R0.01 each)	10 700	10 700
Hex Valley Coolrooms		
16 092 shares at R0.50 each (2014: 16092 shares at R0.50 each)	8 046	8 046
Mcgregor Co-operative Limited		
110 320 shares at R1.00 each (2014: 110 320 shares at R1.00 each)	110 320	110 320
Lanko Co-operative Limited		
21 063 shares at R1.00 each (2014: 21 063 shares at R1.00 each)	21 063	21 063
	203 448	203 448
	5 262 113	4 327 554

Figures in Rand	2015	2014
Non-current assets		
At fair value	5 058 665	4 124 106
At cost	203 448	203 448
	5 262 113	4 327 554

16.Payables from exchange transactions

Figures in Rand	2015	2014
Trade payables	68 244 627	25 207 666
Payments received in advanced - contract in process	103 724 668	155 719 685
Other payables	95 749 203	47 718 443
	267 718 498	228 645 794

Trade payables are settled within thirty days. Exceptions may arise where an account is settled after thirty days.

Payables ageing

Figures in Rand	2015	2014
Current	40 305 314	20 316 486
Up to 60 days	4 564 203	2 650 470
90 days	2 036 607	566 720
91-120 days	20 729 780	76 945
121-150 days	409 104	226 886
150 days +	199 619	1 370 160
	68 244 627	25 207 667

17. VAT payable

Figures in Rand	2015	2014
VAT payable	12 788 499	7 802 063

Notes to the Annual Financial Statements

for the year ended 31 March 2015

18. Provisions

Reconciliation of provisions - 2015

	Opening Balance	Additions	Utilised during the year	Total
Leave accrual	57 485 925	4 926 811	(22 393 538)	40 019 198
Bonus provision	35 000 001	35 000 001	(22 756 598)	47 243 404
	92 485 926	39 926 812	(45 150 136)	87 262 602

Reconciliation of provisions - 2014

	Opening Balance	Additions	Utilised during the year	Reversed during the year	Total
Leave accrual	50 990 287	13 685 003	(7 189 365)	-	57 485 925
Bonus provision	35 500 000	35 000 001	(26 172 000)	(9 328 000)	35 000 001
	86 490 287	48 685 004	(33 361 365)	(9 328 000)	92 485 926

The leave pay obligation is the balance of employee leave days outstanding at year-end, reflected as a Rand value. The amounts are based on total cost of employment and leave days due.

Bonus provision is the amount that is payable to ARC staff members and is based on the performance rating.

19. Employee benefit obligations

Retirement funds

The ARC has made provision for pension and provident fund schemes covering substantially all employees. At the end of the financial year the following funds were in existence:

- ARC Pension fund (Categories A, B & C), operating as a defined benefit fund
- ARC Pension fund (Category D), operating as a defined contribution fund
- ARC Provident fund, operating as a defined contribution fund

The defined benefit fund covers 1.0%(2014: 1.0%) of the employees whilst 99.0 % (2014: 99.0%) are covered by the two defined contribution funds.

Members pay a contribution of 7.5%. The employer's contribution of 16% is expensed when incurred. All funds are governed by the South African Pension Fund Act No. 24 of 1956.

Defined benefit fund

The defined benefit fund is actuarially valued at least every three years on the projected unit credit method. A statutory valuation was performed on 31 March 2015. No material transactions or other material changes in circumstances have occurred since the valuation date necessitating additional bridging valuations.

Membership of the fund at 31 March and employer contributions for the year were as follows:

	Working members		Employer contributions	
	2015	2014	2015	2014
ARC Pension Fund (Options A to C)	11	12	516 000	408 000

Employer contribution for the next financial year are estimated at R 557 280.

Estimates were made by the actuary based on the actuarial valuation as at 31 March 2015.

Principal actuarial assumptions (expressed at weighted averages) were as follows:

	2015 %	2014 %
Pre-retirement discount rate	6,28	8,89
Post-retirement discount rate	4,78	6,74
Expected real after-tax return on fund's assets	6,28	8,89
Future general and merit salary increases	5,78	7,74
Expected rate of return on assets	6,28	8,89

The ARC responsibility is to fund the shortfall on the defined benefit. This is sufficiently covered by the employers surplus account. The ARC is responsible to appoint some of the Trustees who are charged with governance and administration of the fund. The Trustees administer the fund independent of ARC's management.

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The following table summarises the components of the benefit

Figures in Rand	2015	2014
Net benefit gain		
Current service cost	(1 012 000)	(1 018 000)
Interest on the benefit obligation	(3 139 000)	(2 923 000)
Expected return on plan assets	5 367 000	4 087 000
Net benefit (loss)/gain	1 216 000	146 000
Defined obligation	(42 792 000)	(34 804 000)
Fair value of plan assets	65 900 000	60 191 000
Net asset	23 108 000	25 387 000
Unrecognised asset	(23 108 000)	(25 387 000)
Benefit asset/liability	-	-

The pension plan assets consist primarily of equity, interest-bearing stock, cash deposits and overseas financial assets. The assets are diversified to guard against change in any economic factors. Change in one of the economic factors will result in an insignificant change in the plan assets.

Figures in Rand	2015	2014
Reconciliation of plan assets		
Fair value at the beginning of the year	60 191 000	49 437 000
Expected returns on the asset	5 367 000	4 087 000
Member contributions	192 000	192 000
Risk premiums	(123 000)	(120 000)
Benefits paid	(644 000)	(2 592 000)
Actuarial gains	401 000	8 779 000
Employer contributions	516 000	408 000
	65 900 000	60 191 000

Figures in Rand	2015	2014
Changes in the defined benefit obligation		
Benefit obligation at beginning of the year	34 804 000	33 856 000
Service cost	1 012 000	1 018 000
Members contributions	192 000	192 000
Interest cost	3 139 000	2 923 000
Actuarial gain (loss)	4 412 000	(473 000)
Benefits paid	(644 000)	(2 592 000)
Risk premiums	(123 000)	(120 000)
Benefit obligation at end of the year	42 792 000	34 804 000

	2013	2012	2011	2010
Benefit obligation	(28 575 000)	(22 840 000)	(20 368 000)	(24 080 000)
Fair value - benefit asset	43 748 000	40 475 000	33 825 000	39 774 000
Unrecognised surplus	15 173 000	17 635 000	13 457 000	15 694 000

Defined contribution Funds

Membership of the fund at 31 March and employer contributions for the year were as follows:

	Working members		Employer contributions	
	2015	2014	2015	2014
ARC Pension Fund (Option D)	1 400	1 289	34 844 392	32 564 852
ARC Provident Fund	956	901	11 289 157	10 550 614

Due to the nature of these funds the accrued liabilities by definition equate the total assets under these funds.

Management estimated that ARC will contribute R 38 880 000 to option D pension fund and R 12 960 000 to the provident fund in 2015.

Post-retirement medical benefits

This includes current and past employees of ARC who are currently members of the medical aid fund. Membership to the fund is voluntary.

The Council attempted to restructure the defined medical aid scheme, in terms of which the ARC had obligations to provide certain post-medical aid benefits to ARC pensioners in terms of ARC service conditions, by renegotiating the benefit structuring from a medical subsidy to a guaranteed income (pension). This restructuring was not completed and the defined benefit obligation remained. ARC currently has no continuation members with effect from 1 April 2004.

The scheme is actuarially valued on an annual basis. The effective date of the most recent actuarial valuation was 31 March 2015. At that date, in the opinion of the actuary, the defined benefit plan was found to be in a sound financial position. The projected unit credit method has been used for purposes of determining the actuarial valuation. Change in currency or interest rate result is an insignificant change in the plan obligation.

The following table summarises the components of the net benefit expense recognised in the statement of financial performance and amounts recognised in the statement of financial position at 31 March 2015. The obligation matures as the employees exit this fund.

The principal assumptions in determining the post-retirement medical aid liability are as shown:

The amount included in the statement of financial position arising from the ARC's obligation in respect of post-retirement medical benefits is as follows:

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for the year ended 31 March 2015

Figures in Rand	2015	2014
Present value of obligations	20 230 000	16 641 000
Post-retirement benefit obligation	20 230 000	16 641 000
Net discount rate applied	6.28%	8,89%
Membership of the fund at 31 March	486	478
Amounts recognised in respect of the scheme are as follows:		
Current service cost	545 000	827 000
Interest cost	843 000	1 594 000
Annual expense	1 388 000	2 421 000
Changes in the benefit obligation		
Opening balance	16 641 000	20 682 000
Service cost	545 000	827 000
Interest cost	843 000	1 594 000
Expected benefit settlements	(2 459 685)	(2 610 000)
Expected liability as at 31 March 2015/14	15 569 315	20 493 000
Actuarial (loss) gain	4 660 685	(3 852 000)
Closing balance	20 230 000	16 641 000

20. Deferred Income: Parliamentary Grant

Government grants received that will be recognised in future accounting periods. These conditional revenue will be recognised in future period upon completion of the Exotic disease and the Wild suide facilities . The construction of the Exotic disease and Wild suide facilities is in progress.

Movement during the year

Figures in Rand	2015	2014
Balance at the beginning of the year	192 596 947	192 596 947

This grant relates to construction of the Exotic Disease and Wild Suide facilities.

21. Capital fund

Figures in Rand	2015	2014
Contributed		
Balance	109 593 403	109 593 403

The capital fund represent the cost of land when the ARC was transferred out of the Department of Agriculture, Forestry and Fisheries.

22. Cash generated from operations

Figures in Rand	2015	2014
Surplus	33 305 633	135 683 330
Adjustments for:		
Depreciation and amortisation	47 017 287	31 108 610
Loss on sale of assets and liabilities	-	(793 025)
Impairment	530 601	19 937 793
Movements in retirement benefit assets and liabilities	3 588 999	(4 041 000)
Movements in provisions	(5 223 324)	5 995 639
Other non-cash items	263 158	-
Assets written off	570 789	829 810
Change in investments fair value	(934 559)	(478 618)
Changes in working capital:		
Inventories	6 452 510	(8 430 599)
Receivables from exchange transactions	8 271 701	(45 224 474)
Payables from exchange transactions	39 072 702	1 977 641
VAT	4 986 436	(6 181 493)
	137 901 933	130 383 614

23. Operating lease

The ARC leases certain of its equipment in terms of operating leases. The ARC does not have the option to acquire the assets at the termination on the lease. There are no escalation or renewal terms clauses or restrictions imposed by the leases. The ARC is not charged any contingent rentals.

The future minimum lease payments under non-cancellable operating leases are as follows:

2015	Up to 1 year	2-5 yrs	More than 5 yrs	Total
Commitment	5 770 588	2 446 745	-	8 217 333

2014	Up to 1 year	2-5 yrs	More than 5 yrs	Total
Commitment	10 030 329	5 047 698	-	15 078 027

Notes to the Annual Financial Statements

for the year ended 31 March 2015

24. Contingencies

Figures in Rand	2015	2014
There are contingent liabilities in respect of		
Guarantees on municipal and electricity accounts	1 075 360	1 075 360
Pending labour dispute	4 919 191	3 479 827
Surplus generated from commercial activities	33 305 632	135 683 330
Litigation	2 118 296	300 000
	41 418 479	140 538 517

The permission to keep the surplus for both financial years will be sought.

The guarantee on municipal and electrical accounts relate to the City of Tshwane municipality to ensure a continued service to the ARC- Onderstepoort Veterinary Institute. The timing of these contingent liabilities is not known and ARC does not expect any reimbursement of the contingent liabilities.

Labour dispute contingent liability relate to outstanding labour matters that are at CCMA and labour court.

Litigation relate to civil matters against ARC for which the outcome of the court cannot be determined reliably.

25.Commitments

25.1 Capital Commitments

Figures in Rand	2015	2014
Building	6 344 326	28 760 631
Infrastructure	660 677	4 413 268
Machinery and farming equipment	613 792	772 271
Laboratory equipment	12 588 050	6 762 681
Office furniture and equipment	50 468	108 662
Computer equipment	97 002	10 617 495
Motor Vehicles	1 067 386	4 140 340
	21 421 701	55 575 348

Capital expenses commitments relate to various capital items for which orders have been placed.

26. Related parties

Relationships	Name of the related party
Executive managers are regarded as related parties	
Controlling entity	Department of Agriculture, Forestry and Fisheries
National department - (under common control with controlling entity)	Department of Tourism
Public entity - (Under common control with ARC)	Perishable Products Export Control Board
National Department - (under common control with controlling entity)	Department of Environmental Affairs
Public entity - (Under common control with ARC)	Onderstepoort Biological Products
National Department - (under common control with controlling entity)	Department of Science and Technology
National Department - (under common control with controlling entity)	Department of Rural Development and Land Reform
National Department - (under common control with controlling entity)	Department of Water Affairs
National Department - (under common control with controlling entity)	Department of Public Works
National Department - (under common control with controlling entity)	Department of Basic Education
National Department - (under common control with controlling entity)	Department of Arts and Culture
National Department - (under common control with controlling entity)	Department of Transport

During the year the entity in the ordinary course of business entered into various transactions with related parties. Transactions entered into and balances outstanding between these parties are as follows:

Notes to the Annual Financial Statements

for the year ended 31 March 2015

Related party balances

Figures in Rand	2015	2014
Department of Water Affairs	8 816	8 815 727
Department of Rural Development and Land Reform - Other Grants	(244 896)	(12 853 593)
Department of Agriculture Forestry and Fisheries - Other Grants	-	(14 376 357)
Department of Agriculture Forestry and Fisheries - Other Grants	12 374 997	8 141 371
Department of Public Works	12 703	19 245
OBP	-	(36 822)
OBP	139 079	998 060
Department of Agriculture Forestry and Fisheries FMD	(129 524 909)	(129 524 909)
Department of Agriculture Forestry and Fisheries Economics Competitiveness support	(80 400 615)	(44 299 596)
Department of Science and Technology	(16 109 088)	(17 989 046)
Department of Environmental Affairs	25 960 011	666 377
Department of Education	27 662	41 394
Department of Arts and Culture	-	6 500
Department of Rural Development and Land Reform	60 850 678	43 194 234
Department of Tourism	-	(104 676)
Department of Science and Technology	-	978 711
Department of Agriculture Forestry and Fisheries - deferred grant	(4 877 451)	(4 877 451)

Related party transactions

Department of Water Affairs - Services	-	9 836
Department of Rural Development and Land Reform -Services	(175 162 343)	(163 972 415)
Department of Environmental Affairs - Services	(34 596 641)	(584 541)
Department of Agriculture forestry and Fisheries - PBR registrations	-	33 406
OBP -Utilities recovery	(11 459 161)	(10 271 308)
Department of Science and Technology - Parliamentary Grant	(52 543 859)	(52 236 842)
Department of Science and Technology - Other Revenue Grants	(11 396 000)	(9 664 742)
Department of Agriculture Forestry and Fisheries - Parliamentary Grant	(902 762 842)	(833 556 140)
Department of Education	(63 185)	-
Department of Water affairs -Research services	(8 267 464)	(17 550 263)
Perishable Products Export Control Board - Training Services	-	802 051
Department of Public works - Services	(16 141)	-
Department of Agriculture forestry and Fisheries - Services	(16 717 354)	(24 097 776)
Department of Tourism - Services	-	(86 274)

The balances are payable and collectable within 30 days. Executive Managers' remuneration is disclosed in note 27.

27. Council, Executive Managers and Audit Committee remuneration

Executive

2015

	Salaries	Subsistence and travel	Pension	Bonus	Medical aid	Total
Dr SR Moephuli	2 146 847	2 548	273 888	167 059	48 478	2 638 821
Mr GM Maluleke	1 792 381	1 876	193 767	140 819	52 602	2 181 446
Dr M Jeenah	1 999 777	36 895	135 219	147 405	-	2 319 298
Dr MA Magadlela	1 393 897	6 914	79 039	86 162	31 442	1 597 456
Mr F Monkwe	1 438 851	5 897	153 850	111 795	26 579	1 736 975
Mrs Umlaw	1 403 993	34 479	121 881	105 413	-	1 665 768
Dr DJG Rees	1 392 145	7 247	205 213	47 995	20 675	1 673 278
Dr LL Magingxa	1 416 398	20 289	153 910	-	48 478	1 639 076
	12 984 294	116 148	1 316 772	806 652	228 256	15 452 123

2014

	Salaries	Subsist-ence and travel	Pension	Bonus	Leave pay out	Medical aid	Total
Dr SR Moephuli	1 935 377	-	249 476	103 796	-	44 394	2 333 043
Mr GM Maluleke	1 649 366	-	180 249	183 735	-	49 762	2 063 112
Ms A Canca	815 278	7 931	56 604	82 426	65 760	13 890	1 041 889
Dr M Jeenah	1 841 406	5 948	125 786	137 377	-	-	2 110 517
Mr F Monkwe	1 327 299	-	143 099	69 460	-	21 997	1 561 855
Mrs Umlaw	1 286 659	1 464	112 441	98 242	-	-	1 498 806
	8 855 385	15 343	867 655	675 036	65 760	130 043	10 609 222

Notes to the Annual Financial Statements

for the year ended 31 March 2015

Non-executive

2015

	Committees fees	Subsistence travel	Total
Prof S Vil Nkomo (Chairperson)	252 222	1 719	253 941
Mr JWA Godden (Former Chairperson)	133 970	1 392	135 362
Ms J Masiteng	213 136	8 529	221 665
Mr M Dyasi	115 744	2 476	118 220
Prof L Hoffman	45 248	2 412	47 660
Mr A Bishop	70 753	7 638	78 391
Ms D Msomi	64 640	7 641	72 281
Ms FW Jansen van Rijssen	142 208	5 714	147 922
Dr JM Chitja	77 568	2 795	80 363
Ms D Ndaba	109 536	10 417	119 953
Mr C Kneale	80 096	9 505	89 601
Prof MJ Kahn	213 601	14 272	227 873
Prof FJC Swanepoel	193 568	9 281	202 849
Mr G Martin	67 520	8 156	75 676
Mr R Nicholls	74 468	12 830	87 298
Mr I Motala	96 784	18 918	115 702
	1 951 062	123 695	2 074 757

2014

	Members' fees	Committees fees	Total
Mr JWA Godden (Former Chairperson)	232 701	2 751	235 452
Ms J Masiteng	42 925	985	43 910
Mr JH Mcbain	63 131	4 732	67 863
Mr M Dyasi	107 313	1 691	109 004
Ms OD Aphane	82 249	3 005	85 254
Prof L Hoffman	42 925	1 464	44 389
Mr A Bishop	45 991	4 002	49 993
Ms D Msomi	70 520	2 585	73 105
Ms FW Jansen van Rijssen	85 830	2 514	88 344
Dr JM Chitja	45 991	2 049	48 040
Prof TV Mayekiso	27 595	1 303	28 898
Ms D Ndaba	49 047	3 910	52 957
Mr C Kneale	45 991	3 446	49 437
Prof MJ Kahn	71 713	5 477	77 190
Prof TA Mofokeng	36 793	2 433	39 226
Prof FJC Swanepoel	70 520	1 955	72 475
Mr G Martin	45 991	4 177	50 168
Prof S Vil Nkomo	87 654	511	88 165
Mr R Nicholls	30 661	1 311	31 972
Mr I Motala	42 925	8 302	51 227
	1 328 466	58 603	1 387 069

Audit committee

2015

	Fees	Subsistence and travel	Total
Mr VN Naicker (Chairperson)	72 375	1 588	73 963
Mr LM Mangquku	65 625	1 623	67 248
Ms K Mokoena	71 806	3 038	74 844
Mr JH Mcbain	48 681	4 664	53 345
Ms G Bruinders	74 306	806	75 112
	332 793	11 719	344 512

2014

	Fees	Subsistence and travel	Total
Mr LM Mangquku	63 960	1 086	65 046
Ms K Mokoena	20 066	920	20 986
Mr R Wesseloo	49 663	1 520	51 183
Ms G Bruiders	30 099	211	30 310
Mr VK Naicker	57 736	637	58 373
Dr S Cornelius	79 010	1 484	80 494
	300 534	5 858	306 392

Notes to the Annual Financial Statements

for the year ended 31 March 2015

28. Risk management

Category of financial instruments and maturity profile

2015	Notes	0-1 Years R	>1 year R	Total R
Assets				
At fair value instruments:				
Investments	15	-	5 262 113	5 262 113
Assets at amortised cost:				
Cash and cash equivalents		508 235 613	-	508 235 613
Trade and other receivables		123 910 639	-	123 910 639
Liabilities				
At amortised cost:				
Payables		(164 167 338)	-	(164 167 338)
		467 978 914	5 262 113	473 241 027
Percentage profile		98,89%	1,11%	100,00%

2014	Notes	0-1 Years R	>1 year R	Total R
Assets				
At fair value through profit or loss:				
Investments	15	-	4 327 554	4 327 554
Loans and receivables:				
Cash and cash equivalents		480 212 232	-	480 212 232
Trade and other receivables		125 940 864	-	125 940 864
Liabilities				
At amortised cost:				
Payables		(69 632 776)	-	(69 632 776)
		536 520 320	4 327 554	540 847 874
Percentage profile		99,20%	0,80%	100,00%

Capital risk management

As the ARC is not exposed to debt, there is no meaningful debt to equity ratios such as gearing ratios to be disclosed.

Financial risk management objectives

The Council members monitor and manage the financial risks relating to the operations of the entity through internal risk reports which analyse exposures by degree and magnitude of risks. These risks include market risk (including currency risk, fair value interest rate risk and price risk), credit risk, liquidity risk and cash flow interest rate risk. Compliance with policies and exposure limits is reviewed by the internal auditors on a continuous basis. The entity does not enter into or trade financial instruments, including derivative financial instruments, for speculative purposes.

Market risk

The entity's activities are of such a nature that it does not materially expose the ARC to financial risks of changes in foreign currency exchange rates and interest rates as referred to below. Market risk exposures are closely monitored by the Council members. Market risk arises on international trade.

There has been no change to the entity's exposure to market risks or the manner in which it manages and measures the risk. The market risk is managed by not taking any volatile instruments as the ARC activities do not materially expose ARC to market risk.

Foreign currency risk management

The ARC incurs currency risk as a result of purchases and sales in foreign currencies, hence exposure to exchange rate fluctuations arise. The currencies in which the Council primarily deals are US Dollars and Euro's. No forward cover is taken out for these transactions. The Council members consider the foreign currency risk to be insignificant.

Interest rate risk management

ARC is exposed to interest rate risk as it places funds at both fixed and floating interest rates. The risk is managed through investing the surplus funds at fixed and floating interest rates with reputable banks.

The following demonstrates the sensitivity to a reasonable change in interest rates, with all being constant and the impact on net surplus:

Figures in Rand	2015	2014
South African Rand (ZAR):		
Increase by 50 base points	2 539 691	2 401 061
Decrease by 50 base points	(2 539 691)	(2 401 061)

Notes to the Annual Financial Statements

for the year ended 31 March 2015

The following table identifies the period within which the financial instruments that are sensitive to interest rate risk reprice. ARC surplus funds are invested in terms of its investments policy as approved by its Council:

2015	%	
Current cash balances	4.25%	133 665 660
Short-term cash deposits	5.75%	374 569 953
		508 235 613

2014	%	
Current cash balances	4.50%	98 230 745
Short-term cash deposits	6.00%	381 981 487
		480 212 232

Other price risks

The ARC is exposed to price risk on its purchases. Prices for future purchases, sales of goods and services are generally established on normal commercial terms. The risk is managed by the application of procurement policy that encourages obtaining goods and services at best prices.

The Council members consider the price risk to be insignificant.

Credit risk management

Credit risk refers to the risk that counterparty would default on its contractual obligations resulting in financial loss to the entity. The entity has adopted a policy of only dealing with creditworthy counterparties and obtaining sufficient collateral, where appropriate, as a means of mitigating the risk of financial loss from defaults.

Financial assets which potentially subject the ARC to concentrations of credit risk consist principally of cash short-term deposits placed with high credit quality financial institutions. Trade receivables are presented net of an allowance for doubtful receivables. Currently only six of the entity's largest debtors exceed 5% of the total trade receivables balance as disclosed in note 9. The ARC does not have any significant exposure to any other individual customer or counter party.

The carrying amounts of financial assets included in the statement of financial position represent the ARC's maximum exposure to credit risk in relation to these assets. ARC does not hold collateral or any credit enhancements to cover its credit risk.

Liquidity risk management

Liquidity risk refers to the risk that an entity will encounter difficulty in meeting obligations associated with financial liabilities. The Council members are satisfied that the entity will be able to settle its financial liabilities (payables and leave pay accrual) in the normal course of business. Liquidity risk is managed by cash forecasting.

Fair value hierarchy

As at 31 March 2015, the entity held the following financial instruments carried at fair value on the statement of financial position:

The entity uses the following hierarchical technique for determining and disclosing the fair value of financial instruments:

Level 1: quoted prices in active markets for identical assets or liabilities
Level 2: other techniques for which all inputs which have a significant effect on the recorded fair value are observable, either directly or indirectly
Level 3: techniques which use inputs that have a significant effect on the recorded fair value that are not based on observable market data.

The fair value of financial assets and financial liabilities is determined as follows:

Assets measured at fair value	31 March 2015	Level 1	31 March 2014	Level 1
Financial assets at fair value	5 124 506	5 124 506	4 084 054	4 084 054

29. Irregular expenditure

Figures in Rand	2015	2014
Opening balance	1 461 128	1 147 056
Add: Irregular Expenditure - current year	648 209	1 449 433
Less: Amounts condoned	(1 461 128)	(1 135 361)
	648 209	1 461 128
Analysis of expenditure awaiting condonation per age classification		
Current year	648 209	1 437 227
Prior years	-	23 901
	648 209	1 461 128

Notes to the Annual Financial Statements

for the year ended 31 March 2015

Goods and services

The irregular expenditure relates to goods and services expenditure incurred in 2014 as a result of a ARC's non compliance to procurement policies and Public Finance Management Act 1 of 1999 (as amended by Act 29 0f 1999).

2015

Management investigated the 2015 irregular procurement of goods and service and applied for condonement recommended a disciplinary action. The amounts that are not condoned are still under investigation and appropriate action will be taken based on the outcome of the investigation.

2014

The irregular expenditure was incurred in the procurement of goods and services. These expenses were investigated to determine appropriate action, i.e. condonement, disciplinary action taken against the employees or the money recovered from the employees who did not follow proper procurement process.

30. Fruitless and wasteful expenditure

Figures in Rand	2015	2014
Fruitless and wasteful expenditure	15 447	4 620

The fruitless and wasteful expenses were incurred by paying interest charged on late payment.

31. Events after reporting date

The Council members are not aware of any significant matters or circumstances arising since the end of the financial year which need to be reported as part of these financial statements.

32. Taxation

The ARC is exempt from Income Tax in terms of section 10(1) (a) of the Income Tax Act no.58 of 1962.

33. Prior period errors

During the 2014 financial year an impairment journal for buildings amounting to R 20 672 054 was not processed. It was noted that invoices which related to intangible assets were recognised incorrectly in the 2015 financial year, when in fact based on invoice dates that related to the 2014 financial year.

The correction of the errors resulted in the following The errors have been corrected by restating each of the affacted financial statement line items for the prior periods, as follows:

Statement of Financial Position	Computer soft-ware - Cost	Buildings - Carry-ing Amount
Amount - before correction	28 751 410	(363 538 148)
Amount - after correction	30 476 774	342 866 094
Increase / (decrease) in amount	1 725 364	(20 672 054)

Error on the impairment of buildings	Buildings
Previously reported - Impairment reversal	794 260
Prior period error - Impairment	(20 672 054)
	(19 877 794)

Impact on Statement of Financial Performance & Changes in Net Assets	Prior year surplus
Previously reported - surplus	156 355 384
Prior period error - impairment	(20 672 054)
	135 683 330

34. Change in estimate

Equipment, land and buildings

The useful life of certain assets were revised and adjusted to shorter useful lives than the initiate estimate. The impact is an increase in depreciation for the current estimated at R 2 702.

The impact on the future years is an increase in depreciation estimated at R 43 231.

ARC Performance Information 2014/15

PROGRAMME	KEY OUTPUTS	INDICATOR	TARGET 2014/15	AUDITED ACTUALS YEAR TO DATE	VARIANCE	REASON FOR VARIANCE
GOAL 1 IMPROVED PRODUCTIVITY, PRODUCTION, COMPETITIVENESS AND SUSTAINABILITY OF CROP BASED AGRICULTURE						
Crops	Generation of knowledge through research	*Number of peer reviewed scientific publications*	110	164	54	Publications were accepted faster than anticipated
	Development of new technologies that improve yield, quality, nutrient content or disease resistance	*Number of IP registered*	12	11	(1)	Registration process has been slower than anticipated
	Scientific Services rendered	*Number of services rendered*	550	922	372	Higher demand for ARC services
Agro-Processing, Food Technology	Generation of knowledge through research	*Number of peer reviewed scientific publications*	10	25	15	Publications were accepted faster than anticipated
	Development of new technologies that improve yield, quality, nutrient content or disease resistance	*Number of IP registered*	1	0	(1)	Registration process has been slower than anticipated
	Scientific Services rendered	*Number of services rendered*	45	50	5	Higher demand for ARC services
Smallholder Agriculture Development	Generation of knowledge through research	*Number of peer reviewed scientific publications*	6	21	15	Publications were accepted faster than anticipated
	Development of new technologies that improve yield, quality, nutrient content or disease resistance	*Number of IP registered*	1	1	0	-
GOAL 2 IMPROVED PRODUCTIVITY, PRODUCTION, COMPETITIVENESS AND SUSTAINABILITY OF LIVESTOCK BASED AGRICULTURE						
Livestock	Generation of knowledge through research	*Number of peer reviewed scientific publications*	92	102	10	Publications were accepted faster than anticipated
	Scientific Services Rendered	*Number of services rendered*	22 500	21 746	(754)	Lower demand for ARC services
Agro-Processing, Food Technology	Generation of knowledge through research	*Number of peer reviewed scientific publications*	5	12	7	Publications were accepted faster than anticipated
Smallholder Agriculture Development	Generation of knowledge through research	*Number of peer reviewed scientific publications*	3	3	0	-

PROGRAMME	KEY OUTPUTS	INDICATOR	TARGET 2014/15	AUDITED ACTUALS YEAR TO DATE	VARIANCE	REASON FOR VARIANCE
GOAL 3 TO ENHANCE THE PRODUCTIVE USE AND CONSERVATION OF NATURAL RESOURCES						
Natural Resources	Generation of knowledge through research	*Number of peer reviewed scientific publications*	79	103	24	Publications were accepted faster than anticipated
	Development of New Technologies	*Number of prototypes developed*	1	10	9	More prototypes developed than anticipated
	Scientific Services Rendered	*Number of services rendered*	4 400	1 513	(2 887)	Lower demand for ARC services
Mechanisation and Engineering	Generation of knowledge through research	*Number of peer reviewed scientific publications*	3	2	(1)	There has been a slow rate in the development of publications
	Development of New Technologies	*Number of prototypes developed*	2	2	0	-
	Scientific Services Rendered	*Number of services rendered*	10	17	7	Higher demand for ARC services
GOAL 4 THE TRANSLATION OF RESEARCH RESULTS TO SUPPORT AGRARIAN TRANSFORMATION AND THE EFFICIENCY AND COMPETITIVENESS OF SECTOR						
Agriculture Economics	ARC developed technologies	*Number of technologies transferred under license*	27	33	6	Higher than anticipated transfer of ARC technologies under license
		Number of agriculture enterprises supported through IP	3	21	18	More focused approach adopted and applied in the support provided to agricultural enterprises
Smallholder Agriculture Development	Scientific Services Rendered	*Number of smallholder farmers supported*	7 000	9 991	2 991	Higher demand for ARC services
Training and Extension	Agriculture skills and capacity development	*Number of people trained*	8 500	8 704	204	Higher demand for ARC services
	Agriculture R & D information communicated / disseminated to stakeholders	*Number of information dissemination events*	1 300	2 619	1 319	Increase request for ARC information from the agriculture sector

PROGRAMME	KEY OUTPUTS	INDICATOR	TARGET 2014/15	AUDITED ACTUALS YEAR TO DATE	VARIANCE	REASON FOR VARIANCE
GOAL 5 GOOD GOVERNANCE, FINANCIAL SUSTAINABILITY AND A HIGH PERFORMING AND VISIBLE ORGANISATION						
Finance	Funding and Revenue generation	*Rand value of external income generated*	365 mil	**AS CONTAINED IN ARC FINANCIAL REPORT**		
		Rand value of royalties	6.6 mil			
Administration	Human Capital Management and Development	*Total size of SET base employed*	1001	945	(56)	SET appointments have occurred slower than anticipated
		Of total SET employed – number of Masters degrees staff employed	273	264	(9)	
		Of total SET employed – number of Doctoral degrees staff employed	191	221	30	Higher number of SET staff employed / appointed, with Doctoral Degrees, than originally anticipated
		Training spend as a % of total salary bill	2%	1%	(1%)	Training, across the ARC, has occurred slower than anticipated
		Number of Post Graduate students graduated	20	14	(6)	Graduation of Post Graduate students, have occurred slower than anticipated
	Sound Corporate Governance	*BBBEE rating*	Level 4	Level 4	-	-

Notes to the Annual Financial Statements

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